**Table S1 Mortality of cohort from specific cancers, 1946-2012**

| **Cancer** | **ICD Codes** | |  | **All workers** | | | |  | **Workers with more than background exposure to styrene** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |
|  |
| **ICD 9** | **ICD 10** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lip | 140 | C00 |  | 0 | 0.2 | 0.00 | 0.00-17.40 |  | 0 | 0.1 | 0.00 | 0.00-28.2 |
| Tongue | 141 | C01-C02 |  | 1 | 3.4 | 0.29 | 0.01-1.62 |  | 1 | 2.4 | 0.42 | 0.01-2.36 |
| Moutha | 143-145 | C03-C06 |  | 3 | 3.1 | 0.97 | 0.20-2.85 |  | 2 | 2.1 | 0.95 | 0.12-3.44 |
| Pharynxa | 146-149.1 | C09-C14.2 |  | 9 | 6.7 | 1.34 | 0.61-2.54 |  | 7 | 4.6 | 1.51 | 0.61-3.11 |
| Oesophagus | 150 | C15 |  | 47 | 44.2 | 1.06 | 0.78-1.41 |  | 35 | 30.3 | 1.16 | 0.80-1.61 |
| Stomach | 151 | C16 |  | 43 | 57.0 | 0.75 | 0.55-1.02 |  | 31 | 36.1 | 0.86 | 0.58-1.22 |
| Small intestinea | 152 | C17 |  | 3 | 2.0 | 1.53 | 0.32-4.47 |  | 3 | 1.3 | 2.32 | 0.48-6.79 |
| Large intestine | 153 | C18 |  | 49 | 63.8 | 0.77 | 0.57-1.02 |  | 36 | 40.6 | 0.89 | 0.62-1.23 |
| Rectum | 154 | C19-C21 |  | 33 | 39.4 | 0.84 | 0.58-1.18 |  | 21 | 25.7 | 0.82 | 0.51-1.25 |
| Liverb | 155.0-155.1 | C22 |  | 16 | 13.6 | 1.18 | 0.67-1.91 |  | 10 | 9.4 | 1.07 | 0.51-1.96 |
| Gall bladderb | 156 | C23-C24 |  | 2 | 3.9 | 0.51 | 0.06-1.86 |  | 2 | 2.3 | 0.87 | 0.10-3.13 |
| Pancreas | 157 | C25 |  | 48 | 42.5 | 1.13 | 0.83-1.50 |  | 27 | 27.6 | 0.98 | 0.64-1.42 |
| Nose and nasal sinuses | 160 | C30-C31 |  | 0 | 1.2 | 0.00 | 0.00-2.98 |  | 0 | 0.8 | 0.00 | 0.00-4.60 |
| Larynx | 161 | C32 |  | 13 | 7.6 | 1.70 | 0.91-2.91 |  | 6 | 5.2 | 1.15 | 0.42-2.50 |
| Lung | 162 | C33-C34 |  | 329 | 273.6 | 1.20 | 1.08-1.34 |  | 229 | 180.2 | 1.27 | 1.11-1.45 |
| Bone | 170 | C40-C41 |  | 1 | 1.9 | 0.53 | 0.01-2.97 |  | 1 | 1.2 | 0.83 | 0.02-4.65 |
| Soft tissue sarcomaa | 171 | C46-C47, C49 |  | 3 | 3.8 | 0.78 | 0.16-2.29 |  | 3 | 2.6 | 1.17 | 0.24-3.42 |
| Melanomaa | 172 | C43 |  | 9 | 10.0 | 0.90 | 0.41-1.71 |  | 4 | 6.8 | 0.59 | 0.16-1.51 |
| Other skina | 173 | C44 |  | 2 | 2.5 | 0.82 | 0.10-2.94 |  | 0 | 1.6 | 0.00 | 0.00-2.32 |
| Breast | 174, 175 | C50 |  | 24 | 31.2 | 0.77 | 0.49-1.15 |  | 11 | 11.6 | 0.95 | 0.47-1.70 |
| Prostate | 185 | C61 |  | 63 | 73.0 | 0.86 | 0.66-1.10 |  | 44 | 50.7 | 0.87 | 0.63-1.17 |
| Testisa | 186 | C62 |  | 1 | 1.8 | 0.54 | 0.01-3.03 |  | 1 | 1.3 | 0.76 | 0.02-4.23 |
| Other genitala | 187 | C63 |  | 1 | 0.8 | 1.30 | 0.03-7.25 |  | 1 | 0.5 | 1.94 | 0.05-10.8 |
| Bladdera | 188 | C65-C68 |  | 38 | 32.8 | 1.16 | 0.82-1.59 |  | 28 | 21.6 | 1.29 | 0.86-1.87 |
| Kidneya | 189 | C64 |  | 28 | 21.1 | 1.33 | 0.88-1.92 |  | 18 | 14.4 | 1.25 | 0.74-1.98 |
| Brain and nervous system | 191,192 | C71-C72 |  | 32 | 24.5 | 1.31 | 0.89-1.84 |  | 26 | 16.7 | 1.55 | 1.02-2.28 |
| Thyroid | 193 | C73 |  | 0 | 1.8 | 0.00 | 0.00-2.10 |  | 0 | 1.1 | 0.00 | 0.00-3.48 |
| Hodgkin’s disease | 201 | C81 |  | 2 | 4.1 | 0.49 | 0.06-1.77 |  | 2 | 2.6 | 0.75 | 0.09-2.73 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Non-Hodgkin lymphomaa | 200.202.0, 202.1,202.8 | C82-C85 |  | 24 | 25.2 | 0.95 | 0.61-1.42 |  | 14 | 16.9 | 0.83 | 0.45-1.39 |
| Multiple myelomaa | 203.0 | C90 |  | 13 | 13.9 | 0.94 | 0.50-1.60 |  | 9 | 9.1 | 0.99 | 0.45-1.88 |
| Leukaemia | 204-208 | C91-C95 |  | 23 | 25.3 | 0.91 | 0.58-1.36 |  | 13 | 16.7 | 0.78 | 0.42-1.33 |
| Lympho-haematopoietic cancer | 200-208 | C81-C96 |  | 62 | 69.8 | 0.89 | 0.68-1.14 |  | 38 | 46.1 | 0.82 | 0.58-1.14 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

aBecause of changes in disease classification, the earliest follow-up for these cancers was from 1950

bBecause of changes in disease classification, the earliest follow-up for these cancers was from 1958

**Table S2 Mortality from major categories of disease in workers with more than background exposure to styrene, 1946-2012: exposures lagged by 10 and 20 years**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cause of death** | **ICD Codes** | |  | **Exposures lagged by 10 years** | | | |  | **Exposures lagged by 20 years** | | | |
|  |
| **ICD 9** | **ICD 10** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95% CI** | **Deaths observed** | **Deaths expected** | **SMR** | **95% CI** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| All cancers | 140-208 | C00-C97 |  | 600 | 570.3 | 1.05 | 0.97-1.14 | 498 | 464.9 | 1.07 | 0.98-1.17 |
| Circulatory disease | 390-459 | I00-I99 |  | 766 | 758.6 | 1.01 | 0.94-1.08 | 604 | 595.1 | 1.01 | 0.94-1.10 |
| Respiratory disease | 460-519 | J00-J99 |  | 224 | 219.6 | 1.02 | 0.89-1.16 | 197 | 186.9 | 1.05 | 0.91-1.21 |
| Digestive diseases | 008-009, 520-579 | K00-K93 |  | 69 | 72.1 | 0.96 | 0.74-1.21 | 59 | 61.4 | 0.96 | 0.73-1.24 |
| Injury and poisoning | 800-999 | U509, V01-Y89 |  | 57 | 60.8 | 0.94 | 0.71-1.21 | 37 | 39.6 | 0.94 | 0.66-1.29 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| All Causes | 001-999 | A00-R99, U5009, V01-Y89 |  | 1,860 | 1,842.4 | 1.01 | 0.96-1.06 | 1,523 | 1,488.0 | 1.02 | 0.97-1.08 |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Table S3 Mortality from specific cancers in workers with more than background exposure to styrene, 1946-2012: exposures lagged by 10 and 20 years**

| **Cancer** | **ICD Codes** | |  | **Exposures lagged by 10 years** | | | |  | **Exposures lagged by 20 years** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |
|  |
| **ICD 9** | **ICD 10** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lip | 140 | C00 |  | 0 | 0.1 | 0.00 | 0.00-32.63 |  | 0 | 0.1 | 0.00 | 0.00-44.20 |
| Tongue | 141 | C01-C02 |  | 1 | 2.2 | 0.46 | 0.01-2.55 |  | 1 | 1.8 | 0.56 | 0.01-3.11 |
| Moutha | 143-145 | C03-C06 |  | 1 | 1.9 | 0.51 | 0.01-2.86 |  | 0 | 1.6 | 0.00 | 0.00-2.37 |
| Pharynxa | 146-149.1 | C09-C14.2 |  | 7 | 4.3 | 1.65 | 0.66-3.39 |  | 7 | 3.5 | 2.03 | 0.81-4.17 |
| Oesophagus | 150 | C15 |  | 34 | 28.9 | 1.18 | 0.82-1.65 |  | 30 | 24.9 | 1.20 | 0.81-1.72 |
| Stomach | 151 | C16 |  | 26 | 31.4 | 0.83 | 0.54-1.21 |  | 18 | 23.3 | 0.77 | 0.46-1.22 |
| Small intestinea | 152 | C17 |  | 2 | 1.2 | 1.71 | 0.21-6.16 |  | 2 | 1.0 | 2.10 | 0.25-7.57 |
| Large intestine | 153 | C18 |  | 33 | 37.5 | 0.88 | 0.61-1.24 |  | 26 | 30.7 | 0.85 | 0.55-1.24 |
| Rectum | 154 | C19-C21 |  | 20 | 23.6 | 0.85 | 0.52-1.31 |  | 16 | 19.1 | 0.84 | 0.48-1.36 |
| Liverb | 155.0-155.1 | C22 |  | 10 | 9.0 | 1.11 | 0.53-2.05 |  | 10 | 8.0 | 1.25 | 0.60-2.29 |
| Gall bladderb | 156 | C23-C24 |  | 2 | 2.0 | 0.99 | 0.12-3.58 |  | 2 | 1.5 | 1.33 | 0.16-4.80 |
| Pancreas | 157 | C25 |  | 26 | 25.5 | 1.02 | 0.67-1.49 |  | 23 | 21.0 | 1.09 | 0.69-1.64 |
| Nose and nasal sinuses | 160 | C30-C31 |  | 0 | 0.7 | 0.00 | 0.00-5.47 |  | 0 | 0.5 | 0.00 | 0.00-7.65 |
| Larynx | 161 | C32 |  | 5 | 4.8 | 1.04 | 0.34-2.44 |  | 5 | 3.8 | 1.31 | 0.42-3.05 |
| Lung | 162 | C33-C34 |  | 205 | 161.5 | 1.27 | 1.10-1.46 |  | 157 | 125.7 | 1.25 | 1.06-1.46 |
| Bone | 170 | C40-C41 |  | 1 | 0.9 | 1.12 | 0.03-6.26 |  | 1 | 0.6 | 1.59 | 0.04-8.85 |
| Soft tissue sarcomaa | 171 | C46, C47, C49 |  | 2 | 2.3 | 0.87 | 0.10-3.13 |  | 2 | 1.8 | 1.09 | 0.13-3.93 |
| Melanomaa | 172 | C43 |  | 4 | 6.2 | 0.64 | 0.18-1.65 |  | 3 | 5.1 | 0.59 | 0.12-1.72 |
| Other skina | 173 | C44 |  | 0 | 1.5 | 0.00 | 0.00-2.53 |  | 0 | 1.2 | 0.00 | 0.00-3.14 |
| Breast | 174, 175 | C50 |  | 10 | 10.3 | 0.97 | 0.46-1.78 |  | 9 | 7.9 | 1.14 | 0.52-2.17 |
| Prostate | 185 | C61 |  | 42 | 49.4 | 0.85 | 0.61-1.15 |  | 38 | 44.4 | 0.86 | 0.61-1.17 |
| Testisa | 186 | C62 |  | 1 | 0.7 | 1.52 | 0.04-8.47 |  | 0 | 0.3 | 0.00 | 0.00-12.98 |
| Other genitala | 187 | C63 |  | 1 | 0.4 | 2.29 | 0.06-12.78 |  | 0 | 0.3 | 0.00 | 0.00-12.77 |
| Bladdera | 188 | C65-C68 |  | 28 | 20.2 | 1.39 | 0.92-2.00 |  | 25 | 16.7 | 1.49 | 0.97-2.20 |
| Kidneya | 189 | C64 |  | 18 | 13.4 | 1.34 | 0.80-2.12 |  | 17 | 11.2 | 1.52 | 0.88-2.43 |
| Brain and nervous system | 191,192 | C71-C72 |  | 23 | 14.6 | 1.58 | 1.00-2.37 |  | 21 | 11.2 | 1.88 | 1.16-2.87 |
| Thyroid | 193 | C73 |  | 0 | 1.0 | 0.00 | 0.00-3.88 |  | 0 | 0.8 | 0.00 | 0.00-4.86 |
| Hodgkin’s disease | 201 | C81 |  | 1 | 1.7 | 0.59 | 0.01-3.30 |  | 0 | 1.0 | 0.00 | 0.00-3.79 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Non-Hodgkin lymphomaa | 200.202.0, 202.1,202.8 | C82-C85 |  | 14 | 15.6 | 0.90 | 0.49-1.50 |  | 12 | 13.0 | 0.92 | 0.48-1.61 |
| Multiple myelomaa | 203.0 | C90 |  | 8 | 8.6 | 0.93 | 0.40-1.84 |  | 8 | 7.3 | 1.10 | 0.47-2.17 |
| Leukaemia | 204-208 | C91-C95 |  | 12 | 14.9 | 0.81 | 0.42-1.41 |  | 10 | 12.2 | 0.82 | 0.39-1.51 |
| Lympho-haematopoietic cancer | 200-208 | C81C96 |  | 35 | 41.5 | 0.84 | 0.59-1.17 |  | 30 | 34.0 | 0.88 | 0.59-1.26 |

aBecause of changes in disease classification, the earliest follow-up for these cancers was from 1950

bBecause of changes in disease classification, the earliest follow-up for these cancers was from 1958

**Table S4 Mortality from selected cancers by highest level of exposure to styrene, 1946-2012: exposures lagged by 10 years**

| **Cancer** |  | **Highest level of exposurea** | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Background** | | | |  | | **Low/Moderate** | | | |  | **High for <1 year** | | | |  | **High for ≥1 year** | | | | |
|  | **Observed** | **Expected** | **SMR** | **95% CI** |  | | **Observed** | **Expected** | **SMR** | **95% CI** |  | **Observed** | **Expected** | **SMR** | **95% CI** |  | **Observed** | **Expected** | **SMR** | **95% CI** | |
|  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |
| Oesophagus |  | 13 | 14.2 | 0.92 | 0.49-1.57 |  | | 13 | 12.0 | 1.09 | 0.58-1.86 |  | 12 | 9.8 | 1.22 | 0.63-2.13 |  | 9 | 6.8 | 1.33 | | 0.61-2.53 |
| Stomach |  | 13 | 22.1 | 0.59 | 0.31-1.01 |  | | 15 | 14.3 | 1.05 | 0.59-1.73 |  | 6 | 9.7 | 0.62 | 0.23-1.34 |  | 5 | 7.1 | 0.70 | | 0.23-1.64 |
| Large intestine |  | 14 | 23.9 | 0.59 | 0.32-0.98 |  | | 11 | 16.0 | 0.69 | 0.34-1.23 |  | 14 | 12.2 | 1.15 | 0.63-1.93 |  | 8 | 9.0 | 0.89 | | 0.38-1.75 |
| Rectum |  | 13 | 14.1 | 0.92 | 0.49-1.57 |  | | 11 | 10.1 | 1.09 | 0.54-1.95 |  | 7 | 7.7 | 0.91 | 0.36-1.86 |  | 2 | 5.5 | 0.36 | | 0.04-1.31 |
| Pancreas |  | 21 | 15.4 | 1.37 | 0.85-2.09 |  | | 10 | 10.5 | 0.95 | 0.46-1.76 |  | 10 | 8.6 | 1.17 | 0.56-2.15 |  | 6 | 6.2 | 0.96 | | 0.35-2.10 |
| Lung |  | 105 | 97.9 | 1.07 | 0.88-1.30 |  | | 84 | 70.7 | 1.19 | 0.95-1.47 |  | 66 | 51.7 | 1.28 | 0.99-1.62 |  | 52 | 37.6 | 1.38 | | 1.03-1.82 |
| Prostate |  | 19 | 22.7 | 0.84 | 0.50-1.31 |  | | 20 | 24.4 | 0.82 | 0.50-1.26 |  | 15 | 14.4 | 1.04 | 0.58-1.72 |  | 7 | 10.2 | 0.68 | | 0.28-1.41 |
| Bladderb |  | 10 | 11.5 | 0.87 | 0.42-1.60 |  | | 16 | 9.3 | 1.73 | 0.99-2.80 |  | 8 | 6.2 | 1.29 | 0.56-2.54 |  | 3 | 4.5 | 0.66 | | 0.14-1.93 |
| Kidneyb |  | 10 | 6.9 | 1.45 | 0.69-2.66 |  | | 7 | 5.4 | 1.29 | 0.52-2.66 |  | 7 | 4.6 | 1.51 | 0.61-3.11 |  | 4 | 3.2 | 1.26 | | 0.34-3.22 |
| Brain and nervous system |  | 7 | 8.2 | 0.86 | 0.34-1.76 |  | | 11 | 5.4 | 2.02 | 1.01-3.62 |  | 4 | 5.4 | 0.74 | 0.20-1.89 |  | 8 | 3.5 | 2.25 | | 0.97-4.44 |
| Non-Hodgkin lymphomab |  | 10 | 8.5 | 1.17 | 0.56-2.15 |  | 3 | | 6.3 | 0.48 | 0.10-1.40 |  | 6 | 5.4 | 1.11 | 0.41-2.41 |  | 5 | 3.8 | 1.32 | | 0.43-3.08 |
| Leukaemia |  | 10 | 9.0 | 1.11 | 0.53-2.05 |  | 5 | | 6.2 | 0.80 | 0.26-1.88 |  | 4 | 5.0 | 0.80 | 0.22-2.05 |  | 3 | 3.5 | 0.85 | | 0.18-2.49 |
|  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  | |  |

aAt each time-point during follow-up, subjects were classed according to the highest grade of exposure experienced up to that date

bBecause of changes in disease classification, the earliest follow-up for these cancers was from 1950

**Table S5 Mortality from selected cancers by highest level of exposure to styrene, 1946-2012: exposures lagged by 20 years**

| **Cancer** |  | | **Highest level of exposurea** | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Background** | | | | |  | **Low/Moderate** | | | |  | **High for <1 year** | | | | |  | **High for ≥1 year** | | | |
|  | | **Observed** | **Expected** | **SMR** | **95% CI** | |  | **Observed** | **Expected** | **SMR** | **95% CI** |  | **Observed** | **Expected** | **SMR** | | **95% CI** |  | **Observed** | **Expected** | **SMR** | **95% CI** |
|  |  | |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |
| Oesophagus | |  | 14 | 15.0 | 0.93 | 0.51-1.57 |  | | 13 | 10.0 | 1.30 | 0.69-2.22 |  | 10 | 8.8 | | 1.14 | 0.55-2.09 |  | 7 | 5.8 | 1.21 | 0.48-2.48 |
| Stomach | |  | 15 | 24.0 | 0.63 | 0.35-1.03 |  | | 10 | 10.1 | 0.99 | 0.47-1.82 |  | 5 | 7.7 | | 0.65 | 0.21-1.52 |  | 3 | 5.3 | 0.57 | 0.12-1.66 |
| Large intestine | |  | 16 | 25.2 | 0.63 | 0.36-1.03 |  | | 7 | 12.7 | 0.55 | 0.22-1.14 |  | 12 | 10.4 | | 1.16 | 0.60-2.02 |  | 7 | 7.4 | 0.95 | 0.38-1.96 |
| Rectum | |  | 14 | 15.1 | 0.93 | 0.51-1.56 |  | | 8 | 7.9 | 1.02 | 0.44-2.00 |  | 6 | 6.6 | | 0.91 | 0.33-1.99 |  | 2 | 4.5 | 0.45 | 0.05-1.61 |
| Pancreas | |  | 22 | 16.3 | 1.35 | 0.84-2.04 |  | | 8 | 8.3 | 0.97 | 0.42-1.90 |  | 9 | 7.4 | | 1.22 | 0.56-2.31 |  | 6 | 5.2 | 1.16 | 0.43-2.54 |
| Lung | |  | 121 | 106.2 | 1.14 | 0.95-1.36 |  | | 65 | 52.2 | 1.25 | 0.96-1.59 |  | 54 | 42.7 | | 1.26 | 0.95-1.65 |  | 37 | 29.5 | 1.25 | 0.88-1.73 |
| Prostate | |  | 19 | 23.8 | 0.80 | 0.48-1.25 |  | | 18 | 21.4 | 0.84 | 0.50-1.33 |  | 13 | 13.4 | | 0.97 | 0.52-1.66 |  | 7 | 9.2 | 0.76 | 0.30-1.56 |
| Bladderb | |  | 11 | 12.3 | 0.89 | 0.45-1.60 |  | | 15 | 7.4 | 2.02 | 1.13-3.34 |  | 6 | 5.4 | | 1.11 | 0.41-2.42 |  | 3 | 3.8 | 0.79 | 0.16-2.32 |
| Kidneyb | |  | 10 | 7.3 | 1.36 | 0.65-2.51 |  | | 6 | 4.4 | 1.36 | 0.50-2.97 |  | 7 | 4.0 | | 1.74 | 0.70-3.59 |  | 4 | 2.6 | 1.51 | 0.41-3.87 |
| Brain and nervous system | |  | 8 | 8.7 | 0.92 | 0.40-1.81 |  | | 11 | 4.1 | 2.71 | 1.35-4.85 |  | 4 | 4.3 | | 0.93 | 0.25-2.38 |  | 6 | 2.7 | 2.23 | 0.82-4.85 |
| Non-Hodgkin lymphomab | |  | 10 | 9.0 | 1.11 | 0.53-2.05 |  | | 3 | 5.1 | 0.59 | 0.12-1.71 |  | 5 | 4.6 | | 1.08 | 0.35-2.53 |  | 4 | 3.1 | 1.28 | 0.35-3.27 |
| Leukaemia | |  | 10 | 9.5 | 1.06 | 0.51-1.94 |  | | 4 | 5.0 | 0.80 | 0.22-2.05 |  | 3 | 4.2 | | 0.72 | 0.15-2.11 |  | 3 | 2.9 | 1.04 | 0.22-3.05 |
|  |  | |  |  |  |  | |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |

aAt each time-point during follow-up, subjects were classed according to the highest grade of exposure experienced up to that date

bBecause of changes in disease classification, the earliest follow-up for these cancers was from 1950

**Supplementary Table S6 Cases Included in Nested Case-control Analyses by Source of First Ascertainment**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cancer** |  | **Source of first ascertainment** | | | | | | |
| **Cancer registration** |  | **Underlying cause of death** |  | **Contributing cause of death** |  | **All sources** |
| Hodgkin’s disease |  | 7 |  | 0 |  | 0 |  | 7 |
| Non-Hodgkin lymphoma (including chronic lymphocytic leukaemia) |  | 61 |  | 6 |  | 3 |  | 70 |
| Multiple myeloma |  | 18 |  | 5 |  | 1 |  | 24 |
| Other leukaemia |  | 14 |  | 6 |  | 2 |  | 22 |
|  |  |  |  |  |  |  |  |  |
| All lymphatic and haematopoietic cancer |  | 100 |  | 17 |  | 6 |  | 123 |
|  |  |  |  |  |  |  |  |  |

**Supplementary Table S7 Mortality from major categories of disease, 1991-2012**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cause of death** | **ICD Codes** | |  | **All workers** | | | |  | **Workers with more than background exposure to styrene** | | | |
|  |
| **ICD 9** | **ICD 10** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95% CI** | **Deaths observed** | **Deaths expected** | **SMR** | **95% CI** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| All cancers | 140-208 | C00-C97 |  | 678 | 605.7 | 1.12 | 1.04-1.21 | 467 | 412.9 | 1.13 | 1.03-1.24 |
| Circulatory disease | 390-459 | I00-I99 |  | 741 | 700.0 | 1.06 | 0.98-1.14 | 503 | 472.3 | 1.06 | 0.97-1.16 |
| Respiratory disease | 460-519 | J00-J99 |  | 261 | 217.6 | 1.20 | 1.06-1.35 | 181 | 143.9 | 1.26 | 1.08-1.45 |
| Digestive diseases | 008-009, 520-579 | K00-K93 |  | 75 | 79.9 | 0.94 | 0.74-1.18 | 50 | 54.5 | 0.92 | 0.68-1.21 |
| Injury and poisoning | 800-999 | U509, V01-Y89 |  | 58 | 48.8 | 1.19 | 0.90-1.54 | 39 | 35.0 | 1.11 | 0.79-1.52 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| All Causes | 001-999 | A00-R99, U5009, V01-Y89 |  | 2,022 | 1,814.0 | 1.11 | 1.07-1.16 | 1,354 | 1,225.2 | 1.11 | 1.05-1.17 |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Supplementary Table S8 Mortality from specific cancers, 1991-2012**

| **Cancer** | **ICD Codes** | |  | **All workers** | | | |  | **Workers with more than background exposure to styrene** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |
|  |
| **ICD 9** | **ICD 10** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |  | **Deaths observed** | **Deaths expected** | **SMR** | **95%CI** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lip | 140 | C00 |  | 0 | 0.1 | 0.00 | 0.00-42.68 |  | 0 | 0.1 | 0.00 | 0.00-60.77 |
| Tongue | 141 | C01-C02 |  | 1 | 2.3 | 0.44 | 0.01-2.43 |  | 1 | 1.7 | 0.60 | 0.02-3.36 |
| Moutha | 143-145 | C03-C06 |  | 2 | 2.0 | 1.00 | 0.12-3.63 |  | 1 | 1.4 | 0.70 | 0.02-3.92 |
| Pharynxa | 146-149.1 | C09-C14.2 |  | 8 | 4.4 | 1.81 | 0.78-3.57 |  | 6 | 3.2 | 1.86 | 0.68-4.04 |
| Oesophagus | 150 | C15 |  | 37 | 32.9 | 1.13 | 0.79-1.55 |  | 26 | 23.4 | 1.11 | 0.73-1.63 |
| Stomach | 151 | C16 |  | 21 | 27.5 | 0.76 | 0.47-1.17 |  | 21 | 27.5 | 0.76 | 0.47-1.17 |
| Small intestinea | 152 | C17 |  | 1 | 1.3 | 0.78 | 0.02-4.33 |  | 1 | 0.9 | 1.13 | 0.03-6.28 |
| Large intestine | 153 | C18 |  | 33 | 40.1 | 0.82 | 0.57-1.15 |  | 33 | 40.1 | 0.82 | 0.57-1.15 |
| Rectum | 154 | C19-C21 |  | 24 | 24.1 | 1.00 | 0.64-1.48 |  | 15 | 16.8 | 0.89 | 0.50-1.47 |
| Liverb | 155.0-155.1 | C22 |  | 16 | 11.0 | 1.45 | 0.83-2.36 |  | 10 | 7.7 | 1.29 | 0.62-2.37 |
| Gall bladderb | 156 | C23-C24 |  | 2 | 2.0 | 1.01 | 0.12-3.65 |  | 2 | 1.3 | 1.59 | 0.19-5.75 |
| Pancreas | 157 | C25 |  | 37 | 28.0 | 1.32 | 0.93-1.82 |  | 22 | 19.0 | 1.16 | 0.72-1.75 |
| Nose and nasal sinuses | 160 | C30-C31 |  | 0 | 0.6 | 0.00 | 0.00-6.43 |  | 0 | 0.4 | 0.00 | 0.00-9.11 |
| Larynx | 161 | C32 |  | 8 | 4.7 | 1.71 | 0.74-3.38 |  | 3 | 3.4 | 0.88 | 0.18-2.58 |
| Lung | 162 | C33-C34 |  | 204 | 157.3 | 1.30 | 1.12-1.49 |  | 153 | 109.1 | 1.40 | 1.19-1.64 |
| Bone | 170 | C40-C41 |  | 1 | 0.8 | 1.25 | 0.03-6.99 |  | 1 | 0.6 | 1.78 | 0.04-9.89 |
| Soft tissue sarcomaa | 171 | C46, C47, C49 |  | 2 | 2.5 | 0.79 | 0.10-2.84 |  | 2 | 1.8 | 1.14 | 0.14-4.12 |
| Melanomaa | 172 | C43 |  | 7 | 7.1 | 0.99 | 0.40-2.05 |  | 4 | 5.0 | 0.81 | 0.22-2.07 |
| Other skina | 173 | C44 |  | 0 | 1.5 | 0.00 | 0.00-2.40 |  | 0 | 1.1 | 0.00 | 0.00-3.47 |
| Breast | 174, 175 | C50 |  | 20 | 16.9 | 1.18 | 0.72-1.83 |  | 9 | 6.9 | 1.31 | 0.60-2.48 |
| Prostate | 185 | C61 |  | 46 | 52.4 | 0.88 | 0.64-1.17 |  | 32 | 37.8 | 0.85 | 0.58-1.20 |
| Testisa | 186 | C62 |  | 0 | 0.3 | 0.00 | 0.00-10.87 |  | 0 | 0.3 | 0.00 | 0.00-14.21 |
| Other genitala | 187 | C63 |  | 0 | 0.3 | 0.00 | 0.00-11.90 |  | 0 | 0.2 | 0.00 | 0.00-16.31 |
| Bladdera | 188 | C65-C68 |  | 31 | 21.6 | 1.44 | 0.98-2.04 |  | 24 | 15.0 | 1.60 | 1.02-2.38 |
| Kidneya | 189 | C64 |  | 24 | 14.9 | 1.61 | 1.03-2.40 |  | 17 | 10.5 | 1.62 | 0.94-2.59 |
| Brain and nervous system | 191,192 | C71-C72 |  | 25 | 14.8 | 1.69 | 1.09-2.49 |  | 20 | 10.5 | 1.90 | 1.16-2.93 |
| Thyroid | 193 | C73 |  | 0 | 1.1 | 0.00 | 0.00-3.51 |  | 0 | 0.7 | 0.00 | 0.00-5.41 |
| Hodgkin’s disease | 201 | C81 |  | 0 | 1.2 | 0.00 | 0.00-3.08 |  | 0 | 0.8 | 0.00 | 0.00-4.37 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Non-Hodgkin lymphomaa | 200.202.0, 202.1,202.8 | C82-C85 |  | 18 | 18.0 | 1.00 | 0.59-1.58 |  | 9 | 12.4 | 0.73 | 0.33-1.38 |
| Multiple myelomaa | 203.0 | C90 |  | 11 | 9.9 | 1.11 | 0.55-1.98 |  | 8 | 6.7 | 1.19 | 0.51-2.34 |
| Leukaemia | 204-208 | C91-C95 |  | 15 | 15.9 | 0.94 | 0.53-1.55 |  | 8 | 11.0 | 0.73 | 0.31-1.44 |
| Lympho-haematopoietic cancer | 200-208 | C81-C96 |  | 44 | 45.4 | 0.97 | 0.70-1.30 |  | 25 | 31.2 | 0.80 | 0.52-1.18 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

aBecause of changes in disease classification, the earliest follow-up for these cancers was from 1950

bBecause of changes in disease classification, the earliest follow-up for these cancers was from 1958