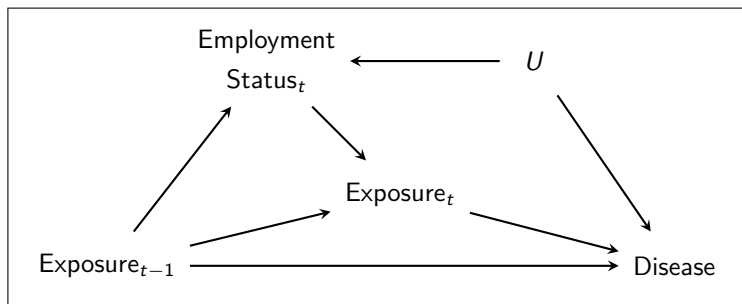


HWSE path analysis

Cancer incidence

June 15, 2021

From Erika Garcia's paper¹



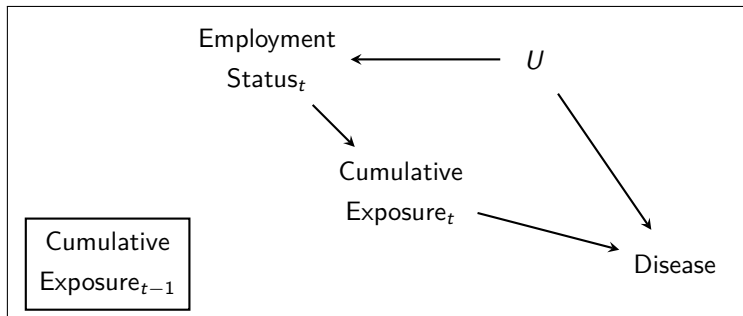
The presence of the healthy worker survivor effect (HWSE) implies the presence of the following three conditions:

1. Leaving work predicts (future) exposure
2. Leaving work is associated with the disease
3. Prior exposure predicts predicts leaving work

Analytic population

- ▶ Cancer incidence follow-up
 - ▶ Starting in 1973 in plants 1 and 2; 1985 in plant 3
 - ▶ Ending in 2015
- ▶ Employment records in 1994; individuals still at work in 1995 were censored

2. Leaving work and cancer incidence



- ▶ Exposure: Employment status (binary)
- ▶ Conditioning set:
 - ▶ Age (index time for Cox model)
 - ▶ Cumulative MWF exposure (lagged 1 year)
 - ▶ Year of hire
 - ▶ Race (MI)
 - ▶ Plant
 - ▶ Sex

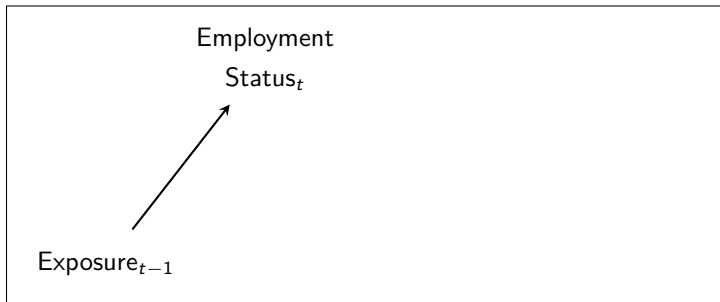
2. Leaving work at age 60 and cancer incidence

$$\begin{aligned}\log h(t \mid a, x) = & \log h_0(t) \\ & + a \cdot \mathbb{1}[t < 60] \cdot \beta_1 + a \cdot \mathbb{1}[t \geq 60] \cdot \beta_2 \\ & + x \begin{pmatrix} \beta_3 & \cdots & \beta_p \end{pmatrix}^\top\end{aligned}$$

where a is the indicator of having left work, t is age, and x is a vector of covariates

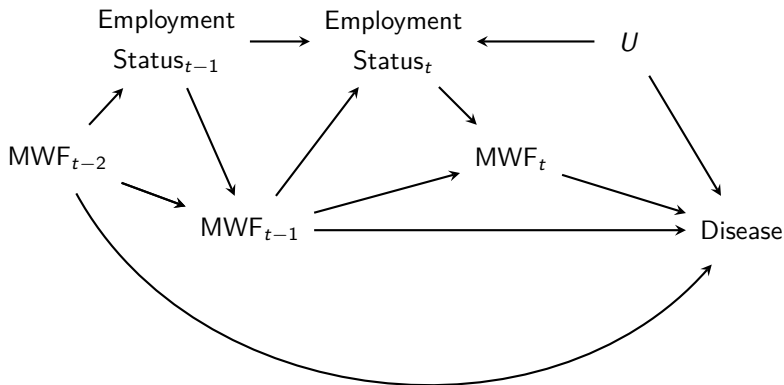
- ▶ Coefficients β_1 and β_2 may be thought of as interaction effects of employment status and age

3. Prior exposure and leaving work



- ▶ Exposure: Cumulative exposure lagged 1 year
- ▶ Conditioning set:
 - ▶ Age (index time for Cox model)
 - ▶ Year of hire
 - ▶ Race (MI)
 - ▶ Plant
 - ▶ Sex

Can conventional methods be used for the path analysis?



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.