

Cancer incidence and HWSE path analysis

GM-UAW Cohort Study

April 1, 2021

This packet summarizes Cox proportional hazard model results relating cumulative exposure to straight, soluble, and synthetic metalworking fluids (MWF), lagged 21 years, to cancer incidence of 14 types and for all sites combined (includes types not shown here) in the UAW-GM Cohort.

- Colon cancer
- Rectal cancer
- Pancreatic cancer
- Esophageal cancer
- Stomach cancer
- Laryngeal cancer
- Lung and bronchial cancers
- Breast cancer
- Prostate cancer
- Kidney and renal pelvic cancers
- Bladder cancer
- Melanoma
- Leukemia
- Non-Hodgkin lymphoma

In addition, path analyses for evidence of the healthy worker survivor effect are presented. These include Cox models relating employment status to cancer incidence and one Cox model relating cumulative MWF exposure to leaving work. In these models, metalworking fluid was lagged 1 year only. The path analyses largely follow the methods outlined in Garcia et al.¹

The study population, summarized in Table 1, included subjects from the UAW-GM Cohort who were still alive at the start of cancer incidence follow-up. Cancer incidence data were abstracted from Michigan Cancer Registry for all plants from years 1985 onward. Cancer incidence data for plants 1 and 2 were supplemented with data from the Surveillance, Epidemiology, and End Results Program (SEER).

In all analyses, follow-up began three years after hire and no earlier than 1973 for plants 1 and 2 or 1985 for plant 3; follow-up ended upon experiencing the outcome of interest, attaining the oldest observed age at death (considered lost to follow-up), dying, or reaching the year 2015, whichever came first. In path analyses involving employment status, subjects were censored on December 31, 1994 (end of employment records) if they did not leave work before then. Missing race was handled by multiple imputation ($M = 50$).²

Table 1: Summary of population characteristics. In plants 1 and 2, follow-up for cancer incidence extends from 1973 through 2015. In plant 3, follow-up starts in 1985.

| | <i>n</i> | <i>p</i> | |
|---|----------|------------------------|------------------------|
| Study population size (person-years) | 39 132 | 1 087 230 | |
| Race | | | |
| White | 25 119 | 64% | |
| Black | 6 862 | 18% | |
| Unknown | 7 151 | 18% | |
| Sex | | | |
| Male | 34 498 | 88% | |
| Female | 4 634 | 12% | |
| Plant [‡] | | | |
| Plant 1 | 11 467 | 29% | |
| Plant 2 | 15 910 | 41% | |
| Plant 3 | 11 755 | 30% | |
| Ever exposed to MWFs | | | |
| Straight | 21 294 | 54% | |
| Soluble | 34 055 | 87% | |
| Synthetic | 12 530 | 32% | |
| Diagnosed with cancer by end of follow-up | 7 809 | 20% | |
| | Median | 25 th %tile | 75 th %tile |
| Years of follow-up | 39.5 | 34.3 | 46.99 |
| Year of birth | 1937 | 1921 | 1949 |
| Year of hire | 1965 | 1952 | 1973 |
| Age at hire (years) | 24 | 20 | 31 |
| Year of leaving work* | 1985 | 1970 | 1995 |
| Age at leaving work (years)* | 46 | 37 | 56 |
| Years at work* | 15.73 | 7.65 | 27.06 |
| Year of first cancer diagnosis | 1999 | 1991 | 2007 |
| Age at first cancer diagnosis (years) | 67 | 59 | 74 |
| Cumulative exposure [‡] to MWFs (mg/m ³ ·y) | | | |
| Straight | 0.69 | 0.21 | 2.53 |
| Soluble | 4.93 | 1.93 | 13.31 |
| Synthetic | 0.44 | 0.15 | 1.56 |

[‡] Some individuals worked at several sites; plant indicates the site of longest work record time.

* Among those with known date of worker exit.

[‡] Summary statistics calculated for ever-exposed individuals at end of follow-up only. Exposures were lagged 21 years.

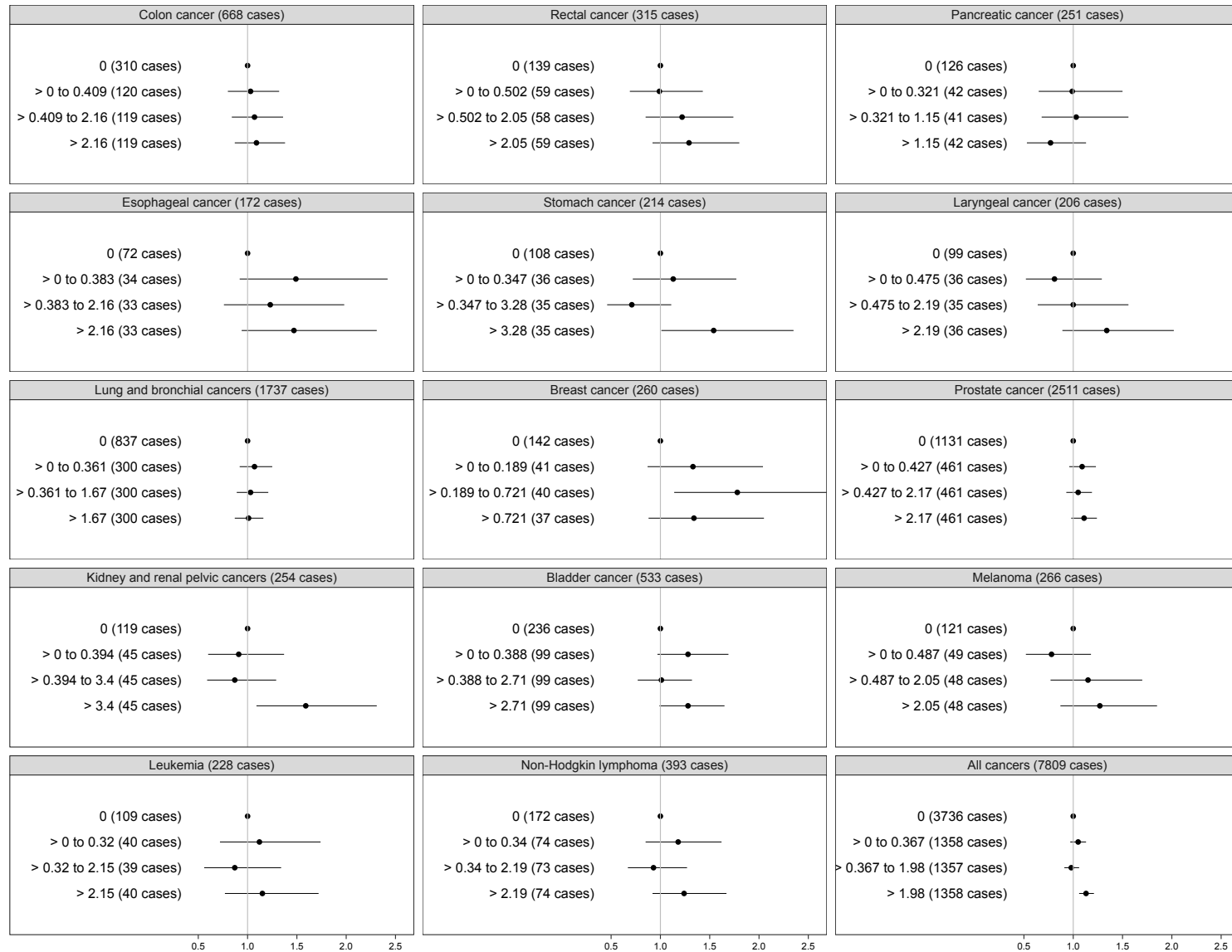
Figure 1: Adjusted hazard ratios associated with exposure to straight metal working fluids in the **UAW-GM Cohort**.

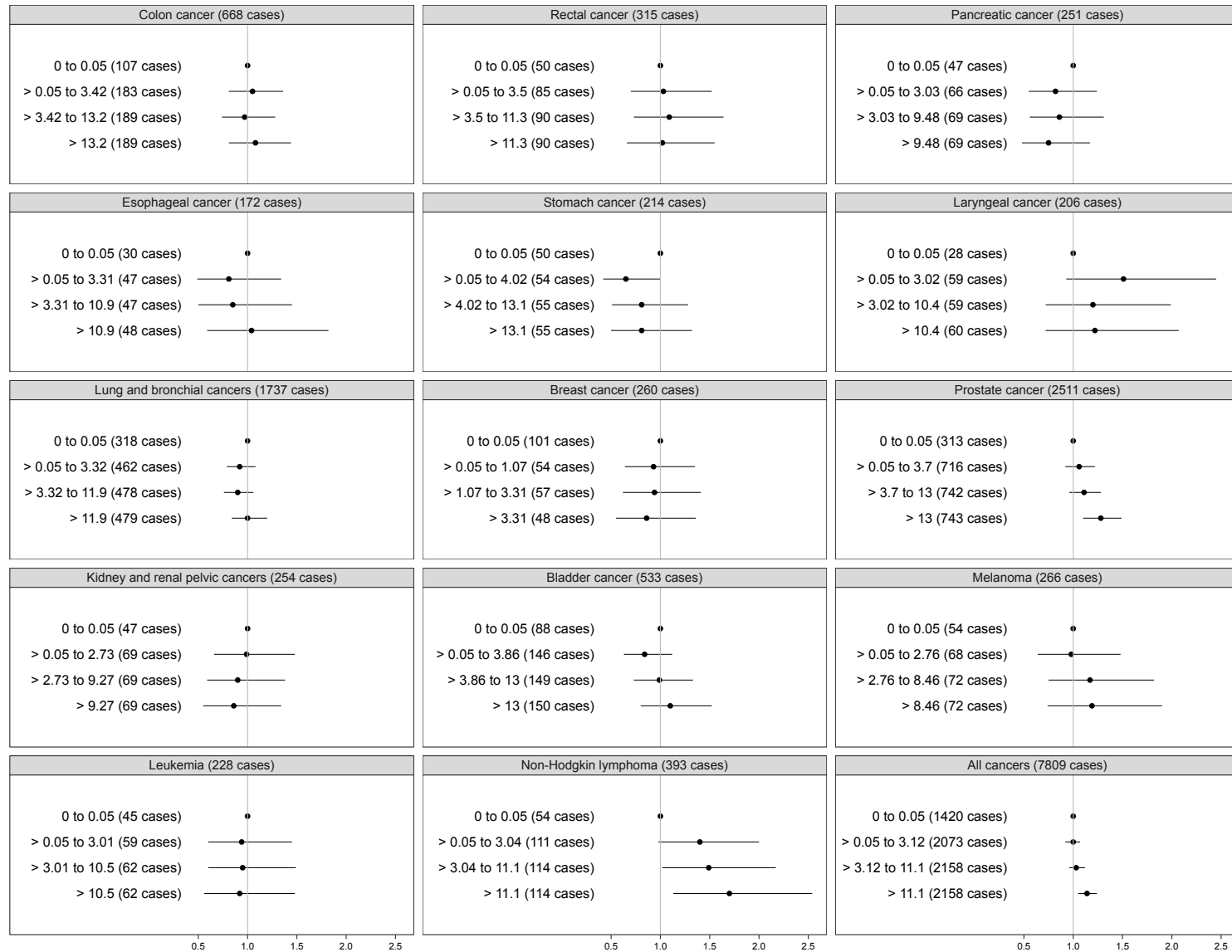
Figure 2: Adjusted hazard ratios associated with exposure to soluble metal working fluids in the **UAW-GM Cohort**.

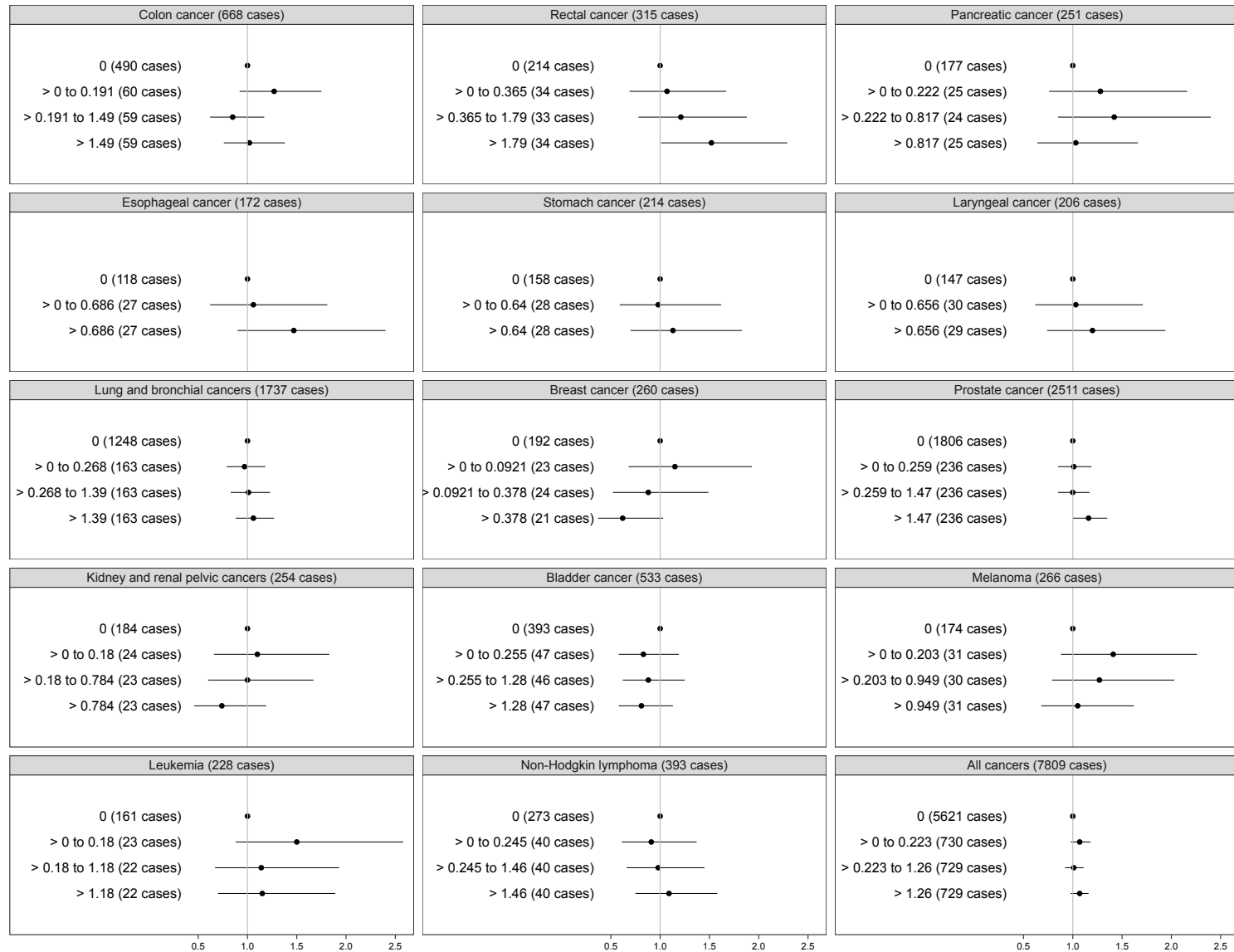
Figure 3: Adjusted hazard ratios associated with exposure to synthetic metal working fluids in the **UAW-GM Cohort**.

Figure 4: Adjusted hazard ratios for cancer incidence associated with leaving work in the **UAW-GM Cohort** (HWSE Condition 2).

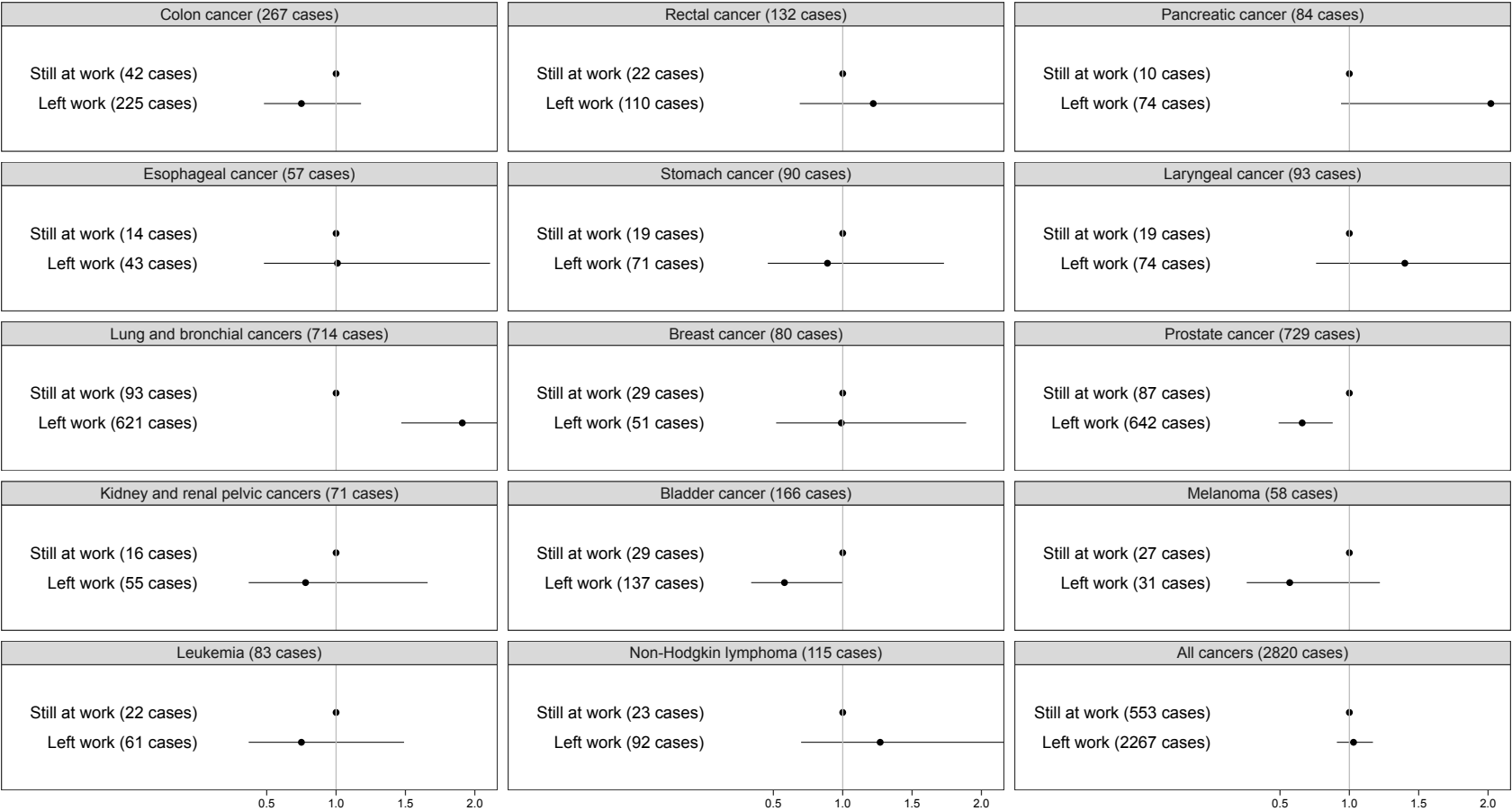


Table 2: Adjusted HR estimates for cancer incidence and employment status.

| | <i>n</i> | HR | (95% CI) | <i>p</i> | |
|-------------------------------|----------|------|--------------|----------|---|
| Colon cancer (267 events) | | | | | |
| Still employed | 42 | 1.00 | — | | |
| Not employed | 225 | 0.75 | (0.48, 1.18) | 0.22 | |
| Left work (under 50) | 75 | 0.56 | (0.34, 0.93) | 0.02 | * |
| Left work (50 or older) | 150 | 0.98 | (0.60, 1.59) | 0.93 | |
| Left work (under 55) | 90 | 0.59 | (0.37, 0.96) | 0.03 | * |
| Left work (55 or older) | 135 | 1.10 | (0.67, 1.82) | 0.70 | |
| Left work (under 60) | 123 | 0.65 | (0.41, 1.04) | 0.07 | |
| Left work (60 or older) | 102 | 1.18 | (0.70, 1.97) | 0.54 | |
| Rectal cancer (132 events) | | | | | |
| Still employed | 22 | 1.00 | — | | |
| Not employed | 110 | 1.22 | (0.69, 2.16) | 0.50 | |
| Left work (under 50) | 38 | 0.91 | (0.49, 1.71) | 0.78 | |
| Left work (50 or older) | 72 | 1.80 | (0.95, 3.44) | 0.07 | |
| Left work (under 55) | 47 | 0.99 | (0.54, 1.81) | 0.97 | |
| Left work (55 or older) | 63 | 1.99 | (1.02, 3.91) | 0.04 | * |
| Left work (under 60) | 61 | 1.06 | (0.59, 1.91) | 0.85 | |
| Left work (60 or older) | 49 | 2.28 | (1.13, 4.62) | 0.02 | * |
| Pancreatic cancer (84 events) | | | | | |
| Still employed | 10 | 1.00 | — | | |
| Not employed | 74 | 2.02 | (0.94, 4.35) | 0.07 | |
| Left work (under 50) | 25 | 1.35 | (0.59, 3.11) | 0.48 | |
| Left work (50 or older) | 49 | 3.23 | (1.40, 7.43) | 0.01 | * |
| Left work (under 55) | 30 | 1.46 | (0.65, 3.28) | 0.37 | |
| Left work (55 or older) | 44 | 4.13 | (1.72, 9.95) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------------|----|------|--------------|---------|---|
| Left work (under 60) | 47 | 1.84 | (0.84, 4.01) | 0.13 | |
| Left work (60 or older) | 27 | 3.04 | (1.23, 7.52) | 0.02 | * |
| Esophageal cancer (57 events) | | | | | |
| Still employed | 14 | 1.00 | — | | |
| Not employed | 43 | 1.01 | (0.48, 2.11) | 0.98 | |
| Left work (under 50) | 20 | 0.97 | (0.44, 2.15) | 0.94 | |
| Left work (50 or older) | 23 | 1.06 | (0.46, 2.44) | 0.89 | |
| Left work (under 55) | 25 | 1.01 | (0.47, 2.16) | 0.99 | |
| Left work (55 or older) | 18 | 1.01 | (0.42, 2.48) | 0.98 | |
| Left work (under 60) | 34 | 1.08 | (0.52, 2.27) | 0.83 | |
| Left work (60 or older) | 9 | 0.64 | (0.22, 1.81) | 0.40 | |
| Stomach cancer (90 events) | | | | | |
| Still employed | 19 | 1.00 | — | | |
| Not employed | 71 | 0.89 | (0.46, 1.73) | 0.73 | |
| Left work (under 50) | 28 | 0.73 | (0.36, 1.50) | 0.39 | |
| Left work (50 or older) | 43 | 1.18 | (0.56, 2.50) | 0.66 | |
| Left work (under 55) | 34 | 0.78 | (0.39, 1.56) | 0.47 | |
| Left work (55 or older) | 37 | 1.24 | (0.57, 2.70) | 0.59 | |
| Left work (under 60) | 44 | 0.82 | (0.42, 1.63) | 0.58 | |
| Left work (60 or older) | 27 | 1.27 | (0.56, 2.90) | 0.57 | |
| Laryngeal cancer (93 events) | | | | | |
| Still employed | 19 | 1.00 | — | | |
| Not employed | 74 | 1.40 | (0.76, 2.58) | 0.28 | |
| Left work (under 50) | 26 | 0.89 | (0.45, 1.77) | 0.74 | |
| Left work (50 or older) | 48 | 2.49 | (1.25, 4.94) | 0.01 | * |
| Left work (under 55) | 35 | 1.06 | (0.56, 2.02) | 0.86 | |
| Left work (55 or older) | 39 | 3.06 | (1.44, 6.47) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|---|-----|------|--------------|---------|---|
| Left work (under 60) | 55 | 1.36 | (0.74, 2.52) | 0.33 | |
| Left work (60 or older) | 19 | 1.70 | (0.74, 3.91) | 0.21 | |
| Lung and bronchial cancers (714 events) | | | | | |
| Still employed | 93 | 1.00 | — | | |
| Not employed | 621 | 1.91 | (1.47, 2.48) | < 0.005 | * |
| Left work (under 50) | 236 | 1.47 | (1.11, 1.94) | 0.01 | * |
| Left work (50 or older) | 385 | 2.76 | (2.08, 3.68) | < 0.005 | * |
| Left work (under 55) | 304 | 1.65 | (1.26, 2.15) | < 0.005 | * |
| Left work (55 or older) | 317 | 2.87 | (2.13, 3.87) | < 0.005 | * |
| Left work (under 60) | 404 | 1.79 | (1.38, 2.33) | < 0.005 | * |
| Left work (60 or older) | 217 | 2.66 | (1.94, 3.64) | < 0.005 | * |
| Breast cancer (80 events) | | | | | |
| Still employed | 29 | 1.00 | — | | |
| Not employed | 51 | 0.99 | (0.52, 1.89) | 0.99 | |
| Left work (under 50) | 27 | 0.98 | (0.50, 1.93) | 0.95 | |
| Left work (50 or older) | 24 | 1.02 | (0.47, 2.21) | 0.95 | |
| Left work (under 55) | 32 | 0.96 | (0.49, 1.85) | 0.89 | |
| Left work (55 or older) | 19 | 1.16 | (0.51, 2.65) | 0.72 | |
| Left work (under 60) | 41 | 0.99 | (0.52, 1.89) | 0.97 | |
| Left work (60 or older) | 10 | 1.07 | (0.41, 2.76) | 0.89 | |
| Prostate cancer (729 events) | | | | | |
| Still employed | 87 | 1.00 | — | | |
| Not employed | 642 | 0.66 | (0.49, 0.88) | < 0.005 | * |
| Left work (under 50) | 202 | 0.53 | (0.39, 0.73) | < 0.005 | * |
| Left work (50 or older) | 440 | 0.74 | (0.55, 1.00) | 0.05 | |
| Left work (under 55) | 244 | 0.54 | (0.40, 0.73) | < 0.005 | * |
| Left work (55 or older) | 398 | 0.81 | (0.60, 1.10) | 0.18 | |

Cancer incidence (including SEER data)

| | | | | | |
|---|-----|------|--------------|---------|---|
| Left work (under 60) | 342 | 0.58 | (0.43, 0.78) | < 0.005 | * |
| Left work (60 or older) | 300 | 0.86 | (0.63, 1.19) | 0.37 | |
| Kidney and renal pelvic cancers (71 events) | | | | | |
| Still employed | 16 | 1.00 | — | | |
| Not employed | 55 | 0.78 | (0.37, 1.66) | 0.52 | |
| Left work (under 50) | 15 | 0.49 | (0.21, 1.15) | 0.10 | |
| Left work (50 or older) | 40 | 1.37 | (0.58, 3.22) | 0.47 | |
| Left work (under 55) | 20 | 0.57 | (0.25, 1.30) | 0.18 | |
| Left work (55 or older) | 35 | 1.49 | (0.61, 3.63) | 0.39 | |
| Left work (under 60) | 30 | 0.68 | (0.31, 1.48) | 0.34 | |
| Left work (60 or older) | 25 | 1.31 | (0.53, 3.28) | 0.56 | |
| Bladder cancer (166 events) | | | | | |
| Still employed | 29 | 1.00 | — | | |
| Not employed | 137 | 0.58 | (0.34, 1.00) | 0.05 | |
| Left work (under 50) | 38 | 0.41 | (0.22, 0.76) | < 0.005 | * |
| Left work (50 or older) | 99 | 0.72 | (0.40, 1.28) | 0.27 | |
| Left work (under 55) | 52 | 0.48 | (0.27, 0.87) | 0.02 | * |
| Left work (55 or older) | 85 | 0.71 | (0.39, 1.28) | 0.26 | |
| Left work (under 60) | 77 | 0.55 | (0.32, 0.97) | 0.04 | * |
| Left work (60 or older) | 60 | 0.64 | (0.35, 1.19) | 0.16 | |
| Melanoma (58 events) | | | | | |
| Still employed | 27 | 1.00 | — | | |
| Not employed | 31 | 0.57 | (0.26, 1.22) | 0.15 | |
| Left work (under 50) | 14 | 0.53 | (0.23, 1.17) | 0.12 | |
| Left work (50 or older) | 17 | 0.72 | (0.27, 1.97) | 0.53 | |
| Left work (under 55) | 17 | 0.55 | (0.25, 1.21) | 0.14 | |
| Left work (55 or older) | 14 | 0.65 | (0.23, 1.86) | 0.42 | |

Cancer incidence (including SEER data)

| | | | | | |
|-----------------------------------|------|------|--------------|---------|---|
| Left work (under 60) | 20 | 0.55 | (0.25, 1.20) | 0.13 | |
| Left work (60 or older) | 11 | 0.73 | (0.24, 2.19) | 0.57 | |
| Leukemia (83 events) | | | | | |
| Still employed | 22 | 1.00 | — | | |
| Not employed | 61 | 0.75 | (0.37, 1.49) | 0.41 | |
| Left work (under 50) | 23 | 0.66 | (0.32, 1.39) | 0.27 | |
| Left work (50 or older) | 38 | 0.94 | (0.42, 2.13) | 0.89 | |
| Left work (under 55) | 30 | 0.72 | (0.36, 1.47) | 0.37 | |
| Left work (55 or older) | 31 | 0.84 | (0.36, 1.95) | 0.68 | |
| Left work (under 60) | 37 | 0.73 | (0.36, 1.46) | 0.37 | |
| Left work (60 or older) | 24 | 0.91 | (0.38, 2.21) | 0.84 | |
| Non-Hodgkin lymphoma (115 events) | | | | | |
| Still employed | 23 | 1.00 | — | | |
| Not employed | 92 | 1.27 | (0.70, 2.31) | 0.43 | |
| Left work (under 50) | 44 | 1.36 | (0.73, 2.52) | 0.33 | |
| Left work (50 or older) | 48 | 1.13 | (0.58, 2.23) | 0.72 | |
| Left work (under 55) | 48 | 1.24 | (0.67, 2.28) | 0.49 | |
| Left work (55 or older) | 44 | 1.38 | (0.68, 2.79) | 0.37 | |
| Left work (under 60) | 62 | 1.27 | (0.70, 2.31) | 0.44 | |
| Left work (60 or older) | 30 | 1.31 | (0.61, 2.79) | 0.49 | |
| All cancers (2820 events) | | | | | |
| Still employed | 553 | 1.00 | — | | |
| Not employed | 2267 | 1.03 | (0.91, 1.17) | 0.60 | |
| Left work (under 50) | 839 | 0.83 | (0.73, 0.95) | 0.01 | * |
| Left work (50 or older) | 1428 | 1.37 | (1.20, 1.57) | < 0.005 | * |
| Left work (under 55) | 1043 | 0.89 | (0.78, 1.01) | 0.07 | |
| Left work (55 or older) | 1224 | 1.48 | (1.28, 1.70) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|------|------|--------------|---------|---|
| Left work (under 60) | 1400 | 0.96 | (0.85, 1.09) | 0.53 | |
| Left work (60 or older) | 867 | 1.45 | (1.25, 1.68) | < 0.005 | * |

Table 3: Adjusted HR estimates for **leaving work**.

| Covariate | level | <i>n</i> | HR | (95% CI) | <i>p</i> | |
|----------------------|-----------------|----------|------|--------------|----------|---|
| Cumulative straight | 0 | 6956 | 1.00 | – | | |
| | > 0 to 0.314 | 2493 | 1.03 | (0.98, 1.09) | 0.25 | |
| | > 0.314 to 1.66 | 2492 | 0.93 | (0.88, 0.98) | 0.01 | * |
| | > 1.66 | 2492 | 0.96 | (0.92, 1.01) | 0.16 | |
| Cumulative soluble | 0 to 0.05 | 2555 | 1.00 | – | | |
| | > 0.05 to 2.7 | 3842 | 0.85 | (0.80, 0.90) | < 0.005 | * |
| | > 2.7 to 12.2 | 4018 | 0.74 | (0.70, 0.78) | < 0.005 | * |
| | > 12.2 | 4018 | 0.75 | (0.70, 0.80) | < 0.005 | * |
| Cumulative synthetic | 0 | 9812 | 1.00 | – | | |
| | > 0 to 0.187 | 1541 | 0.91 | (0.85, 0.98) | 0.01 | * |
| | > 0.187 to 1.14 | 1540 | 0.91 | (0.85, 0.97) | < 0.005 | * |
| | > 1.14 | 1540 | 0.92 | (0.87, 0.98) | 0.01 | * |
| Year | 1973 to 1977 | 2574 | 1.00 | – | | |
| | 1978 to 1982 | 2568 | 0.99 | (0.93, 1.04) | 0.64 | |
| | 1983 to 1986 | 2084 | 0.95 | (0.89, 1.01) | 0.08 | |
| | 1987 to 1990 | 2809 | 1.35 | (1.26, 1.43) | < 0.005 | * |
| | 1991 to 1993 | 2568 | 2.10 | (1.96, 2.24) | < 0.005 | * |
| | > 1993 | 1830 | 6.47 | (6.00, 6.98) | < 0.005 | * |
| | | | | | | |
| Year of hire | 1938 to 1952 | 2344 | 1.00 | – | | |
| | 1953 to 1958 | 2390 | 0.83 | (0.78, 0.88) | < 0.005 | * |
| | 1959 to 1965 | 2029 | 0.52 | (0.48, 0.55) | < 0.005 | * |
| | 1966 to 1971 | 2687 | 0.37 | (0.35, 0.40) | < 0.005 | * |
| | 1972 to 1976 | 1641 | 0.32 | (0.29, 0.35) | < 0.005 | * |
| | > 1976 | 3342 | 0.37 | (0.34, 0.40) | < 0.005 | * |
| Race | White | 10368.1 | 1.00 | – | | |
| | Black | 4064.9 | 0.91 | (0.87, 0.95) | < 0.005 | * |
| Plant | 1 | 5247 | 1.00 | – | | |
| | 2 | 6380 | 0.69 | (0.66, 0.73) | < 0.005 | * |
| | 3 | 2806 | 0.61 | (0.58, 0.65) | < 0.005 | * |
| Sex | Male | 12587 | 1.00 | – | | |
| | Female | 1846 | 1.15 | (1.09, 1.21) | < 0.005 | * |

Table 4: Adjusted HR estimates for incidence of **colon cancer** ($n = 668$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|--------|------|--------------|---------|---|
| Cumulative straight | 0 | 310 | 1.00 | — | | |
| | > 0 to 0.409 | 120 | 1.03 | (0.80, 1.32) | 0.82 | |
| | > 0.409 to 2.16 | 119 | 1.07 | (0.84, 1.36) | 0.60 | |
| | > 2.16 | 119 | 1.09 | (0.87, 1.38) | 0.46 | |
| Cumulative soluble | 0 to 0.05 | 107 | 1.00 | — | | |
| | > 0.05 to 3.42 | 183 | 1.05 | (0.81, 1.36) | 0.73 | |
| | > 3.42 to 13.2 | 189 | 0.97 | (0.74, 1.28) | 0.85 | |
| | > 13.2 | 189 | 1.08 | (0.81, 1.44) | 0.61 | |
| Cumulative synthetic | 0 | 490 | 1.00 | — | | |
| | > 0 to 0.191 | 60 | 1.27 | (0.92, 1.75) | 0.14 | |
| | > 0.191 to 1.49 | 59 | 0.85 | (0.62, 1.17) | 0.33 | |
| | > 1.49 | 59 | 1.02 | (0.76, 1.38) | 0.88 | |
| Year | 1973 to 1987 | 115 | 1.00 | — | | |
| | 1988 to 1992 | 117 | 2.01 | (1.54, 2.63) | < 0.005 | * |
| | 1993 to 1998 | 120 | 1.53 | (1.15, 2.02) | < 0.005 | * |
| | 1999 to 2003 | 106 | 1.45 | (1.06, 1.97) | 0.02 | * |
| | 2004 to 2008 | 104 | 1.29 | (0.93, 1.78) | 0.13 | |
| | > 2008 | 106 | 0.85 | (0.60, 1.20) | 0.36 | |
| Year of hire | 1938 to 1945 | 108 | 1.00 | — | | |
| | 1946 to 1951 | 102 | 0.84 | (0.62, 1.14) | 0.26 | |
| | 1952 to 1955 | 121 | 0.83 | (0.62, 1.13) | 0.24 | |
| | 1956 to 1965 | 111 | 1.06 | (0.77, 1.48) | 0.72 | |
| | 1966 to 1971 | 112 | 1.00 | (0.69, 1.45) | 1.00 | |
| | > 1971 | 114 | 0.99 | (0.65, 1.49) | 0.95 | |
| Race | White | 491.98 | 1.00 | — | | |
| | Black | 176.02 | 1.78 | (1.44, 2.20) | < 0.005 | * |
| Plant | 1 | 224 | 1.00 | — | | |
| | 2 | 244 | 1.17 | (0.90, 1.52) | 0.24 | |
| | 3 | 200 | 1.30 | (1.01, 1.67) | 0.04 | * |
| Sex | Male | 590 | 1.00 | — | | |
| | Female | 78 | 0.91 | (0.70, 1.18) | 0.49 | |
| Employment status | Still employed | 42 | 1.00 | — | | |
| | Not employed | 225 | 0.75 | (0.48, 1.18) | 0.22 | |
| | Still employed | 42 | 1.00 | — | | |
| | Left work (under 50) | 75 | 0.56 | (0.34, 0.93) | 0.02 | * |
| | Left work (50 or older) | 150 | 0.98 | (0.60, 1.59) | 0.93 | |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|-----|------|--------------|------|---|
| Still employed | 42 | 1.00 | — | | |
| Left work (under 55) | 90 | 0.59 | (0.37, 0.96) | 0.03 | * |
| Left work (55 or older) | 135 | 1.10 | (0.67, 1.82) | 0.70 | |
| Still employed | 42 | 1.00 | — | | |
| Left work (under 60) | 123 | 0.65 | (0.41, 1.04) | 0.07 | |
| Left work (60 or older) | 102 | 1.18 | (0.70, 1.97) | 0.54 | |

Table 5: Adjusted HR estimates for incidence of **rectal cancer** ($n = 315$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-------|------|--------------|------|---|
| Cumulative straight | 0 | 139 | 1.00 | — | | |
| | > 0 to 0.502 | 59 | 0.99 | (0.69, 1.43) | 0.97 | |
| | > 0.502 to 2.05 | 58 | 1.22 | (0.85, 1.74) | 0.29 | |
| | > 2.05 | 59 | 1.29 | (0.92, 1.80) | 0.13 | |
| Cumulative soluble | 0 to 0.05 | 50 | 1.00 | — | | |
| | > 0.05 to 3.5 | 85 | 1.03 | (0.70, 1.52) | 0.87 | |
| | > 3.5 to 11.3 | 90 | 1.09 | (0.73, 1.64) | 0.66 | |
| | > 11.3 | 90 | 1.02 | (0.66, 1.55) | 0.94 | |
| Cumulative synthetic | 0 | 214 | 1.00 | — | | |
| | > 0 to 0.365 | 34 | 1.07 | (0.69, 1.67) | 0.77 | |
| | > 0.365 to 1.79 | 33 | 1.21 | (0.78, 1.88) | 0.39 | |
| | > 1.79 | 34 | 1.52 | (1.01, 2.29) | 0.04 | * |
| Year | 1973 to 1986 | 60 | 1.00 | — | | |
| | 1987 to 1992 | 53 | 1.28 | (0.87, 1.89) | 0.21 | |
| | 1993 to 1998 | 50 | 1.04 | (0.69, 1.57) | 0.86 | |
| | 1999 to 2004 | 52 | 0.93 | (0.60, 1.45) | 0.76 | |
| | 2005 to 2008 | 53 | 1.30 | (0.81, 2.09) | 0.27 | |
| | > 2008 | 47 | 0.61 | (0.37, 1.02) | 0.06 | |
| Year of hire | 1938 to 1947 | 46 | 1.00 | — | | |
| | 1948 to 1952 | 51 | 1.69 | (1.09, 2.61) | 0.02 | * |
| | 1953 to 1958 | 60 | 1.37 | (0.88, 2.13) | 0.17 | |
| | 1959 to 1965 | 45 | 1.85 | (1.12, 3.05) | 0.02 | * |
| | 1966 to 1971 | 54 | 1.68 | (0.97, 2.90) | 0.06 | |
| | > 1971 | 59 | 1.90 | (1.04, 3.47) | 0.04 | * |
| Race | White | 257.8 | 1.00 | — | | |
| | Black | 57.2 | 0.91 | (0.65, 1.27) | 0.56 | |
| Plant | 1 | 97 | 1.00 | — | | |
| | 2 | 127 | 0.86 | (0.59, 1.25) | 0.43 | |
| | 3 | 91 | 0.86 | (0.60, 1.25) | 0.44 | |
| Sex | Male | 291 | 1.00 | — | | |
| | Female | 24 | 0.60 | (0.39, 0.94) | 0.02 | * |
| Employment status | Still employed | 22 | 1.00 | — | | |
| | Not employed | 110 | 1.22 | (0.69, 2.16) | 0.50 | |
| | Still employed | 22 | 1.00 | — | | |
| | Left work (under 50) | 38 | 0.91 | (0.49, 1.71) | 0.78 | |
| | Left work (50 or older) | 72 | 1.80 | (0.95, 3.44) | 0.07 | |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|----|------|--------------|------|---|
| Still employed | 22 | 1.00 | – | | |
| Left work (under 55) | 47 | 0.99 | (0.54, 1.81) | 0.97 | |
| Left work (55 or older) | 63 | 1.99 | (1.02, 3.91) | 0.04 | * |
| Still employed | 22 | 1.00 | – | | |
| Left work (under 60) | 61 | 1.06 | (0.59, 1.91) | 0.85 | |
| Left work (60 or older) | 49 | 2.28 | (1.13, 4.62) | 0.02 | * |

Table 6: Adjusted HR estimates for incidence of **pancreatic cancer** ($n = 251$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|------|---|
| Cumulative straight | 0 | 126 | 1.00 | — | | |
| | > 0 to 0.321 | 42 | 0.99 | (0.65, 1.50) | 0.95 | |
| | > 0.321 to 1.15 | 41 | 1.03 | (0.68, 1.56) | 0.89 | |
| | > 1.15 | 42 | 0.77 | (0.53, 1.13) | 0.19 | |
| Cumulative soluble | 0 to 0.05 | 47 | 1.00 | — | | |
| | > 0.05 to 3.03 | 66 | 0.82 | (0.55, 1.24) | 0.35 | |
| | > 3.03 to 9.48 | 69 | 0.86 | (0.56, 1.31) | 0.49 | |
| | > 9.48 | 69 | 0.75 | (0.48, 1.17) | 0.20 | |
| Cumulative synthetic | 0 | 177 | 1.00 | — | | |
| | > 0 to 0.222 | 25 | 1.28 | (0.76, 2.16) | 0.34 | |
| | > 0.222 to 0.817 | 24 | 1.42 | (0.85, 2.40) | 0.18 | |
| | > 0.817 | 25 | 1.03 | (0.64, 1.66) | 0.91 | |
| Year | 1973 to 1988 | 46 | 1.00 | — | | |
| | 1989 to 1994 | 38 | 1.60 | (1.02, 2.51) | 0.04 | * |
| | 1995 to 2001 | 47 | 1.52 | (0.96, 2.40) | 0.08 | |
| | 2002 to 2006 | 44 | 1.81 | (1.10, 3.00) | 0.02 | * |
| | 2007 to 2011 | 45 | 1.72 | (1.01, 2.93) | 0.05 | |
| | > 2011 | 31 | 1.42 | (0.78, 2.59) | 0.26 | |
| | | | | | | |
| Year of hire | 1938 to 1948 | 41 | 1.00 | — | | |
| | 1949 to 1952 | 28 | 1.01 | (0.61, 1.68) | 0.97 | |
| | 1953 to 1961 | 56 | 0.94 | (0.60, 1.49) | 0.80 | |
| | 1962 to 1966 | 34 | 1.10 | (0.62, 1.96) | 0.74 | |
| | 1967 to 1973 | 48 | 0.94 | (0.52, 1.70) | 0.83 | |
| | > 1973 | 44 | 0.92 | (0.47, 1.80) | 0.81 | |
| Race | White | 180 | 1.00 | — | | |
| | Black | 71 | 1.58 | (1.13, 2.20) | 0.01 | * |
| Plant | 1 | 85 | 1.00 | — | | |
| | 2 | 98 | 0.91 | (0.60, 1.38) | 0.66 | |
| | 3 | 68 | 0.91 | (0.61, 1.37) | 0.67 | |
| Sex | Male | 221 | 1.00 | — | | |
| | Female | 30 | 0.89 | (0.59, 1.35) | 0.59 | |
| Employment status | Still employed | 10 | 1.00 | — | | |
| | Not employed | 74 | 2.02 | (0.94, 4.35) | 0.07 | |
| | Still employed | 10 | 1.00 | — | | |
| | Left work (under 50) | 25 | 1.35 | (0.59, 3.11) | 0.48 | |
| | Left work (50 or older) | 49 | 3.23 | (1.40, 7.43) | 0.01 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|----|------|--------------|---------|---|
| Still employed | 10 | 1.00 | — | | |
| Left work (under 55) | 30 | 1.46 | (0.65, 3.28) | 0.37 | |
| Left work (55 or older) | 44 | 4.13 | (1.72, 9.95) | < 0.005 | * |
| Still employed | 10 | 1.00 | — | | |
| Left work (under 60) | 47 | 1.84 | (0.84, 4.01) | 0.13 | |
| Left work (60 or older) | 27 | 3.04 | (1.23, 7.52) | 0.02 | * |

Table 7: Adjusted HR estimates for incidence of **esophageal cancer** ($n = 172$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|---------|---|
| Cumulative straight | 0 | 72 | 1.00 | – | | |
| | > 0 to 0.383 | 34 | 1.49 | (0.92, 2.42) | 0.10 | |
| | > 0.383 to 2.16 | 33 | 1.23 | (0.76, 1.98) | 0.39 | |
| | > 2.16 | 33 | 1.47 | (0.94, 2.31) | 0.09 | |
| Cumulative soluble | 0 to 0.05 | 30 | 1.00 | – | | |
| | > 0.05 to 3.31 | 47 | 0.81 | (0.49, 1.34) | 0.40 | |
| | > 3.31 to 10.9 | 47 | 0.85 | (0.50, 1.45) | 0.55 | |
| | > 10.9 | 48 | 1.04 | (0.59, 1.82) | 0.90 | |
| Cumulative synthetic | 0 | 118 | 1.00 | – | | |
| | > 0 to 0.686 | 27 | 1.06 | (0.62, 1.81) | 0.84 | |
| | > 0.686 | 27 | 1.47 | (0.90, 2.40) | 0.12 | |
| Year | 1973 to 1988 | 29 | 1.00 | – | | |
| | 1989 to 1995 | 32 | 1.45 | (0.85, 2.47) | 0.17 | |
| | 1996 to 2002 | 28 | 1.01 | (0.56, 1.82) | 0.98 | |
| | 2003 to 2006 | 26 | 1.37 | (0.72, 2.61) | 0.33 | |
| | 2007 to 2012 | 34 | 1.08 | (0.56, 2.09) | 0.81 | |
| | > 2012 | 23 | 1.41 | (0.67, 2.94) | 0.36 | |
| Year of hire | 1938 to 1951 | 29 | 1.00 | – | | |
| | 1952 to 1956 | 27 | 1.17 | (0.67, 2.06) | 0.58 | |
| | 1957 to 1965 | 29 | 1.80 | (0.98, 3.31) | 0.06 | |
| | 1966 to 1968 | 29 | 2.06 | (1.04, 4.07) | 0.04 | * |
| | 1969 to 1973 | 29 | 2.53 | (1.24, 5.16) | 0.01 | * |
| | > 1973 | 29 | 2.01 | (0.91, 4.42) | 0.08 | |
| Race | White | 128 | 1.00 | – | | |
| | Black | 44 | 1.49 | (0.99, 2.23) | 0.05 | |
| Plant | 1 | 52 | 1.00 | – | | |
| | 2 | 55 | 0.88 | (0.52, 1.50) | 0.64 | |
| | 3 | 65 | 1.14 | (0.71, 1.83) | 0.58 | |
| Sex | Male | 167 | 1.00 | – | | |
| | Female | 5 | 0.20 | (0.08, 0.50) | < 0.005 | * |
| Employment status | Still employed | 14 | 1.00 | – | | |
| | Not employed | 43 | 1.01 | (0.48, 2.11) | 0.98 | |
| | Still employed | 14 | 1.00 | – | | |
| | Left work (under 50) | 20 | 0.97 | (0.44, 2.15) | 0.94 | |
| | Left work (50 or older) | 23 | 1.06 | (0.46, 2.44) | 0.89 | |
| | Still employed | 14 | 1.00 | – | | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Left work (under 55) | 25 | 1.01 | (0.47, 2.16) | 0.99 |
| Left work (55 or older) | 18 | 1.01 | (0.42, 2.48) | 0.98 |
| Still employed | 14 | 1.00 | — | |
| Left work (under 60) | 34 | 1.08 | (0.52, 2.27) | 0.83 |
| Left work (60 or older) | 9 | 0.64 | (0.22, 1.81) | 0.40 |

Table 8: Adjusted HR estimates for incidence of **stomach cancer** ($n = 214$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|---------|---|
| Cumulative straight | 0 | 108 | 1.00 | — | | |
| | > 0 to 0.347 | 36 | 1.13 | (0.72, 1.77) | 0.60 | |
| | > 0.347 to 3.28 | 35 | 0.71 | (0.46, 1.11) | 0.14 | |
| | > 3.28 | 35 | 1.54 | (1.01, 2.35) | 0.04 | * |
| Cumulative soluble | 0 to 0.05 | 50 | 1.00 | — | | |
| | > 0.05 to 4.02 | 54 | 0.65 | (0.42, 1.00) | 0.05 | |
| | > 4.02 to 13.1 | 55 | 0.81 | (0.51, 1.28) | 0.36 | |
| | > 13.1 | 55 | 0.81 | (0.50, 1.32) | 0.40 | |
| Cumulative synthetic | 0 | 158 | 1.00 | — | | |
| | > 0 to 0.64 | 28 | 0.98 | (0.59, 1.62) | 0.93 | |
| | > 0.64 | 28 | 1.13 | (0.70, 1.83) | 0.60 | |
| Year | 1973 to 1986 | 42 | 1.00 | — | | |
| | 1987 to 1991 | 30 | 1.32 | (0.81, 2.14) | 0.27 | |
| | 1992 to 1997 | 45 | 1.49 | (0.93, 2.36) | 0.09 | |
| | 1998 to 2003 | 26 | 0.82 | (0.47, 1.44) | 0.49 | |
| | 2004 to 2010 | 43 | 1.10 | (0.63, 1.92) | 0.73 | |
| | > 2010 | 28 | 0.99 | (0.52, 1.89) | 0.98 | |
| Year of hire | 1938 to 1946 | 31 | 1.00 | — | | |
| | 1947 to 1952 | 37 | 1.05 | (0.62, 1.78) | 0.86 | |
| | 1953 to 1955 | 34 | 1.09 | (0.62, 1.90) | 0.77 | |
| | 1956 to 1965 | 37 | 1.31 | (0.73, 2.37) | 0.37 | |
| | 1966 to 1972 | 35 | 0.98 | (0.50, 1.94) | 0.96 | |
| | > 1972 | 40 | 1.15 | (0.54, 2.48) | 0.72 | |
| Race | White | 149 | 1.00 | — | | |
| | Black | 65 | 2.19 | (1.53, 3.13) | < 0.005 | * |
| Plant | 1 | 73 | 1.00 | — | | |
| | 2 | 91 | 1.60 | (1.03, 2.50) | 0.04 | * |
| | 3 | 50 | 1.07 | (0.68, 1.69) | 0.77 | |
| Sex | Male | 198 | 1.00 | — | | |
| | Female | 16 | 0.49 | (0.29, 0.84) | 0.01 | * |
| Employment status | Still employed | 19 | 1.00 | — | | |
| | Not employed | 71 | 0.89 | (0.46, 1.73) | 0.73 | |
| | Still employed | 19 | 1.00 | — | | |
| | Left work (under 50) | 28 | 0.73 | (0.36, 1.50) | 0.39 | |
| | Left work (50 or older) | 43 | 1.18 | (0.56, 2.50) | 0.66 | |
| | Still employed | 19 | 1.00 | — | | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Left work (under 55) | 34 | 0.78 | (0.39, 1.56) | 0.47 |
| Left work (55 or older) | 37 | 1.24 | (0.57, 2.70) | 0.59 |
| Still employed | 19 | 1.00 | — | |
| Left work (under 60) | 44 | 0.82 | (0.42, 1.63) | 0.58 |
| Left work (60 or older) | 27 | 1.27 | (0.56, 2.90) | 0.57 |

Table 9: Adjusted HR estimates for incidence of **laryngeal cancer** ($n = 206$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|---------|---|
| Cumulative straight | 0 | 99 | 1.00 | — | | |
| | > 0 to 0.475 | 36 | 0.81 | (0.52, 1.29) | 0.38 | |
| | > 0.475 to 2.19 | 35 | 1.00 | (0.64, 1.56) | 1.00 | |
| | > 2.19 | 36 | 1.34 | (0.89, 2.02) | 0.17 | |
| Cumulative soluble | 0 to 0.05 | 28 | 1.00 | — | | |
| | > 0.05 to 3.02 | 59 | 1.51 | (0.93, 2.45) | 0.10 | |
| | > 3.02 to 10.4 | 59 | 1.20 | (0.72, 1.99) | 0.48 | |
| | > 10.4 | 60 | 1.22 | (0.72, 2.07) | 0.47 | |
| Cumulative synthetic | 0 | 147 | 1.00 | — | | |
| | > 0 to 0.656 | 30 | 1.03 | (0.62, 1.71) | 0.92 | |
| | > 0.656 | 29 | 1.20 | (0.74, 1.94) | 0.45 | |
| Year | 1973 to 1985 | 36 | 1.00 | — | | |
| | 1986 to 1991 | 35 | 1.60 | (0.98, 2.61) | 0.06 | |
| | 1992 to 1996 | 32 | 1.67 | (0.99, 2.83) | 0.06 | |
| | 1997 to 2004 | 42 | 1.31 | (0.76, 2.27) | 0.33 | |
| | 2005 to 2009 | 29 | 1.47 | (0.77, 2.79) | 0.24 | |
| | > 2009 | 32 | 1.44 | (0.72, 2.85) | 0.30 | |
| Year of hire | 1938 to 1948 | 29 | 1.00 | — | | |
| | 1949 to 1952 | 26 | 1.11 | (0.63, 1.94) | 0.72 | |
| | 1953 to 1959 | 41 | 1.14 | (0.67, 1.95) | 0.63 | |
| | 1960 to 1965 | 36 | 1.46 | (0.80, 2.69) | 0.22 | |
| | 1966 to 1969 | 37 | 1.11 | (0.56, 2.20) | 0.76 | |
| | > 1969 | 37 | 0.76 | (0.35, 1.63) | 0.48 | |
| Race | White | 141 | 1.00 | — | | |
| | Black | 65 | 1.74 | (1.21, 2.49) | < 0.005 | * |
| Plant | 1 | 80 | 1.00 | — | | |
| | 2 | 81 | 1.10 | (0.70, 1.72) | 0.68 | |
| | 3 | 45 | 0.62 | (0.39, 0.98) | 0.04 | * |
| Sex | Male | 202 | 1.00 | — | | |
| | Female | 4 | 0.16 | (0.06, 0.43) | < 0.005 | * |
| Employment status | Still employed | 19 | 1.00 | — | | |
| | Not employed | 74 | 1.40 | (0.76, 2.58) | 0.28 | |
| | Still employed | 19 | 1.00 | — | | |
| | Left work (under 50) | 26 | 0.89 | (0.45, 1.77) | 0.74 | |
| | Left work (50 or older) | 48 | 2.49 | (1.25, 4.94) | 0.01 | * |
| | Still employed | 19 | 1.00 | — | | |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|----|------|--------------|---------|---|
| Left work (under 55) | 35 | 1.06 | (0.56, 2.02) | 0.86 | |
| Left work (55 or older) | 39 | 3.06 | (1.44, 6.47) | < 0.005 | * |
| Still employed | 19 | 1.00 | — | | |
| Left work (under 60) | 55 | 1.36 | (0.74, 2.52) | 0.33 | |
| Left work (60 or older) | 19 | 1.70 | (0.74, 3.91) | 0.21 | |

Table 10: Adjusted HR estimates for incidence of **lung and bronchial cancers** ($n = 1737$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|---------|------|--------------|---------|---|
| Cumulative straight | 0 | 837 | 1.00 | — | | |
| | > 0 to 0.361 | 300 | 1.07 | (0.92, 1.25) | 0.40 | |
| | > 0.361 to 1.67 | 300 | 1.03 | (0.89, 1.21) | 0.67 | |
| | > 1.67 | 300 | 1.01 | (0.87, 1.16) | 0.94 | |
| Cumulative soluble | 0 to 0.05 | 318 | 1.00 | — | | |
| | > 0.05 to 3.32 | 462 | 0.92 | (0.79, 1.08) | 0.32 | |
| | > 3.32 to 11.9 | 478 | 0.90 | (0.76, 1.06) | 0.21 | |
| | > 11.9 | 479 | 1.00 | (0.84, 1.20) | 0.96 | |
| Cumulative synthetic | 0 | 1248 | 1.00 | — | | |
| | > 0 to 0.268 | 163 | 0.97 | (0.79, 1.18) | 0.73 | |
| | > 0.268 to 1.39 | 163 | 1.01 | (0.83, 1.23) | 0.91 | |
| | > 1.39 | 163 | 1.06 | (0.88, 1.27) | 0.55 | |
| Year | 1973 to 1986 | 304 | 1.00 | — | | |
| | 1987 to 1992 | 290 | 1.43 | (1.21, 1.69) | < 0.005 | * |
| | 1993 to 1997 | 278 | 1.46 | (1.22, 1.75) | < 0.005 | * |
| | 1998 to 2003 | 300 | 1.20 | (0.99, 1.44) | 0.06 | |
| | 2004 to 2009 | 287 | 1.05 | (0.86, 1.29) | 0.63 | |
| | > 2009 | 278 | 0.95 | (0.76, 1.19) | 0.67 | |
| | | | | | | |
| Year of hire | 1938 to 1948 | 273 | 1.00 | — | | |
| | 1949 to 1952 | 221 | 1.31 | (1.09, 1.59) | < 0.005 | * |
| | 1953 to 1958 | 368 | 1.34 | (1.12, 1.60) | < 0.005 | * |
| | 1959 to 1965 | 231 | 1.52 | (1.23, 1.87) | < 0.005 | * |
| | 1966 to 1972 | 346 | 1.45 | (1.16, 1.81) | < 0.005 | * |
| | > 1972 | 298 | 1.34 | (1.03, 1.72) | 0.03 | * |
| Race | White | 1321.88 | 1.00 | — | | |
| | Black | 415.12 | 1.37 | (1.20, 1.57) | < 0.005 | * |
| Plant | 1 | 546 | 1.00 | — | | |
| | 2 | 709 | 1.14 | (0.97, 1.33) | 0.11 | |
| | 3 | 482 | 1.03 | (0.88, 1.20) | 0.75 | |
| Sex | Male | 1550 | 1.00 | — | | |
| | Female | 187 | 0.82 | (0.70, 0.97) | 0.02 | * |
| Employment status | Still employed | 93 | 1.00 | — | | |
| | Not employed | 621 | 1.91 | (1.47, 2.48) | < 0.005 | * |
| | Still employed | 93 | 1.00 | — | | |
| | Left work (under 50) | 236 | 1.47 | (1.11, 1.94) | 0.01 | * |
| | Left work (50 or older) | 385 | 2.76 | (2.08, 3.68) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|-----|------|--------------|---------|---|
| Still employed | 93 | 1.00 | — | | |
| Left work (under 55) | 304 | 1.65 | (1.26, 2.15) | < 0.005 | * |
| Left work (55 or older) | 317 | 2.87 | (2.13, 3.87) | < 0.005 | * |
| Still employed | 93 | 1.00 | — | | |
| Left work (under 60) | 404 | 1.79 | (1.38, 2.33) | < 0.005 | * |
| Left work (60 or older) | 217 | 2.66 | (1.94, 3.64) | < 0.005 | * |

Table 11: Adjusted HR estimates for incidence of **breast cancer** ($n = 260$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|---------|---|
| Cumulative straight | 0 | 142 | 1.00 | – | | |
| | > 0 to 0.189 | 41 | 1.33 | (0.87, 2.04) | 0.19 | |
| | > 0.189 to 0.721 | 40 | 1.78 | (1.14, 2.78) | 0.01 | * |
| | > 0.721 | 37 | 1.34 | (0.88, 2.05) | 0.17 | |
| Cumulative soluble | 0 to 0.05 | 101 | 1.00 | – | | |
| | > 0.05 to 1.07 | 54 | 0.93 | (0.64, 1.35) | 0.69 | |
| | > 1.07 to 3.31 | 57 | 0.94 | (0.62, 1.41) | 0.75 | |
| | > 3.31 | 48 | 0.86 | (0.55, 1.36) | 0.52 | |
| Cumulative synthetic | 0 | 192 | 1.00 | – | | |
| | > 0 to 0.0921 | 23 | 1.15 | (0.68, 1.93) | 0.61 | |
| | > 0.0921 to 0.378 | 24 | 0.88 | (0.52, 1.49) | 0.63 | |
| | > 0.378 | 21 | 0.62 | (0.37, 1.03) | 0.06 | |
| Year | 1973 to 1990 | 45 | 1.00 | – | | |
| | 1991 to 1996 | 53 | 1.92 | (1.25, 2.94) | < 0.005 | * |
| | 1997 to 2001 | 37 | 1.36 | (0.82, 2.24) | 0.23 | |
| | 2002 to 2006 | 39 | 1.27 | (0.75, 2.16) | 0.37 | |
| | 2007 to 2011 | 47 | 1.59 | (0.92, 2.75) | 0.09 | |
| | > 2011 | 39 | 1.81 | (1.00, 3.27) | 0.05 | |
| Year of hire | 1938 to 1953 | 40 | 1.00 | – | | |
| | 1954 to 1968 | 36 | 0.96 | (0.59, 1.55) | 0.86 | |
| | 1969 to 1972 | 18 | 1.29 | (0.66, 2.51) | 0.45 | |
| | 1973 to 1976 | 67 | 1.12 | (0.62, 2.04) | 0.71 | |
| | 1977 to 1977 | 47 | 1.07 | (0.57, 2.00) | 0.84 | |
| | > 1977 | 52 | 0.86 | (0.46, 1.60) | 0.63 | |
| Race | White | 177 | 1.00 | – | | |
| | Black | 83 | 1.23 | (0.90, 1.69) | 0.19 | |
| Plant | 1 | 31 | 1.00 | – | | |
| | 2 | 148 | 1.21 | (0.75, 1.97) | 0.43 | |
| | 3 | 81 | 1.30 | (0.81, 2.08) | 0.27 | |
| Employment status | Still employed | 29 | 1.00 | – | | |
| | Not employed | 51 | 0.99 | (0.52, 1.89) | 0.99 | |
| | Still employed | 29 | 1.00 | – | | |
| | Left work (under 50) | 27 | 0.98 | (0.50, 1.93) | 0.95 | |
| | Left work (50 or older) | 24 | 1.02 | (0.47, 2.21) | 0.95 | |
| | Still employed | 29 | 1.00 | – | | |
| | Left work (under 55) | 32 | 0.96 | (0.49, 1.85) | 0.89 | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Left work (55 or older) | 19 | 1.16 | (0.51, 2.65) | 0.72 |
| Still employed | 29 | 1.00 | – | |
| Left work (under 60) | 41 | 0.99 | (0.52, 1.89) | 0.97 |
| Left work (60 or older) | 10 | 1.07 | (0.41, 2.76) | 0.89 |

Table 12: Adjusted HR estimates for incidence of **prostate cancer** ($n = 2511$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|---------|------|--------------|---------|---|
| Cumulative straight | 0 | 1131 | 1.00 | — | | |
| | > 0 to 0.427 | 461 | 1.09 | (0.96, 1.23) | 0.20 | |
| | > 0.427 to 2.17 | 461 | 1.05 | (0.93, 1.19) | 0.44 | |
| | > 2.17 | 461 | 1.11 | (0.98, 1.24) | 0.09 | |
| Cumulative soluble | 0 to 0.05 | 313 | 1.00 | — | | |
| | > 0.05 to 3.7 | 716 | 1.06 | (0.92, 1.22) | 0.46 | |
| | > 3.7 to 13 | 742 | 1.11 | (0.96, 1.28) | 0.17 | |
| | > 13 | 743 | 1.28 | (1.10, 1.49) | < 0.005 | * |
| Cumulative synthetic | 0 | 1806 | 1.00 | — | | |
| | > 0 to 0.259 | 236 | 1.01 | (0.85, 1.19) | 0.92 | |
| | > 0.259 to 1.47 | 236 | 1.00 | (0.85, 1.17) | 0.99 | |
| | > 1.47 | 236 | 1.16 | (1.00, 1.35) | 0.05 | |
| Year | 1973 to 1991 | 445 | 1.00 | — | | |
| | 1992 to 1996 | 421 | 2.50 | (2.17, 2.88) | < 0.005 | * |
| | 1997 to 2001 | 473 | 2.51 | (2.18, 2.91) | < 0.005 | * |
| | 2002 to 2005 | 387 | 2.29 | (1.96, 2.68) | < 0.005 | * |
| | 2006 to 2010 | 408 | 1.68 | (1.43, 1.99) | < 0.005 | * |
| | > 2010 | 380 | 1.41 | (1.18, 1.69) | < 0.005 | * |
| Year of hire | 1938 to 1948 | 418 | 1.00 | — | | |
| | 1949 to 1953 | 395 | 0.85 | (0.73, 0.98) | 0.03 | * |
| | 1954 to 1960 | 412 | 1.05 | (0.90, 1.23) | 0.52 | |
| | 1961 to 1966 | 423 | 1.29 | (1.09, 1.53) | < 0.005 | * |
| | 1967 to 1971 | 439 | 1.42 | (1.18, 1.71) | < 0.005 | * |
| | > 1971 | 427 | 1.56 | (1.27, 1.90) | < 0.005 | * |
| Race | White | 1714.04 | 1.00 | — | | |
| | Black | 799.96 | 2.25 | (2.03, 2.50) | < 0.005 | * |
| Plant | 1 | 914 | 1.00 | — | | |
| | 2 | 800 | 1.09 | (0.95, 1.24) | 0.23 | |
| | 3 | 800 | 1.19 | (1.05, 1.35) | 0.01 | * |
| Employment status | Still employed | 87 | 1.00 | — | | |
| | Not employed | 642 | 0.66 | (0.49, 0.88) | < 0.005 | * |
| | Still employed | 87 | 1.00 | — | | |
| | Left work (under 50) | 202 | 0.53 | (0.39, 0.73) | < 0.005 | * |
| | Left work (50 or older) | 440 | 0.74 | (0.55, 1.00) | 0.05 | |
| | Still employed | 87 | 1.00 | — | | |
| | Left work (under 55) | 244 | 0.54 | (0.40, 0.73) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|-----|------|--------------|---------|---|
| Left work (55 or older) | 398 | 0.81 | (0.60, 1.10) | 0.18 | |
| Still employed | 87 | 1.00 | – | | |
| Left work (under 60) | 342 | 0.58 | (0.43, 0.78) | < 0.005 | * |
| Left work (60 or older) | 300 | 0.86 | (0.63, 1.19) | 0.37 | |

Table 13: Adjusted HR estimates for incidence of **kidney and renal pelvic cancers** ($n = 254$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|-----|------|--------------|------|---|
| Cumulative straight | 0 | 119 | 1.00 | — | | |
| | > 0 to 0.394 | 45 | 0.91 | (0.60, 1.37) | 0.65 | |
| | > 0.394 to 3.4 | 45 | 0.87 | (0.59, 1.29) | 0.49 | |
| | > 3.4 | 45 | 1.59 | (1.09, 2.31) | 0.02 | * |
| Cumulative soluble | 0 to 0.05 | 47 | 1.00 | — | | |
| | > 0.05 to 2.73 | 69 | 0.99 | (0.66, 1.48) | 0.95 | |
| | > 2.73 to 9.27 | 69 | 0.90 | (0.59, 1.38) | 0.64 | |
| | > 9.27 | 69 | 0.86 | (0.55, 1.34) | 0.50 | |
| Cumulative synthetic | 0 | 184 | 1.00 | — | | |
| | > 0 to 0.18 | 24 | 1.10 | (0.66, 1.83) | 0.73 | |
| | > 0.18 to 0.784 | 23 | 1.00 | (0.60, 1.67) | 1.00 | |
| | > 0.784 | 23 | 0.74 | (0.46, 1.19) | 0.22 | |
| Year | 1973 to 1988 | 43 | 1.00 | — | | |
| | 1989 to 1997 | 46 | 1.19 | (0.76, 1.86) | 0.44 | |
| | 1998 to 2003 | 45 | 1.53 | (0.94, 2.48) | 0.09 | |
| | 2004 to 2007 | 36 | 1.71 | (1.00, 2.93) | 0.05 | |
| | 2008 to 2011 | 42 | 1.91 | (1.10, 3.31) | 0.02 | * |
| | > 2011 | 42 | 1.90 | (1.06, 3.39) | 0.03 | * |
| Year of hire | 1938 to 1950 | 40 | 1.00 | — | | |
| | 1951 to 1954 | 42 | 1.10 | (0.69, 1.76) | 0.69 | |
| | 1955 to 1963 | 44 | 1.79 | (1.09, 2.95) | 0.02 | * |
| | 1964 to 1967 | 36 | 1.24 | (0.69, 2.21) | 0.47 | |
| | 1968 to 1973 | 44 | 1.47 | (0.81, 2.66) | 0.20 | |
| | > 1973 | 48 | 1.25 | (0.65, 2.40) | 0.50 | |
| Race | White | 208 | 1.00 | — | | |
| | Black | 46 | 0.95 | (0.66, 1.37) | 0.78 | |
| Plant | 1 | 66 | 1.00 | — | | |
| | 2 | 97 | 1.25 | (0.81, 1.91) | 0.31 | |
| | 3 | 91 | 1.08 | (0.73, 1.61) | 0.70 | |
| Sex | Male | 233 | 1.00 | — | | |
| | Female | 21 | 0.60 | (0.38, 0.96) | 0.03 | * |
| Employment status | Still employed | 16 | 1.00 | — | | |
| | Not employed | 55 | 0.78 | (0.37, 1.66) | 0.52 | |
| | Still employed | 16 | 1.00 | — | | |
| | Left work (under 50) | 15 | 0.49 | (0.21, 1.15) | 0.10 | |
| | Left work (50 or older) | 40 | 1.37 | (0.58, 3.22) | 0.47 | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Still employed | 16 | 1.00 | — | |
| Left work (under 55) | 20 | 0.57 | (0.25, 1.30) | 0.18 |
| Left work (55 or older) | 35 | 1.49 | (0.61, 3.63) | 0.39 |
| Still employed | 16 | 1.00 | — | |
| Left work (under 60) | 30 | 0.68 | (0.31, 1.48) | 0.34 |
| Left work (60 or older) | 25 | 1.31 | (0.53, 3.28) | 0.56 |

Table 14: Adjusted HR estimates for incidence of **bladder cancer** ($n = 533$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|--------|------|--------------|---------|---|
| Cumulative straight | 0 | 236 | 1.00 | — | | |
| | > 0 to 0.388 | 99 | 1.28 | (0.97, 1.69) | 0.08 | |
| | > 0.388 to 2.71 | 99 | 1.01 | (0.77, 1.32) | 0.94 | |
| | > 2.71 | 99 | 1.28 | (0.99, 1.65) | 0.06 | |
| Cumulative soluble | 0 to 0.05 | 88 | 1.00 | — | | |
| | > 0.05 to 3.86 | 146 | 0.84 | (0.63, 1.12) | 0.22 | |
| | > 3.86 to 13 | 149 | 0.99 | (0.73, 1.33) | 0.94 | |
| | > 13 | 150 | 1.10 | (0.80, 1.52) | 0.55 | |
| Cumulative synthetic | 0 | 393 | 1.00 | — | | |
| | > 0 to 0.255 | 47 | 0.83 | (0.58, 1.19) | 0.30 | |
| | > 0.255 to 1.28 | 46 | 0.88 | (0.62, 1.25) | 0.46 | |
| | > 1.28 | 47 | 0.81 | (0.58, 1.13) | 0.22 | |
| Year | 1973 to 1989 | 98 | 1.00 | — | | |
| | 1990 to 1995 | 82 | 1.45 | (1.06, 1.97) | 0.02 | * |
| | 1996 to 2000 | 95 | 1.73 | (1.27, 2.37) | < 0.005 | * |
| | 2001 to 2005 | 85 | 1.38 | (0.98, 1.93) | 0.06 | |
| | 2006 to 2010 | 87 | 1.22 | (0.86, 1.74) | 0.27 | |
| | > 2010 | 86 | 1.07 | (0.73, 1.55) | 0.74 | |
| Year of hire | 1938 to 1948 | 87 | 1.00 | — | | |
| | 1949 to 1953 | 85 | 1.16 | (0.83, 1.62) | 0.37 | |
| | 1954 to 1960 | 92 | 1.45 | (1.04, 2.03) | 0.03 | * |
| | 1961 to 1965 | 61 | 2.05 | (1.38, 3.03) | < 0.005 | * |
| | 1966 to 1971 | 107 | 1.89 | (1.27, 2.80) | < 0.005 | * |
| | > 1971 | 101 | 2.19 | (1.42, 3.37) | < 0.005 | * |
| Race | White | 468.94 | 1.00 | — | | |
| | Black | 64.06 | 0.60 | (0.45, 0.80) | < 0.005 | * |
| Plant | 1 | 144 | 1.00 | — | | |
| | 2 | 186 | 1.02 | (0.76, 1.36) | 0.92 | |
| | 3 | 203 | 1.20 | (0.92, 1.57) | 0.18 | |
| Sex | Male | 510 | 1.00 | — | | |
| | Female | 23 | 0.30 | (0.19, 0.46) | < 0.005 | * |
| Employment status | Still employed | 29 | 1.00 | — | | |
| | Not employed | 137 | 0.58 | (0.34, 1.00) | 0.05 | |
| | Still employed | 29 | 1.00 | — | | |
| | Left work (under 50) | 38 | 0.41 | (0.22, 0.76) | < 0.005 | * |
| | Left work (50 or older) | 99 | 0.72 | (0.40, 1.28) | 0.27 | |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|----|------|--------------|------|---|
| Still employed | 29 | 1.00 | — | | |
| Left work (under 55) | 52 | 0.48 | (0.27, 0.87) | 0.02 | * |
| Left work (55 or older) | 85 | 0.71 | (0.39, 1.28) | 0.26 | |
| Still employed | 29 | 1.00 | — | | |
| Left work (under 60) | 77 | 0.55 | (0.32, 0.97) | 0.04 | * |
| Left work (60 or older) | 60 | 0.64 | (0.35, 1.19) | 0.16 | |

Table 15: Adjusted HR estimates for incidence of **melanoma** ($n = 266$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|--------|------|--------------|---------|---|
| Cumulative straight | 0 | 121 | 1.00 | — | | |
| | > 0 to 0.487 | 49 | 0.78 | (0.52, 1.18) | 0.24 | |
| | > 0.487 to 2.05 | 48 | 1.15 | (0.77, 1.70) | 0.50 | |
| | > 2.05 | 48 | 1.27 | (0.87, 1.85) | 0.21 | |
| Cumulative soluble | 0 to 0.05 | 54 | 1.00 | — | | |
| | > 0.05 to 2.76 | 68 | 0.98 | (0.64, 1.48) | 0.91 | |
| | > 2.76 to 8.46 | 72 | 1.17 | (0.75, 1.82) | 0.49 | |
| | > 8.46 | 72 | 1.19 | (0.74, 1.90) | 0.48 | |
| Cumulative synthetic | 0 | 174 | 1.00 | — | | |
| | > 0 to 0.203 | 31 | 1.41 | (0.88, 2.26) | 0.16 | |
| | > 0.203 to 0.949 | 30 | 1.27 | (0.79, 2.03) | 0.32 | |
| | > 0.949 | 31 | 1.05 | (0.68, 1.62) | 0.82 | |
| Year | 1973 to 1993 | 51 | 1.00 | — | | |
| | 1994 to 1999 | 46 | 2.23 | (1.44, 3.45) | < 0.005 | * |
| | 2000 to 2003 | 41 | 3.11 | (1.93, 5.02) | < 0.005 | * |
| | 2004 to 2007 | 50 | 3.66 | (2.25, 5.96) | < 0.005 | * |
| | 2008 to 2011 | 43 | 3.21 | (1.89, 5.43) | < 0.005 | * |
| | > 2011 | 35 | 2.72 | (1.53, 4.84) | < 0.005 | * |
| Year of hire | 1938 to 1952 | 38 | 1.00 | — | | |
| | 1953 to 1960 | 49 | 1.29 | (0.81, 2.03) | 0.28 | |
| | 1961 to 1965 | 36 | 2.19 | (1.27, 3.77) | < 0.005 | * |
| | 1966 to 1969 | 48 | 1.39 | (0.79, 2.44) | 0.25 | |
| | 1970 to 1976 | 39 | 1.57 | (0.84, 2.93) | 0.16 | |
| | > 1976 | 56 | 1.60 | (0.84, 3.06) | 0.15 | |
| Race | White | 255.72 | 1.00 | — | | |
| | Black | 10.28 | 0.16 | (0.08, 0.31) | < 0.005 | * |
| Plant | 1 | 44 | 1.00 | — | | |
| | 2 | 115 | 1.02 | (0.67, 1.56) | 0.92 | |
| | 3 | 107 | 1.05 | (0.70, 1.56) | 0.82 | |
| Sex | Male | 247 | 1.00 | — | | |
| | Female | 19 | 0.56 | (0.34, 0.91) | 0.02 | * |
| Employment status | Still employed | 27 | 1.00 | — | | |
| | Not employed | 31 | 0.57 | (0.26, 1.22) | 0.15 | |
| | Still employed | 27 | 1.00 | — | | |
| | Left work (under 50) | 14 | 0.53 | (0.23, 1.17) | 0.12 | |
| | Left work (50 or older) | 17 | 0.72 | (0.27, 1.97) | 0.53 | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Still employed | 27 | 1.00 | — | |
| Left work (under 55) | 17 | 0.55 | (0.25, 1.21) | 0.14 |
| Left work (55 or older) | 14 | 0.65 | (0.23, 1.86) | 0.42 |
| Still employed | 27 | 1.00 | — | |
| Left work (under 60) | 20 | 0.55 | (0.25, 1.20) | 0.13 |
| Left work (60 or older) | 11 | 0.73 | (0.24, 2.19) | 0.57 |

Table 16: Adjusted HR estimates for incidence of **leukemia** ($n = 228$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|--------|------|--------------|---------|---|
| Cumulative straight | 0 | 109 | 1.00 | — | | |
| | > 0 to 0.32 | 40 | 1.12 | (0.72, 1.74) | 0.62 | |
| | > 0.32 to 2.15 | 39 | 0.87 | (0.56, 1.34) | 0.52 | |
| | > 2.15 | 40 | 1.15 | (0.77, 1.72) | 0.48 | |
| Cumulative soluble | 0 to 0.05 | 45 | 1.00 | — | | |
| | > 0.05 to 3.01 | 59 | 0.94 | (0.60, 1.45) | 0.77 | |
| | > 3.01 to 10.5 | 62 | 0.95 | (0.60, 1.49) | 0.82 | |
| | > 10.5 | 62 | 0.92 | (0.56, 1.48) | 0.72 | |
| Cumulative synthetic | 0 | 161 | 1.00 | — | | |
| | > 0 to 0.18 | 23 | 1.50 | (0.88, 2.58) | 0.14 | |
| | > 0.18 to 1.18 | 22 | 1.14 | (0.67, 1.93) | 0.64 | |
| | > 1.18 | 22 | 1.15 | (0.70, 1.89) | 0.59 | |
| Year | 1973 to 1988 | 42 | 1.00 | — | | |
| | 1989 to 1993 | 36 | 1.68 | (1.06, 2.69) | 0.03 | * |
| | 1994 to 1999 | 44 | 1.45 | (0.90, 2.32) | 0.12 | |
| | 2000 to 2005 | 33 | 0.94 | (0.55, 1.60) | 0.82 | |
| | 2006 to 2010 | 39 | 1.23 | (0.71, 2.13) | 0.46 | |
| | > 2010 | 34 | 0.99 | (0.55, 1.81) | 0.99 | |
| Year of hire | 1938 to 1948 | 32 | 1.00 | — | | |
| | 1949 to 1953 | 40 | 1.47 | (0.88, 2.45) | 0.14 | |
| | 1954 to 1962 | 41 | 1.60 | (0.95, 2.70) | 0.08 | |
| | 1963 to 1967 | 38 | 1.99 | (1.08, 3.64) | 0.03 | * |
| | 1968 to 1972 | 37 | 2.58 | (1.36, 4.89) | < 0.005 | * |
| | > 1972 | 40 | 1.68 | (0.82, 3.42) | 0.15 | |
| Race | White | 176.84 | 1.00 | — | | |
| | Black | 51.16 | 1.25 | (0.86, 1.81) | 0.24 | |
| Plant | 1 | 68 | 1.00 | — | | |
| | 2 | 85 | 0.95 | (0.61, 1.47) | 0.80 | |
| | 3 | 75 | 1.11 | (0.73, 1.69) | 0.62 | |
| Sex | Male | 209 | 1.00 | — | | |
| | Female | 19 | 0.61 | (0.37, 1.01) | 0.05 | |
| Employment status | Still employed | 22 | 1.00 | — | | |
| | Not employed | 61 | 0.75 | (0.37, 1.49) | 0.41 | |
| | Still employed | 22 | 1.00 | — | | |
| | Left work (under 50) | 23 | 0.66 | (0.32, 1.39) | 0.27 | |
| | Left work (50 or older) | 38 | 0.94 | (0.42, 2.13) | 0.89 | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Still employed | 22 | 1.00 | — | |
| Left work (under 55) | 30 | 0.72 | (0.36, 1.47) | 0.37 |
| Left work (55 or older) | 31 | 0.84 | (0.36, 1.95) | 0.68 |
| Still employed | 22 | 1.00 | — | |
| Left work (under 60) | 37 | 0.73 | (0.36, 1.46) | 0.37 |
| Left work (60 or older) | 24 | 0.91 | (0.38, 2.21) | 0.84 |

Table 17: Adjusted HR estimates for incidence of **non-hodgkin lymphoma** ($n = 393$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|--------|------|--------------|---------|---|
| Cumulative straight | 0 | 172 | 1.00 | — | | |
| | > 0 to 0.34 | 74 | 1.18 | (0.85, 1.62) | 0.32 | |
| | > 0.34 to 2.19 | 73 | 0.93 | (0.67, 1.27) | 0.63 | |
| | > 2.19 | 74 | 1.24 | (0.92, 1.67) | 0.16 | |
| Cumulative soluble | 0 to 0.05 | 54 | 1.00 | — | | |
| | > 0.05 to 3.04 | 111 | 1.40 | (0.98, 2.00) | 0.07 | |
| | > 3.04 to 11.1 | 114 | 1.49 | (1.02, 2.17) | 0.04 | * |
| | > 11.1 | 114 | 1.70 | (1.13, 2.54) | 0.01 | * |
| Cumulative synthetic | 0 | 273 | 1.00 | — | | |
| | > 0 to 0.245 | 40 | 0.91 | (0.61, 1.37) | 0.66 | |
| | > 0.245 to 1.46 | 40 | 0.98 | (0.66, 1.45) | 0.92 | |
| | > 1.46 | 40 | 1.09 | (0.75, 1.58) | 0.65 | |
| Year | 1973 to 1990 | 77 | 1.00 | — | | |
| | 1991 to 1996 | 57 | 1.39 | (0.97, 2.00) | 0.07 | |
| | 1997 to 2001 | 63 | 1.64 | (1.13, 2.38) | 0.01 | * |
| | 2002 to 2005 | 71 | 2.21 | (1.50, 3.25) | < 0.005 | * |
| | 2006 to 2010 | 74 | 1.75 | (1.16, 2.63) | 0.01 | * |
| | > 2010 | 51 | 1.16 | (0.73, 1.84) | 0.53 | |
| Year of hire | 1938 to 1949 | 64 | 1.00 | — | | |
| | 1950 to 1953 | 60 | 1.26 | (0.86, 1.85) | 0.24 | |
| | 1954 to 1962 | 70 | 1.31 | (0.89, 1.92) | 0.16 | |
| | 1963 to 1967 | 63 | 1.46 | (0.93, 2.30) | 0.10 | |
| | 1968 to 1973 | 66 | 1.82 | (1.12, 2.94) | 0.02 | * |
| | > 1973 | 70 | 1.51 | (0.88, 2.58) | 0.13 | |
| Race | White | 337.96 | 1.00 | — | | |
| | Black | 55.04 | 0.67 | (0.48, 0.92) | 0.01 | * |
| Plant | 1 | 99 | 1.00 | — | | |
| | 2 | 156 | 1.02 | (0.72, 1.43) | 0.92 | |
| | 3 | 138 | 1.04 | (0.76, 1.43) | 0.80 | |
| Sex | Male | 348 | 1.00 | — | | |
| | Female | 45 | 0.94 | (0.67, 1.30) | 0.70 | |
| Employment status | Still employed | 23 | 1.00 | — | | |
| | Not employed | 92 | 1.27 | (0.70, 2.31) | 0.43 | |
| | Still employed | 23 | 1.00 | — | | |
| | Left work (under 50) | 44 | 1.36 | (0.73, 2.52) | 0.33 | |
| | Left work (50 or older) | 48 | 1.13 | (0.58, 2.23) | 0.72 | |

Cancer incidence (including SEER data)

| | | | | |
|-------------------------|----|------|--------------|------|
| Still employed | 23 | 1.00 | — | |
| Left work (under 55) | 48 | 1.24 | (0.67, 2.28) | 0.49 |
| Left work (55 or older) | 44 | 1.38 | (0.68, 2.79) | 0.37 |
| Still employed | 23 | 1.00 | — | |
| Left work (under 60) | 62 | 1.27 | (0.70, 2.31) | 0.44 |
| Left work (60 or older) | 30 | 1.31 | (0.61, 2.79) | 0.49 |

Table 18: Adjusted HR estimates for death due to **all cancers** ($n = 7809$).

| Covariate | level | n | HR | (95% CI) | p | |
|----------------------|-------------------------|---------|------|--------------|---------|---|
| Cumulative straight | 0 | 3736 | 1.00 | — | | |
| | > 0 to 0.367 | 1358 | 1.05 | (0.97, 1.13) | 0.21 | |
| | > 0.367 to 1.98 | 1357 | 0.98 | (0.91, 1.06) | 0.64 | |
| | > 1.98 | 1358 | 1.13 | (1.06, 1.21) | < 0.005 | * |
| Cumulative soluble | 0 to 0.05 | 1420 | 1.00 | — | | |
| | > 0.05 to 3.12 | 2073 | 1.00 | (0.92, 1.07) | 0.93 | |
| | > 3.12 to 11.1 | 2158 | 1.03 | (0.96, 1.12) | 0.42 | |
| | > 11.1 | 2158 | 1.14 | (1.05, 1.24) | < 0.005 | * |
| Cumulative synthetic | 0 | 5621 | 1.00 | — | | |
| | > 0 to 0.223 | 730 | 1.07 | (0.98, 1.18) | 0.15 | |
| | > 0.223 to 1.26 | 729 | 1.01 | (0.92, 1.11) | 0.80 | |
| | > 1.26 | 729 | 1.07 | (0.98, 1.16) | 0.14 | |
| Year | 1973 to 1988 | 1401 | 1.00 | — | | |
| | 1989 to 1993 | 1209 | 1.90 | (1.75, 2.06) | < 0.005 | * |
| | 1994 to 1999 | 1349 | 1.63 | (1.50, 1.78) | < 0.005 | * |
| | 2000 to 2004 | 1257 | 1.69 | (1.55, 1.85) | < 0.005 | * |
| | 2005 to 2010 | 1464 | 1.53 | (1.39, 1.68) | < 0.005 | * |
| | > 2010 | 1129 | 1.36 | (1.22, 1.51) | < 0.005 | * |
| Year of hire | 1938 to 1948 | 1172 | 1.00 | — | | |
| | 1949 to 1953 | 1331 | 1.09 | (1.00, 1.19) | 0.05 | |
| | 1954 to 1962 | 1370 | 1.18 | (1.08, 1.29) | < 0.005 | * |
| | 1963 to 1967 | 1311 | 1.34 | (1.21, 1.49) | < 0.005 | * |
| | 1968 to 1973 | 1181 | 1.30 | (1.16, 1.45) | < 0.005 | * |
| | > 1973 | 1444 | 1.36 | (1.20, 1.54) | < 0.005 | * |
| Race | White | 5855.78 | 1.00 | — | | |
| | Black | 1953.22 | 1.48 | (1.39, 1.58) | < 0.005 | * |
| Plant | 1 | 2381 | 1.00 | — | | |
| | 2 | 2968 | 1.05 | (0.98, 1.14) | 0.17 | |
| | 3 | 2460 | 1.09 | (1.02, 1.17) | 0.01 | * |
| Sex | Male | 6916 | 1.00 | — | | |
| | Female | 893 | 0.86 | (0.80, 0.92) | < 0.005 | * |
| Employment status | Still employed | 553 | 1.00 | — | | |
| | Not employed | 2267 | 1.03 | (0.91, 1.17) | 0.60 | |
| | Still employed | 553 | 1.00 | — | | |
| | Left work (under 50) | 839 | 0.83 | (0.73, 0.95) | 0.01 | * |
| | Left work (50 or older) | 1428 | 1.37 | (1.20, 1.57) | < 0.005 | * |

Cancer incidence (including SEER data)

| | | | | | |
|-------------------------|------|------|--------------|---------|---|
| Still employed | 553 | 1.00 | – | | |
| Left work (under 55) | 1043 | 0.89 | (0.78, 1.01) | 0.07 | |
| Left work (55 or older) | 1224 | 1.48 | (1.28, 1.70) | < 0.005 | * |
| Still employed | 553 | 1.00 | – | | |
| Left work (under 60) | 1400 | 0.96 | (0.85, 1.09) | 0.53 | |
| Left work (60 or older) | 867 | 1.45 | (1.25, 1.68) | < 0.005 | * |

Table 19: Adjusted HR estimates for incidence of the indicated outcome, associated with race. Caution: these estimates are simply the conditional estimates from the previous tables.

| Outcome | level | <i>n</i> | HR | (95% CI) | <i>p</i> | |
|---------------------------------|-------|----------|------|--------------|----------|---|
| Colon cancer | White | 491.98 | 1.00 | – | | |
| | Black | 176.02 | 1.78 | (1.44, 2.20) | < 0.005 | * |
| Rectal cancer | White | 257.8 | 1.00 | – | | |
| | Black | 57.2 | 0.91 | (0.65, 1.27) | 0.56 | |
| Pancreatic cancer | White | 180 | 1.00 | – | | |
| | Black | 71 | 1.58 | (1.13, 2.20) | 0.01 | * |
| Esophageal cancer | White | 128 | 1.00 | – | | |
| | Black | 44 | 1.49 | (0.99, 2.23) | 0.05 | |
| Stomach cancer | White | 149 | 1.00 | – | | |
| | Black | 65 | 2.19 | (1.53, 3.13) | < 0.005 | * |
| Laryngeal cancer | White | 141 | 1.00 | – | | |
| | Black | 65 | 1.74 | (1.21, 2.49) | < 0.005 | * |
| Lung and bronchial cancers | White | 1321.88 | 1.00 | – | | |
| | Black | 415.12 | 1.37 | (1.20, 1.57) | < 0.005 | * |
| Breast cancer | White | 177 | 1.00 | – | | |
| | Black | 83 | 1.23 | (0.90, 1.69) | 0.19 | |
| Prostate cancer | White | 1714.04 | 1.00 | – | | |
| | Black | 799.96 | 2.25 | (2.03, 2.50) | < 0.005 | * |
| Kidney and renal pelvic cancers | White | 208 | 1.00 | – | | |
| | Black | 46 | 0.95 | (0.66, 1.37) | 0.78 | |
| Bladder cancer | White | 468.94 | 1.00 | – | | |
| | Black | 64.06 | 0.60 | (0.45, 0.80) | < 0.005 | * |
| Melanoma | White | 255.72 | 1.00 | – | | |
| | Black | 10.28 | 0.16 | (0.08, 0.31) | < 0.005 | * |
| Leukemia | White | 176.84 | 1.00 | – | | |
| | Black | 51.16 | 1.25 | (0.86, 1.81) | 0.24 | |
| Non-Hodgkin lymphoma | White | 337.96 | 1.00 | – | | |
| | Black | 55.04 | 0.67 | (0.48, 0.92) | 0.01 | * |
| All cancers | White | 5855.78 | 1.00 | – | | |
| | Black | 1953.22 | 1.48 | (1.39, 1.58) | < 0.005 | * |

Citations

1. Garcia E, Picciotto S, Costello S, Bradshaw PT, Eisen EA. Assessment of the healthy worker survivor effect in cancer studies of the united autoworkers-general motors cohort. *Occupational and environmental medicine*. 2017;74(4):294-300.
2. Murray JS, others. Multiple imputation: A review of practical and theoretical findings. *Statistical Science*. 2018;33(2):142-159.