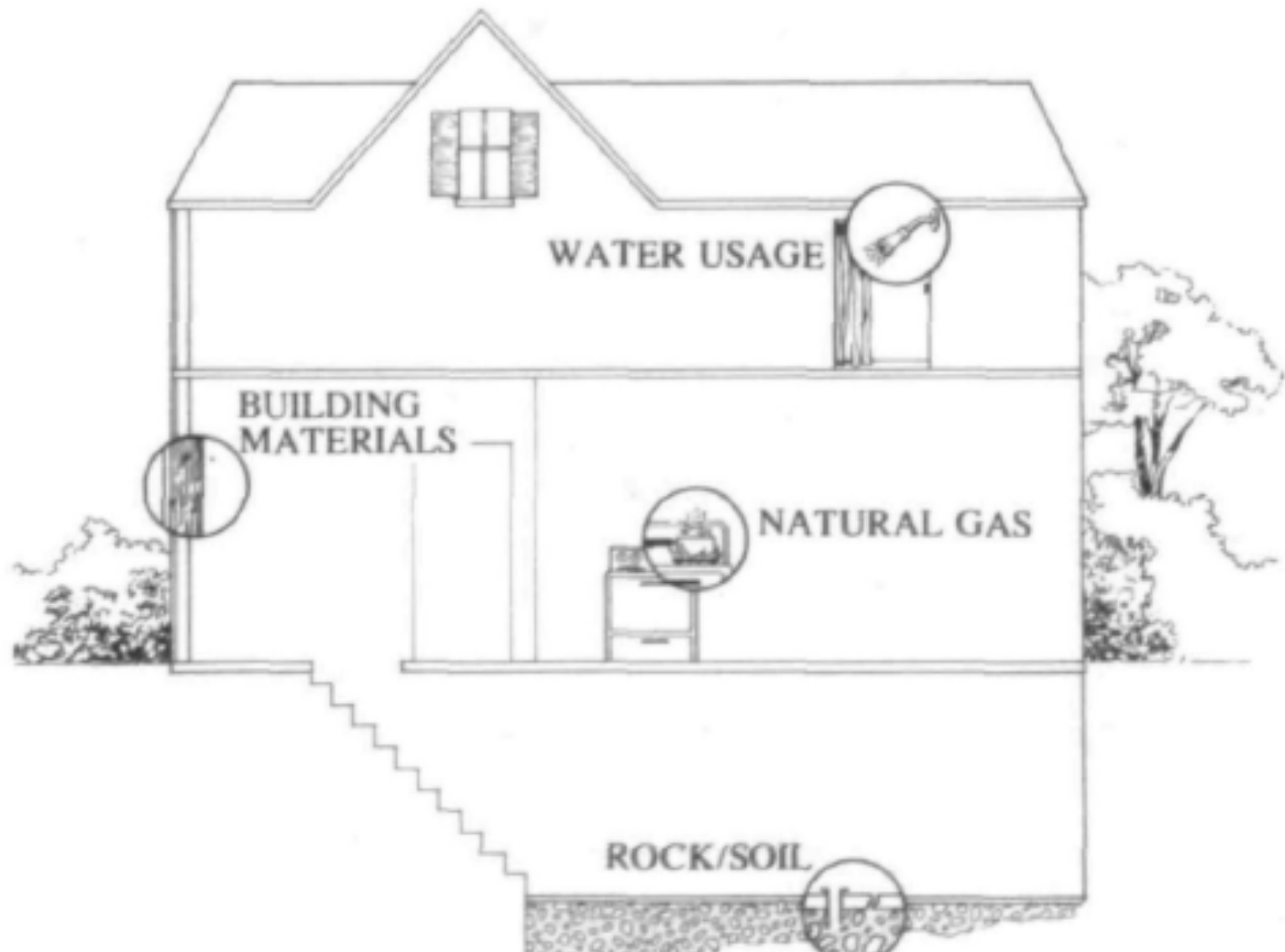
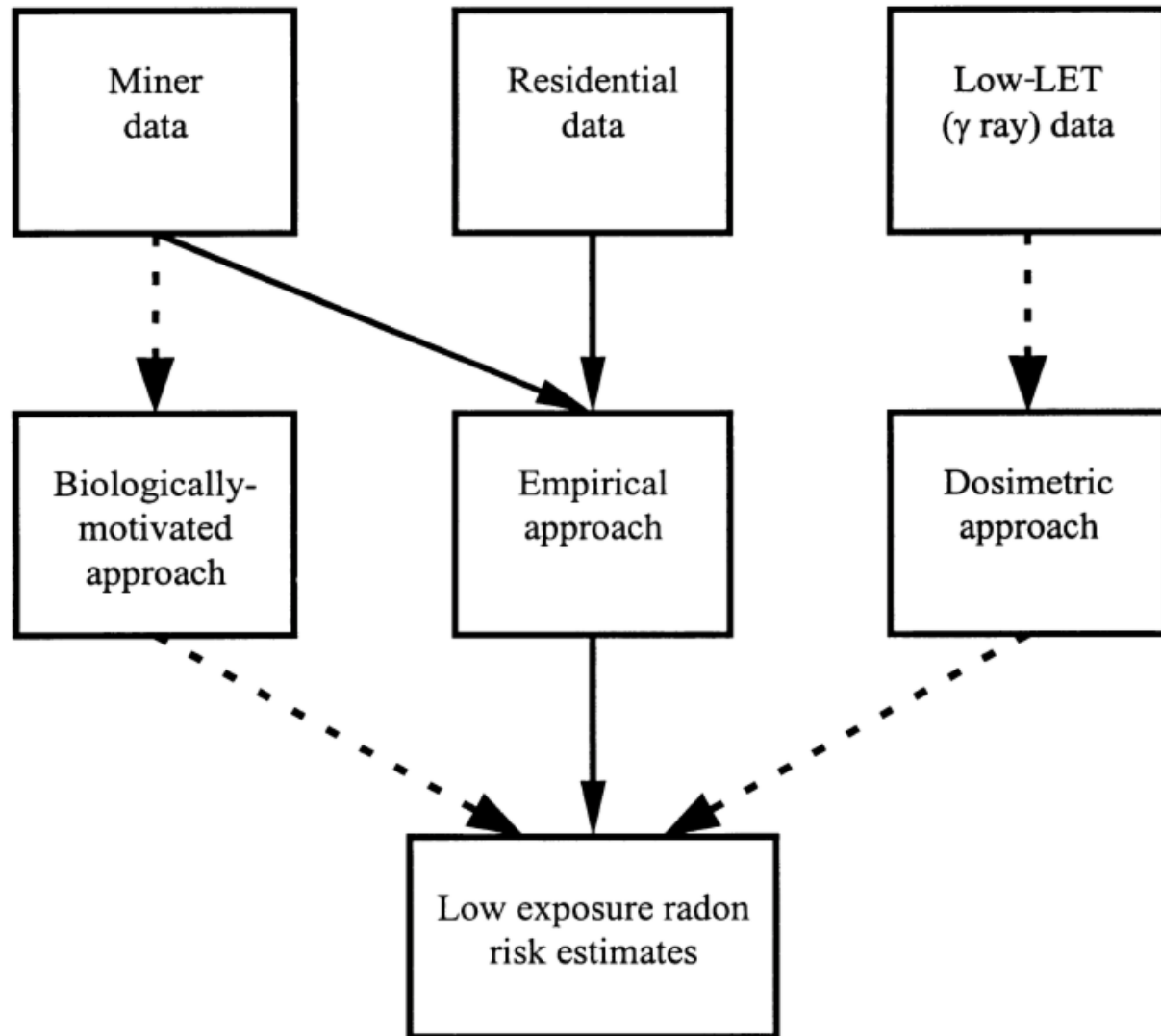


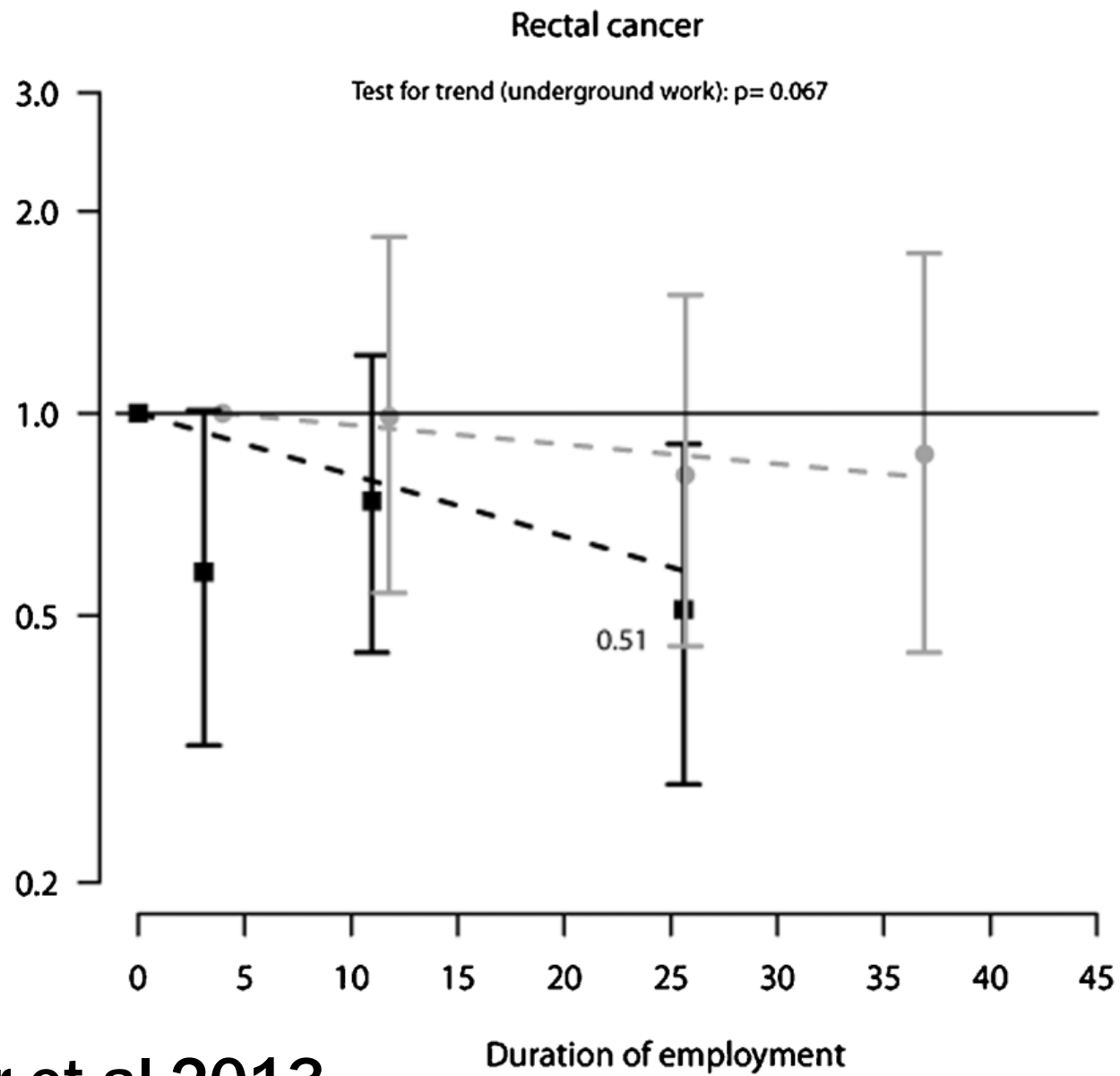
# **Controlling healthy worker survivor bias of the radon-lung cancer exposure-response in a cohort of uranium miners**

Alexander P Keil

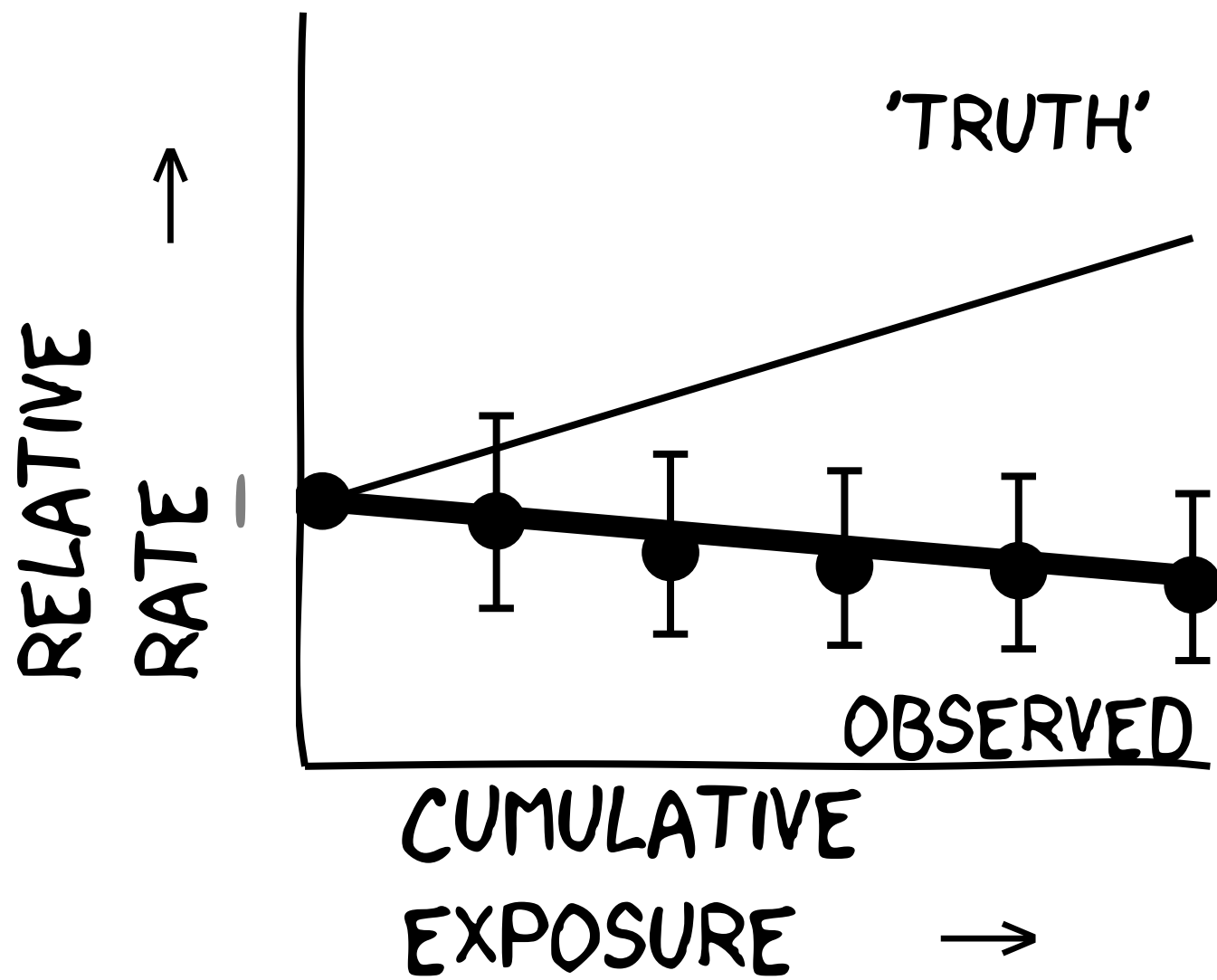
University of North Carolina at Chapel Hill

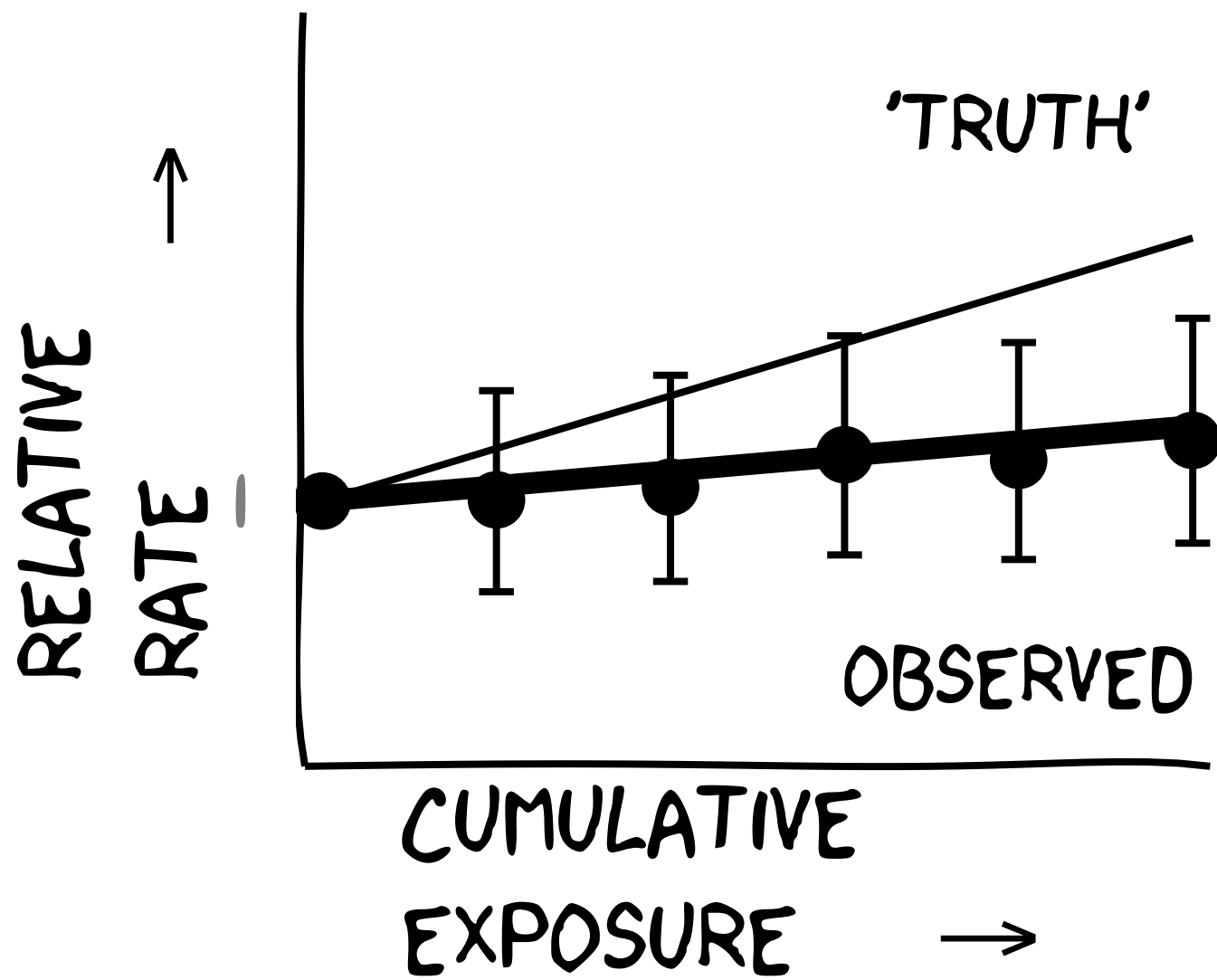






**Bjor et al 2013**





# Colorado Plateau uranium miners

- **4137 men, 617 lung cancer deaths**
- **Follow-up: 1950-2005**
- **Radon: Job exposure matrix and area level measurements**
- **Median exposure: 190 working level months for whites and 240 for Native Americans during follow-up**

# Statistical methods

- Time ratio: change in median age at death per 100 working level months
- Structural nested accelerated failure time models
  - Cumulative exposure
  - Time-windows of exposure



# Mortality and cumulative radon exposure

	Time ratio	95% CI	%diff
Lung cancer			
Adjusted*	1.168	(1.152, 1.174)	ref
Unadjusted**	1.102	(1.099, 1.112)	-39
All Causes			
Adjusted*	1.054	(1.041, 1.068)	ref
Unadjusted**	1.014	(1.013, 1.015)	-74

4,137 Male uranium miners, Colorado Plateau, USA

\* Adjusted for age (time scale) race, birth cohort, year of hire, current employment, employment duration, prior exposure

\*\* Not adjusted for employment, prior exposure

# Windows of radon exposure and lung cancer

Exposure Window	Time ratio*	95% CI	
5-15 years	1.188	(1.116,	1.230)
15-25 years	1.128	(1.050,	1.294)
25+ years	1.022	(0.950,	1.198)

4,137 Male uranium miners, Colorado Plateau, USA

\* Adjusted for age (time scale) race, birth cohort, year of hire, current employment, employment duration, prior exposure

- **Healthy worker survivor bias: radon effects are underestimated**
- **Biased public health impact estimates?**
- **Many cases, large exposure variation**
- **Next: assessment in other miner cohorts**

- **Funding: NIOSH**
- **Collaborators: David Richardson, Steve Cole, Steve Wing, Melissa Troester, Michael Hudgens**
- **Thank you!**

**Questions or comments?**



