When survival bias is not truly a bias, but rather the correct answer to the wrong question

L. Paloma Rojas-Saunero MD, PhD
Postdoctoral scholar
Department of Epidemiology, UCLA

UCLA Fielding School of Public Health

Society for Epidemiologic Research

Competing events

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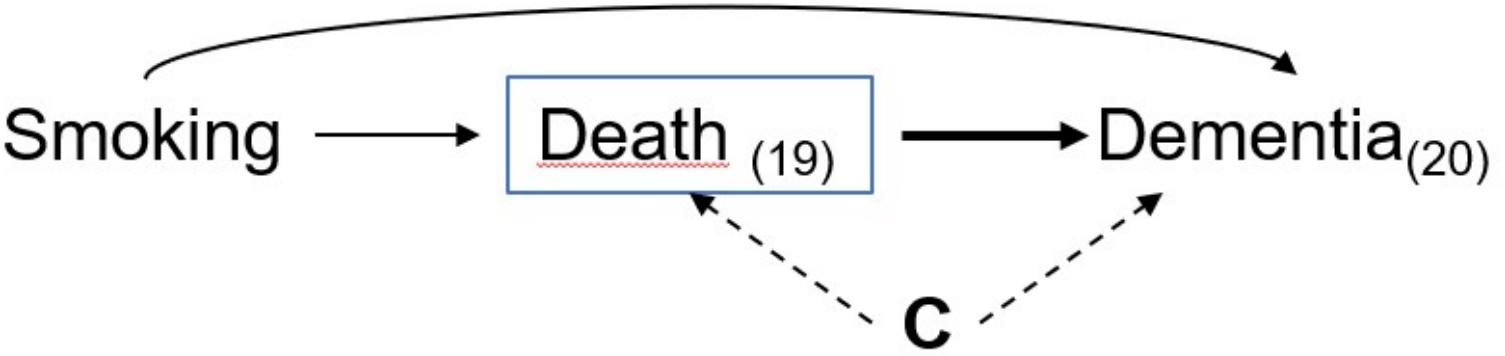

Causal estimands

- Contrast of (counterfactual) outcome distributions in the **same individuals** but under **different levels of exposure**.
- The only explanation for a difference is the exposure, not comparing different individuals.

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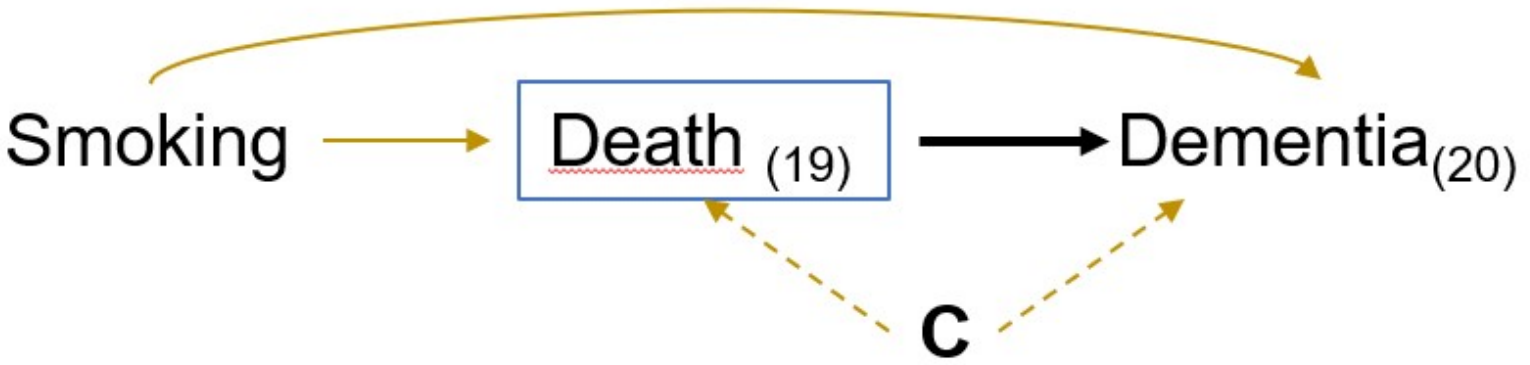

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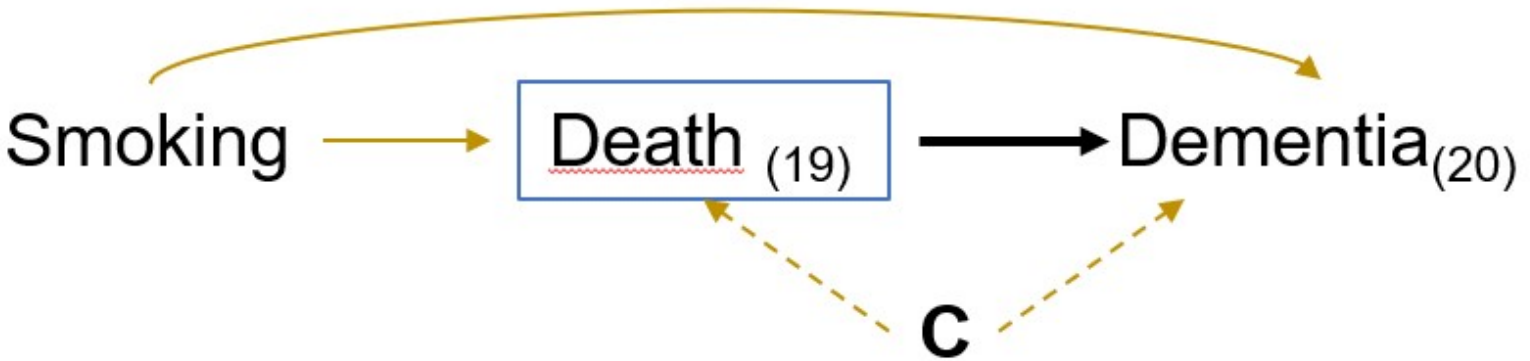

** *Cause-specific cumulative incidence* or *crude* risk

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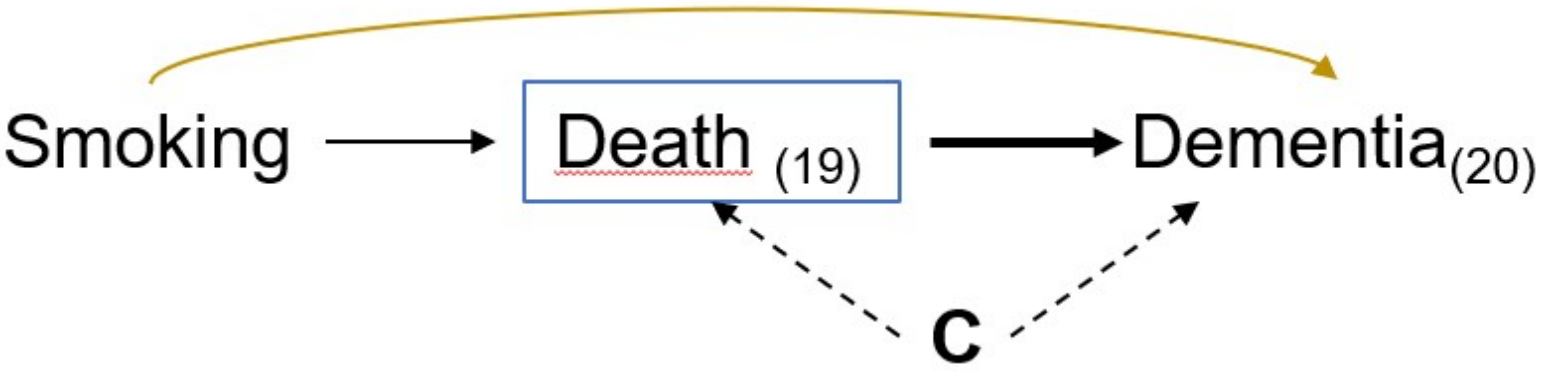

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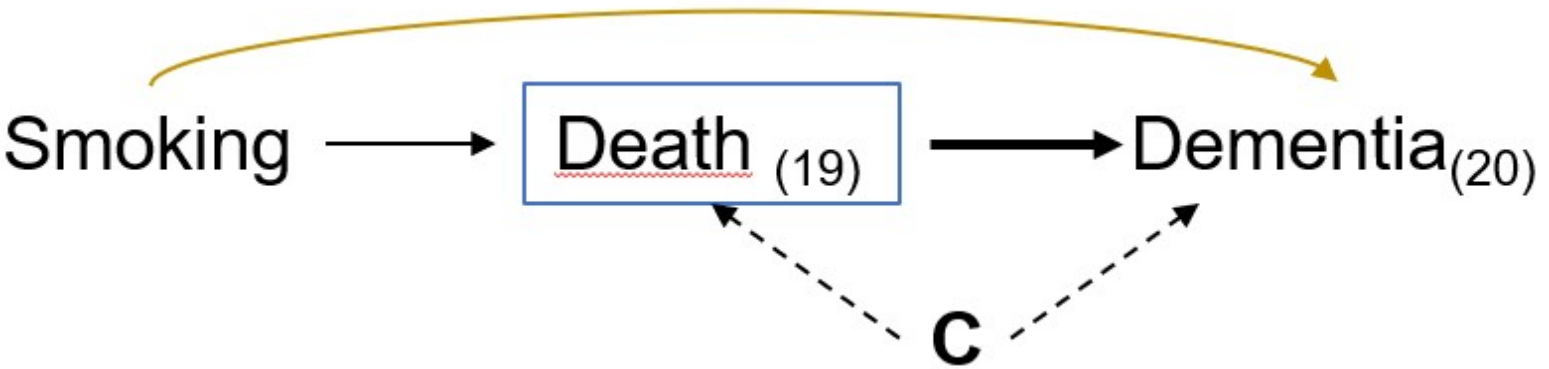

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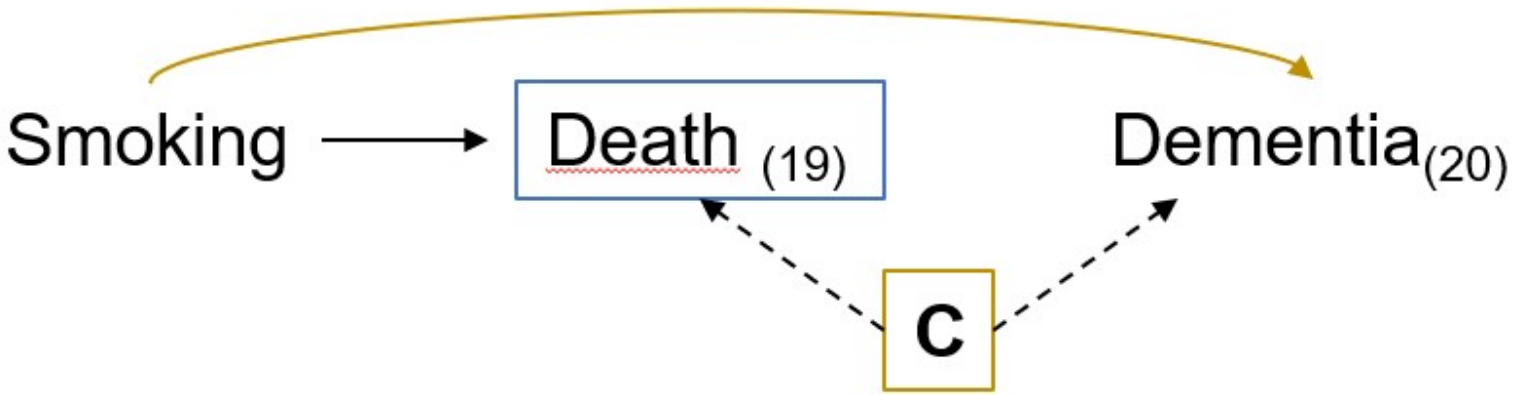

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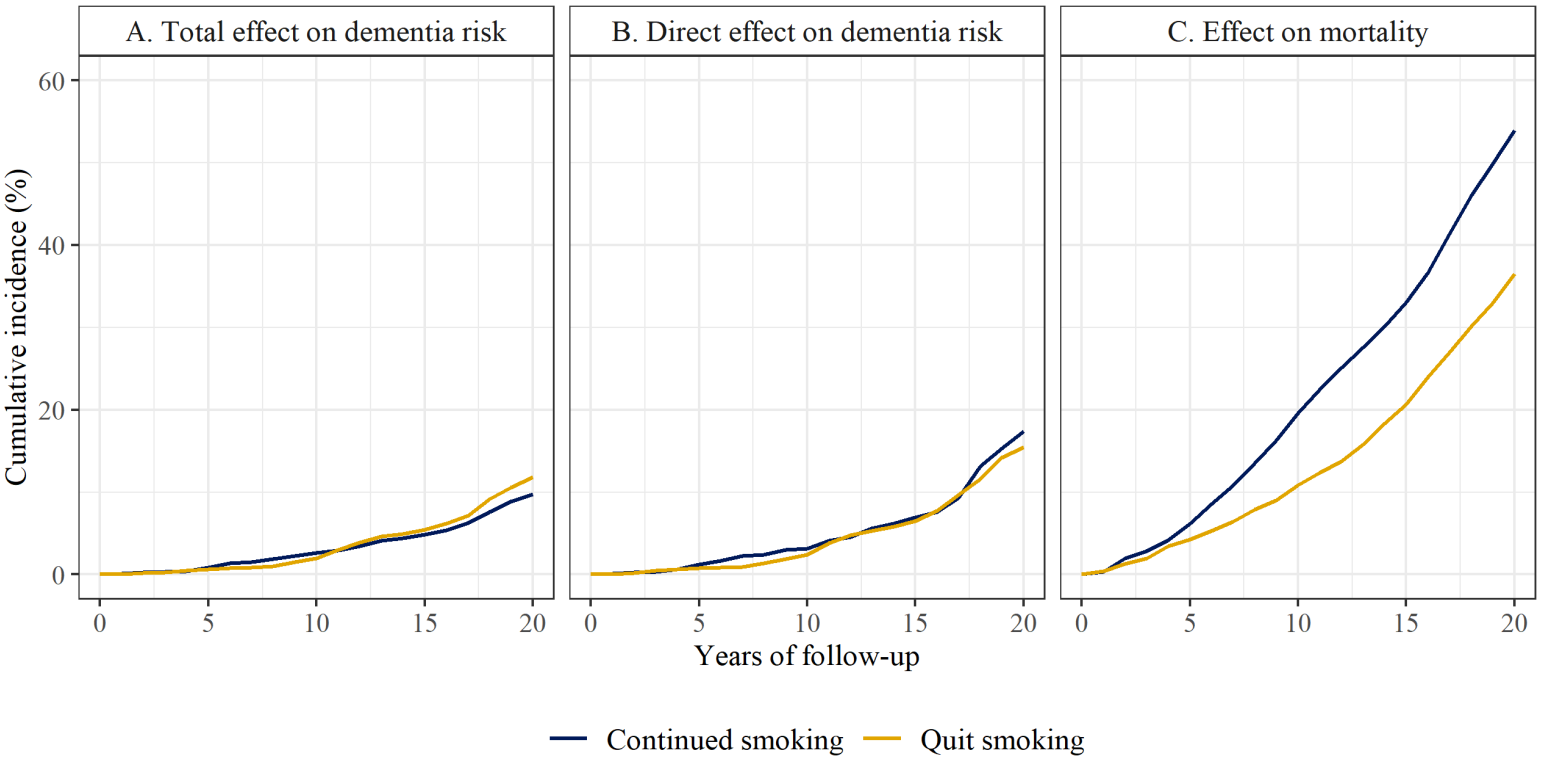
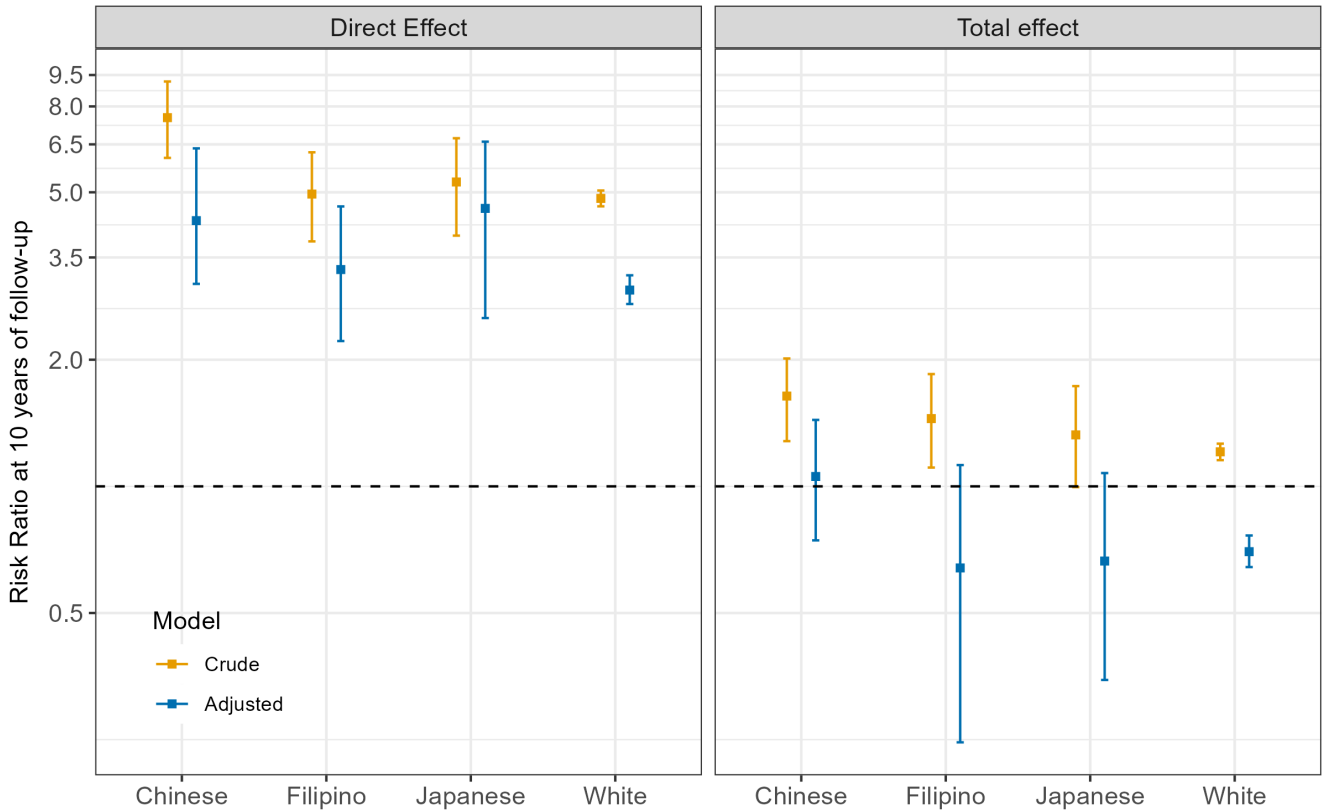
Consistency	Not needed	An intervention that “eliminates death” is well-defined.

Smoking cessation on dementia risk over 20 years



Rojas-Saunero et al. AJE.2023

Incident stroke on dementia risk in Asian American and White population in California



Rojas-Saunero et al. *Work in progress.*

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- Descriptive, predictive or causal estimation of dementia risk will be impacted by differential mortality.
- We can either allow the disparity effect measure to be impacted by the effect of death or we can try to imagine an scenario were we could have eliminated death.

The controlled direct effect estimand

This author views the result in much the same light as a discussion of survival after the zombie apocalypse. The second problem is that the computation for this hypothetical case is only correct

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In replacing dead participants by cloning the living, IPW generates a sample in which participants are not allowed to die. Moreover, IPW attributes particularly high weights to the participants most likely to die, ie, to people with poor health characteristics associated with death in the attrition model. In doing so, IPW not only prevents people from dying but also artificially maintains the lives of people in very poor health—arguably a form of statistical cruelty.

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1. Do not condition on the future;
2. Do not regard individuals at risk after they have died; and
3. Stick to this world.

Andersen & Keiding. Statistics in Medicine. 2012.

History of competing events analysis

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History of competing events analysis

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- Bernoulli compared the observed life expectancy to a counterfactual scenario that **eliminates smallpox deaths** assuming a hypothethical scenario were every person was innoculated at birth.
- Therefore smallpox inoculation (as a vaccine) would improve life expectancy for the population at that time.

Karn. 1931; Colombo & Diamanti. 2015

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- **Separable effects**
  - Physical decomposition of the exposure assumed to operate on dementia and death through separate pathways. (*Stensrud et al. JASA. 2020*)

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- Being explicit about the question, allows us to understand the potential sources of bias, and helps us choose between estimators.
- We can extend these concepts to exploring the selective process before inclusion into the study.

To search for all the refutable consequences of a hypothesis demands highly imaginative thinking. Imagination is needed to arrive at the hypothesis in the first place, let alone to suggest rigorous tests for it. (Carol Buck)

Buck C. Popper's Philosophy for Epidemiologists, IJE. 1975

Thank you! Gracias!

lp.rojassaunero@ucla.edu

@palolili23

@palolili23