**Appendix Table 1:** Mortality for the lead smelter cohort based on underlying and multiple cause-of-death referent rates for selected causes of death, excluding person-time with one day or more of exposure in two cadmium exposed departments a

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cause of Death | US Underlying Cause | |  | US Multiple Cause | |  | Idaho Underlying Cause | |
| OBS | SMR (95% CI) | OBS | SMR (95% CI) | OBS | SMR (95% CI) |
| All causes | 1630 | 1.10 (1.04, 1.15) |  | 3446 | 1.02 (0.98, 1.05) |  | 1442 | 1.22 (1.16, 1.28) |
| All cancers | 357 | 1.07 (0.96, 1.18) |  | 489 | 1.05 (0.96, 1.15) |  | 325 | 1.26 (1.12, 1.40) |
| MN trachea, bronchus, lung | 151 | 1.43 (1.21, 1.67) |  | 150 | 1.35 (1.14, 1.59) |  | 143 | 1.92 (1.62, 2.26) |
| MN stomach | 19 | 1.37 (0.82, 2.14) |  | 13 | 1.18 (0.63, 2.01) |  | 12 | 1.40 (0.72, 2.44) |
| MN kidney | 12 | 1.49 (0.77, 2.61) |  | 9 | 1.02 (0.47, 1.93) |  | 9 | 1.36 (0.62, 2.58) |
| Cardiovascular disease | 735 | 1.01 (0.94, 1.09) |  | 1475 | 0.97 (0.92, 1.02) |  | 661 | 1.22 (1.13, 1.32) |
| Diseases of the heart | 542 | 0.94 (0.86, 1.03) |  | 1035 | 0.91 (0.86, 0.97) |  | 482 | 1.16 (1.06, 1.27) |
| Ischemic heart disease | 441 | 0.93 (0.84, 1.02) |  | 570 | 0.88 (0.81, 0.95) |  | 399 | 1.17 (1.06, 1.30) |
| Hypertension with heart disease | 16 | 0.87 (0.50, 1.41) |  | 14 | 0.86 (0.47, 1.44) |  | 8 | 1.06 (0.46, 2.09) |
| Other diseases of the circulatory system | 193 | 1.30 (1.13, 1.50) |  | 440 | 1.14 (1.04, 1.25) |  | 179 | 1.42 (1.22, 1.64) |
| Hypertension without heart disease | 8 | 1.20 (0.52, 2.37) |  | 73 | 1.26 (0.99, 1.58) |  | 8 | 1.77 (0.76, 3.48) |
| Cerebrovascular disease | 126 | 1.26 (1.05, 1.50) |  | 181 | 1.10 (0.94, 1.27) |  | 114 | 1.35 (1.12, 1.63) |
| Diseases of the respiratory system | 178 | 1.39 (1.19, 1.61) |  | 436 | 1.19 (1.08, 1.30) |  | 163 | 1.28 (1.09, 1.49) |
| Chronic obstructive pulmonary disease | 106 | 1.69 (1.39, 2.05) |  | 200 | 1.36 (1.18, 1.56) |  | 103 | 1.40 (1.14, 1.69) |
| Pneumoconiosis & other respiratory diseases | 25 | 1.29 (0.83, 1.90) |  | 107 | 1.46 (1.19, 1.76) |  | 19 | 1.13 (0.68, 1.76) |
| Diseases of the genitourinary system | 26 | 0.95 (0.62, 1.39) |  | 98 | 0.89 (0.72, 1.08) |  | 24 | 1.30 (0.83, 1.93) |
| Acute glomerulonephritis & renal failure | 3 | 1.17 (0.24, 3.42) |  | 11 | 0.76 (0.38, 1.36) |  | 3 | 2.07 (0.43, 6.04) |
| Chronic & unspecified nephritis & renal failure | 16 | 1.18 (0.67, 1.91) |  | 55 | 0.99 (0.75, 1.29) |  | 14 | 1.59 (0.87, 2.67) |
| Accidents | 101 | 1.72 (1.40, 2.09) |  | 123 | 1.58 (1.31, 1.89) |  | 72 | 1.22 (0.95, 1.54) |
| Transportation accidents | 48 | 1.81 (1.34, 2.40) |  | 32 | 1.96 (1.34, 2.77) |  | 33 | 1.23 (0.85, 1.73) |
| Accidental falls | 24 | 2.09 (1.34, 3.11) |  | 20 | 1.35 (0.82, 2.08) |  | 18 | 1.74 (1.03, 2.74) |
| Violence | 34 | 1.40 (0.97, 1.96) |  | 30 | 1.58 (1.06, 2.25) |  | 30 | 1.34 (0.91, 1.92) |
| Suicide | 32 | 1.60 (1.09, 2.26) |  | 28 | 1.83 (1.22, 2.65) |  | 28 | 1.40 (0.93, 2.03) |
| Homicide | 2 | 0.47 (0.06, 1.69) |  | 2 | 0.54 (0.07, 1.94) |  | 2 | 0.83 (0.10, 3.01) |
| Amyotrophic lateral sclerosis | 3 | 1.31 (0.27, 3.82) |  | 4 | 1.45 (0.40, 3.72) |  |  | NA |

Abbreviations: OBS, observed deaths; SMR, standardized mortality ratio; CI, confidence interval; MN, malignant neoplasm; NA, not available

a Referent rates based on data 1940-2011 for US underlying cause analyses (1960-2009 for ALS), 1960-2011 for US multiple cause analyses (1960-2009 for ALS), and 1960-2007 for Idaho underlying cause analyses. Person-time at risk and observed deaths enumerated for the cohort 1940-2013 for US underlying cause analyses (1960-2013 for ALS), 1960-2013 for US multiple cause analyses (1960-2013 for ALS), and 1960-2013 for Idaho underlying cause analyses.

**Appendix Table 2:** Rate ratios by cumulative lead exposure for selected underlying causes of death (1940-2013) in the lead smelter cohort, excluding person-time with one day or more of exposure in two cadmium exposed departments

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cause of death | Cumulative lead exposure (mg/m3-days) | | | | | | | | |
| 0-<209 | |  | 209-<757 | |  | 757+ | | Trend |
| OBS | SRR | OBS | SRR (95% CI) | OBS | SRR (95% CI) | P‑value |
| All causes | 569 | 1 (ref) |  | 543 | 1.00 (0.89, 1.12) |  | 518 | 1.15 (1.02, 1.29) | 0.02 |
| All cancers a | 149 | 1 (ref) |  | 130 | 1.01 (0.79, 1.29) |  | 108 | 0.95 (0.73, 1.24) | 0.71 |
| MN trachea, bronchus, lung a | 70 | 1 (ref) |  | 49 | 0.85 (0.59, 1.24) |  | 43 | 0.79 (0.53, 1.19) | 0.26 |
| MN stomach a | 11 | 1 (ref) |  | 5 | 0.67 (0.23, 1.96) |  | 3 | 0.50 (0.14, 1.83) | 0.28 |
| MN kidney a | 5 | 1 (ref) |  | 6 | 1.36 (0.39, 4.74) |  | 3 | 0.69 (0.13, 3.57) | 0.67 |
| Cardiovascular disease | 238 | 1 (ref) |  | 252 | 1.04 (0.87, 1.24) |  | 245 | 1.21 (1.01, 1.45) | 0.03 |
| Diseases of the heart | 175 | 1 (ref) |  | 187 | 1.06 (0.86, 1.30) |  | 180 | 1.22 (0.99, 1.51) | 0.06 |
| Ischemic heart disease | 148 | 1 (ref) |  | 148 | 1.00 (0.80, 1.26) |  | 145 | 1.17 (0.93, 1.48) | 0.14 |
| Hypertension with heart disease | 2 | 1 (ref) |  | 7 | 2.46 (0.50, 12.0) |  | 7 | 3.15 (0.65, 15.4) | 0.18 |
| Other diseases of the circulatory system | 63 | 1 (ref) |  | 65 | 0.99 (0.70, 1.40) |  | 65 | 1.20 (0.85, 1.70) | 0.27 |
| Hypertension without heart disease b | 31 | 1 (ref) |  | 23 | 0.81 (0.47, 1.39) |  | 19 | 0.82 (0.46, 1.45) | 0.51 |
| Cerebrovascular disease | 37 | 1 (ref) |  | 45 | 1.15 (0.74, 1.78) |  | 44 | 1.38 (0.89, 2.14) | 0.15 |
| Diseases of the respiratory system | 67 | 1 (ref) |  | 54 | 0.85 (0.59, 1.22) |  | 57 | 1.08 (0.76, 1.55) | 0.57 |
| Chronic obstructive pulmonary disease | 49 | 1 (ref) |  | 29 | 0.65 (0.41, 1.03) |  | 28 | 0.76 (0.48, 1.21) | 0.27 |
| Pneumoconiosis and other respiratory diseases | 7 | 1 (ref) |  | 9 | 1.17 (0.43, 3.17) |  | 9 | 1.40 (0.52, 3.83) | 0.50 |
| Diseases of the genitourinary system | 9 | 1 (ref) |  | 8 | 0.95 (0.36, 2.47) |  | 9 | 1.27 (0.50, 3.21) | 0.58 |
| Acute glomerulonephritis & renal failure b | 3 | 1 (ref) |  | 4 | 1.52 (0.34, 6.84) |  | 4 | 1.86 (0.41, 8.36) | 0.43 |
| Chronic & unspecified nephritis & renal failure b | 18 | 1 (ref) |  | 22 | 1.37 (0.73, 2.56) |  | 15 | 1.11 (0.56, 2.21) | 0.84 |
| Accidents | 38 | 1 (ref) |  | 26 | 0.90 (0.54, 1.48) |  | 37 | 1.51 (0.95, 2.38) | 0.06 |
| Transportation accidents | 17 | 1 (ref) |  | 13 | 1.08 (0.52, 2.24) |  | 18 | 1.73 (0.89, 3.38) | 0.10 |
| Accidental falls | 12 | 1 (ref) |  | 6 | 0.46 (0.17, 1.24) |  | 6 | 0.58 (0.21, 1.56) | 0.31 |
| Violence | 11 | 1 (ref) |  | 16 | 1.77 (0.82, 3.84) |  | 7 | 0.95 (0.37, 2.45) | 0.86 |
| Suicide | 10 | 1 (ref) |  | 15 | 1.84 (0.82, 4.13) |  | 7 | 1.04 (0.39, 2.74) | 0.99 |

Abbreviations: OBS, observed deaths; RR, rate ratio (reference: <209 mg/m3-daysof cumulative lead exposure); MN, malignant neoplasm; CI, confidence interval

a Cumulative exposure was lagged by 10 years for cancer outcomes.

b Results for hypertension without heart disease, acute glomerulonephritis & renal failure (i.e., acute kidney disease, AKD), and chronic & unspecified nephritis & renal failure (i.e., chronic kidney disease, CKD) consider all causes listed on the death certificate (i.e., a multiple cause of death analysis).