Risk of incident prostate cancer risk, weighted by survival to 1985

GM-UAW Cohort Study

# The problem

The Cohort includes all persons who have worked at least 3 years and were hired in the years 1938 through 1981. However, follow-up for cancer incidence (Michigan Cancer Registry) does not begin until 1985. Not all who entered the cohort prior to 1985 were still at-risk of the outcome in 1985. Loss to follow-up may have been differential by underlying health. In particular, healthier individuals may have had lower exposure and a greater probability of surviving to 1985 outcome-free. In this case, the resulting population at-risk in 1985 would be the result of the so-called healthy worker survivor bias.1 (There may also be those who have already experienced incident cancer prior to 1985, but were not recorded as such, but this outcome misclassification problem is not the focus of this analysis.)

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| Adapted from Figure 6c in Hernán et al. (2004). Take , , , and to represent underlying health, occupational exposure, censoring, and cancer incidence, respectively. |

# Workaround

We have no measure of underlying health , but we proceeded by modeling the censoring mechanism for individual at year , conditional on observed covariates that may serve as instruments for unmeasured . We then used the modeled censoring probability to construct stabilized weights for each individual in where

The parameters of model were estimated using a pooled logistic regression for the log-odds of dying due to natural causes by the end of each year of follow-up , conditional on the -length covariate vector and uncensored status at the begninnig of that person-year .

The covariates included:

* Years since hire (quartiles or splined)
* Age (quartiles or splined)
* Plant
* Race (black or white)
* Sex
* Proportion of year spent in assembly, machining (includes grinding), and off (quartiles)
* Cumulative time spent off (quartiles)
* Year of hire (quartiles)
* Cumulative exposure to straight, soluble, and synthetic MWFs (quartiles)
* Employment status

Further information on the estimation of can be found on [Box](https://berkeley.app.box.com/folder/114285681411).

# Four analyses

1. Men still alive in 1973
2. Men still alive in 1985, excluding the 134 men who had prostate cancer before 1985
3. Men still alive in 1985, excluding the 134, weighted by probability of not dying of natural causes
4. Men still alive in 1985, excluding the 134, weighted by stabilized inverse probability with truncation at the 99th percentile of weights ( = 330)

Follow-up ends on the date of death, prostate cancer incidence, LTFU (outcome-free at age 108.39 years), or 2015-12-31, whichever comes first.

All analyses restricted to plants 1 and 2

Summary of population characteristics in the slides to follow.

# Cox PH Models

* Cumulative exposure to straight, soluble, and synthetic MWFs (lagged 20 years)
* Splined calendar year
* Splined year of hire
* Race
* Plant
* Risk sets indexed by age

## 1. Men still alive in 1973

## 2. Men still alive in 1985

## 3. Men still alive in 1985, weighted by probability of not being dead due to natural causes in 1985

## 4. Men still alive in 1985, weighted by the stabilized inverse probability with truncation

# Results by MWF type

1. Hernán MA, Hernández-Dı́az S, Robins JM. A structural approach to selection bias. *Epidemiology*. 2004:615-625.