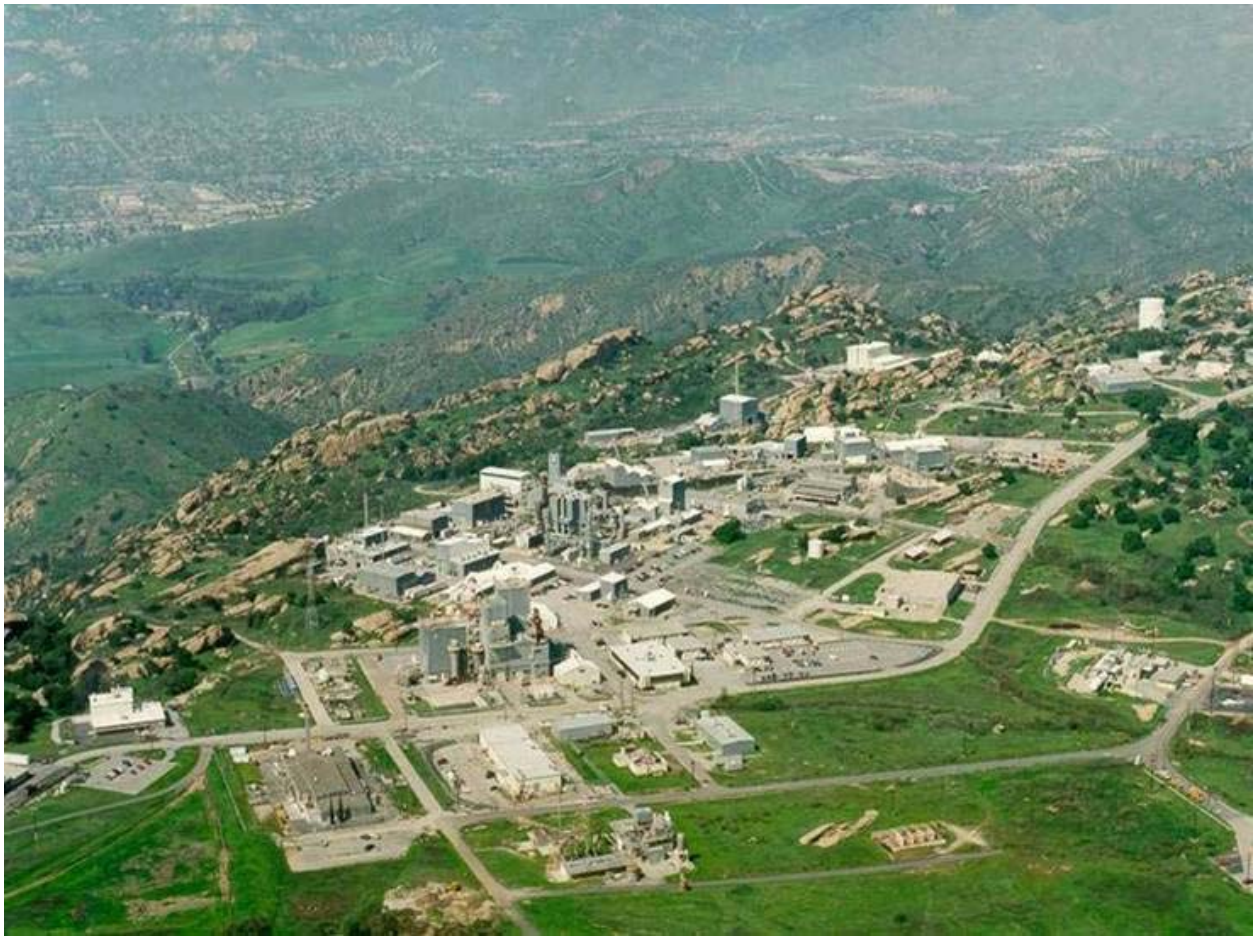
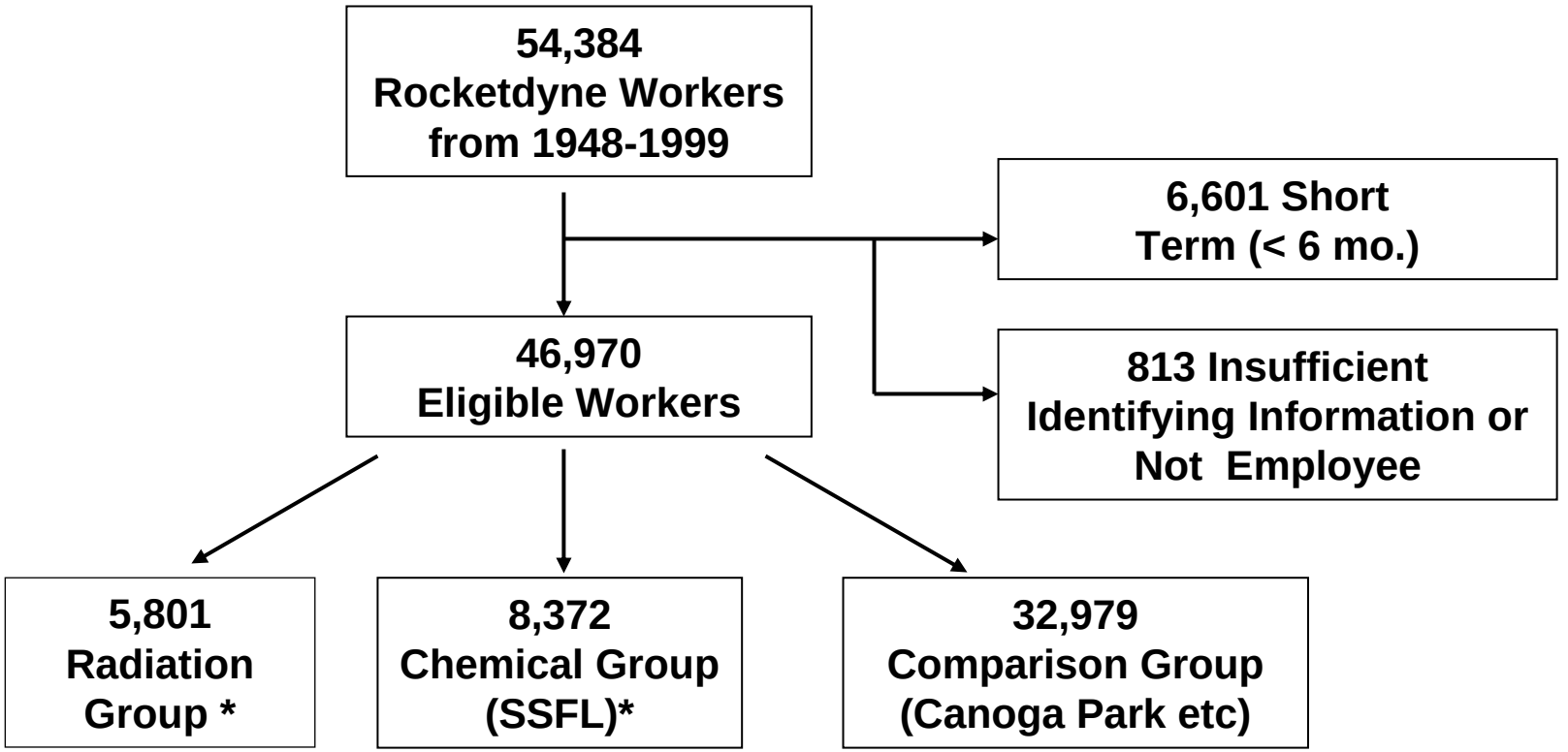
Rocketdyne Follow-On Health Study
6-8 April 2005
Overview



Who was in the study?



99.2% of eligible workers as of 12/31/99 were traced

*182 workers included in both groups

What were the two types of radiation exposure?

External

Uniform dose

Delivered during exposure

Film (TLD) badge reading

Internal

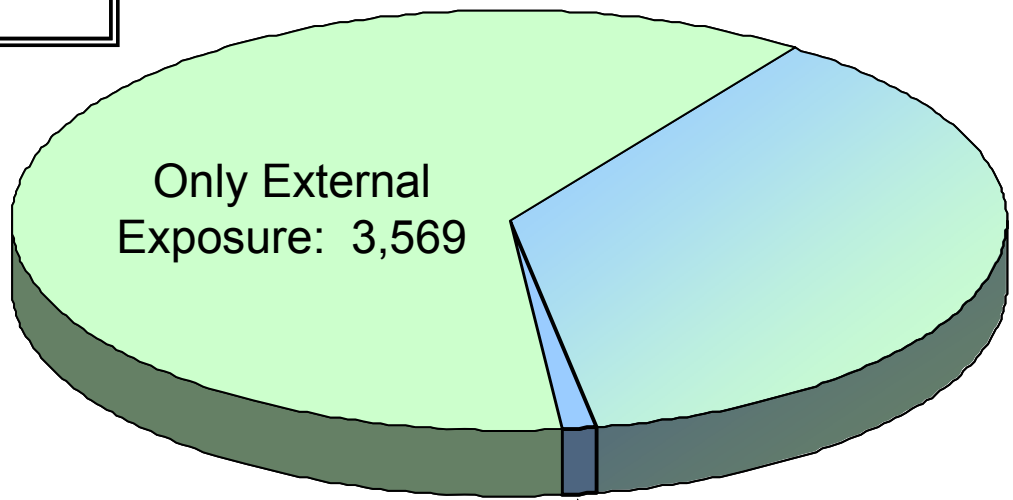
Non uniform dose

Protracted in time

Bioassay measurements

How many people were in the radiation group?

Total in Group:
5,801



Both Internal and External Exposure: 2,174

Only Internal Exposure: 58

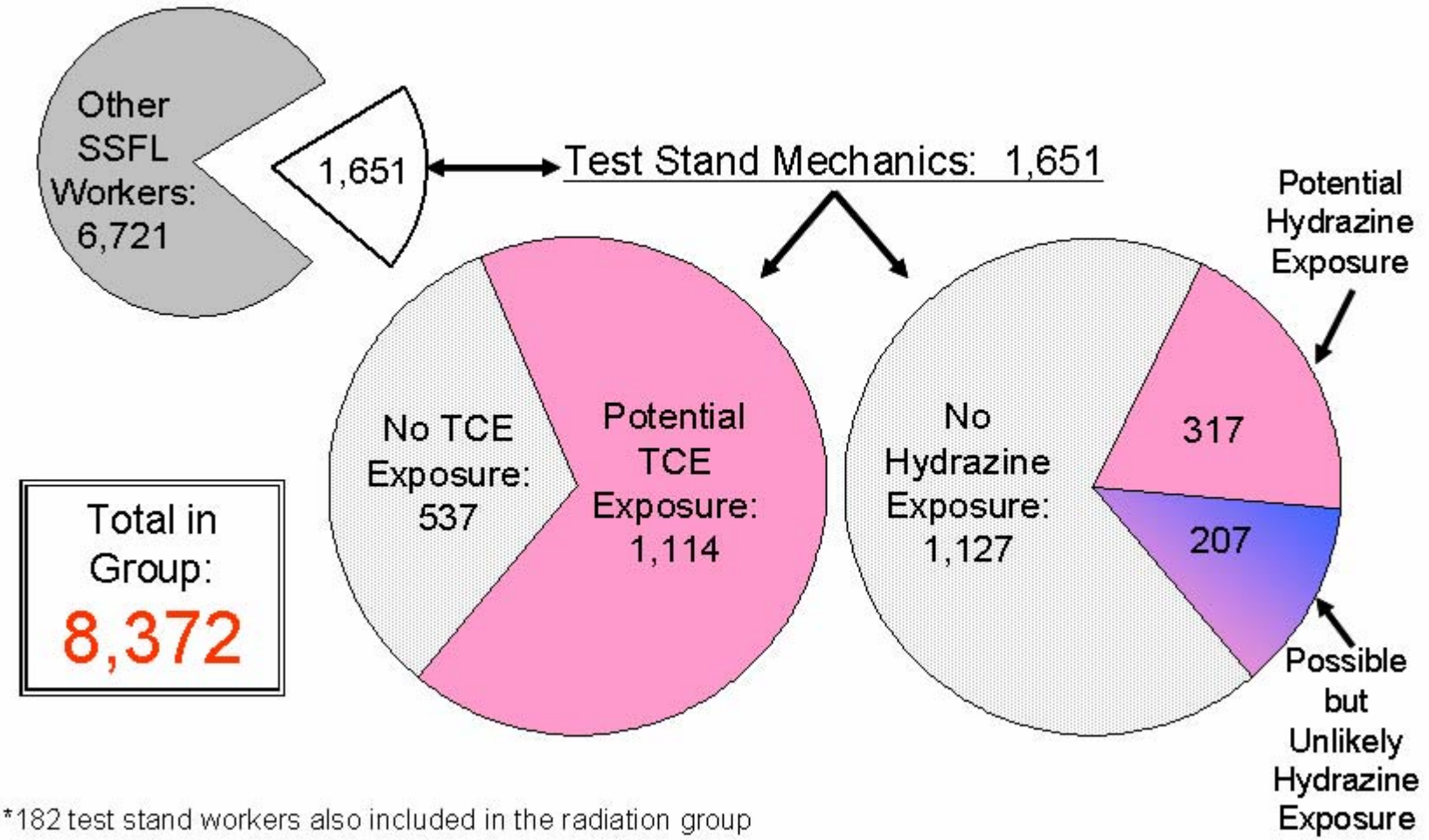
*182 workers in the radiation group also worked on test stands

Potential Chemical Exposure Characterized by Years Worked

- Work at SSFL
- Work as Test Stand Mechanic
  - Exposure to “Test Stand Environment”, including chemical mixture of fuels, oxidizers, exhaust gasses, solvents and other chemicals
  - Hydrazines
  - TCE as a “Utility Solvent”
  - TCE as a “Flush Solvent”

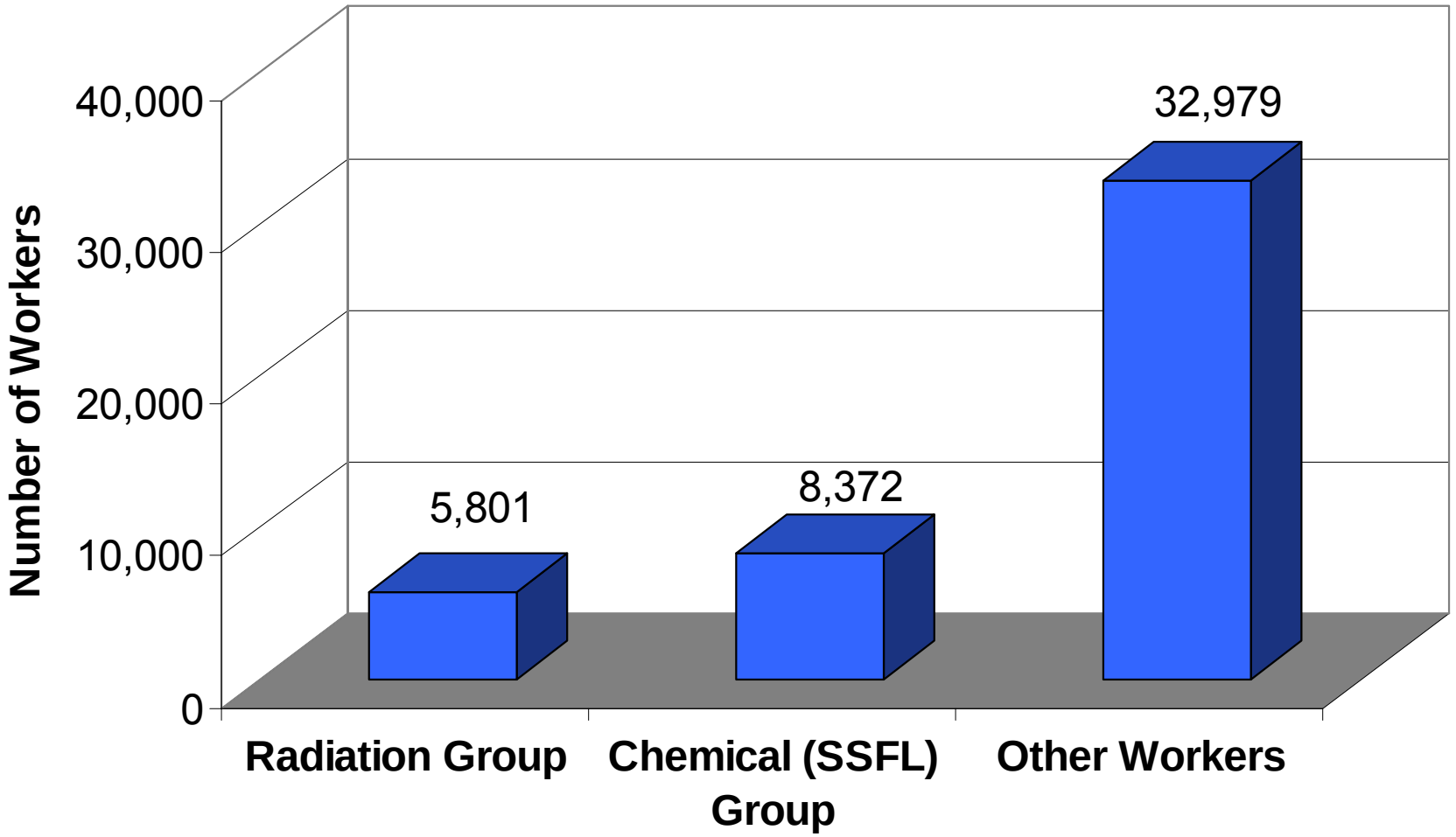
Nine Discussion Sessions

How many SSFL workers were potentially exposed to chemicals as test stand mechanics?

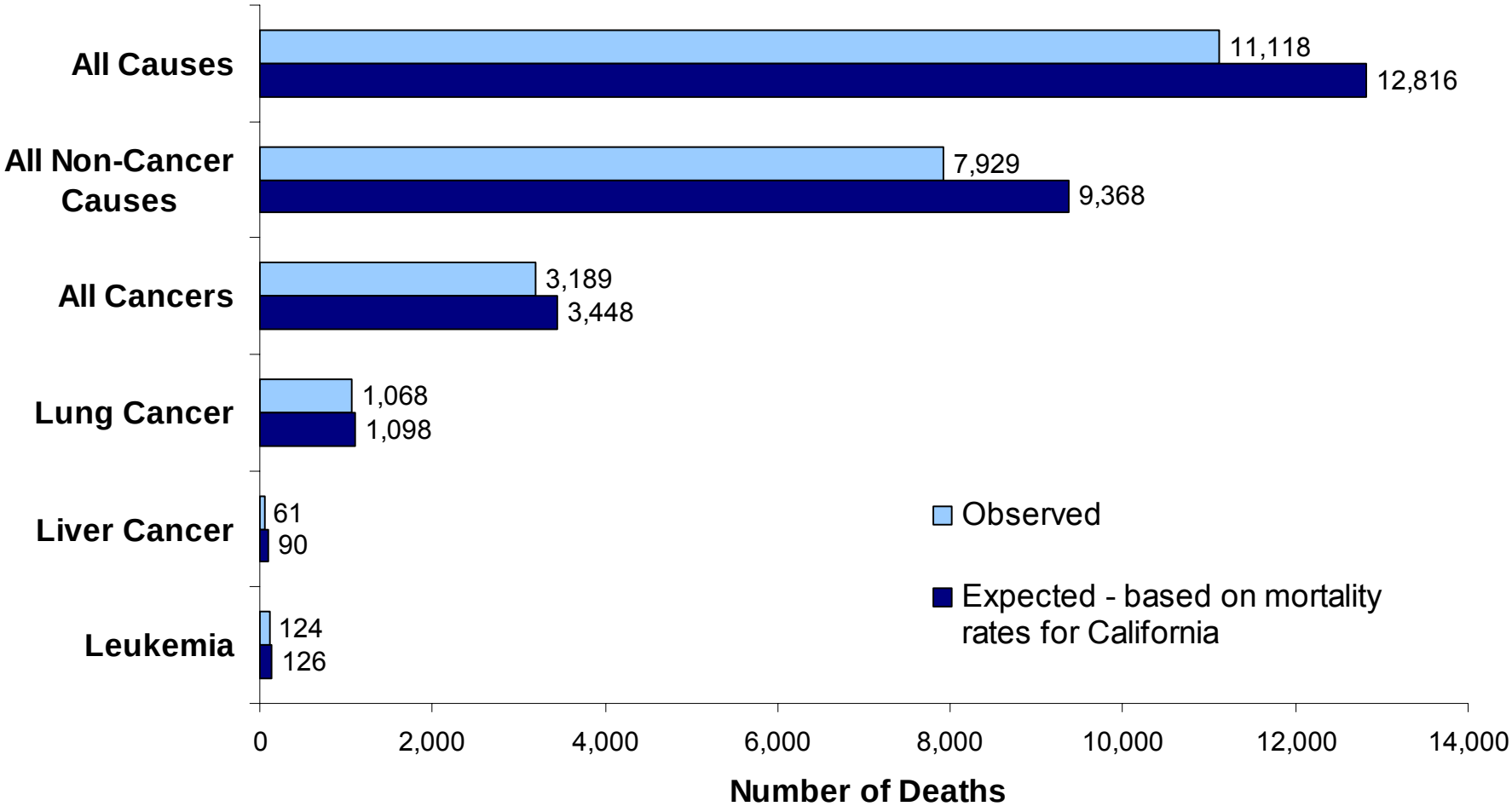


*182 test stand workers also included in the radiation group

Worker Groups



Rocketdyne workers had a lower risk of death than the general population of California



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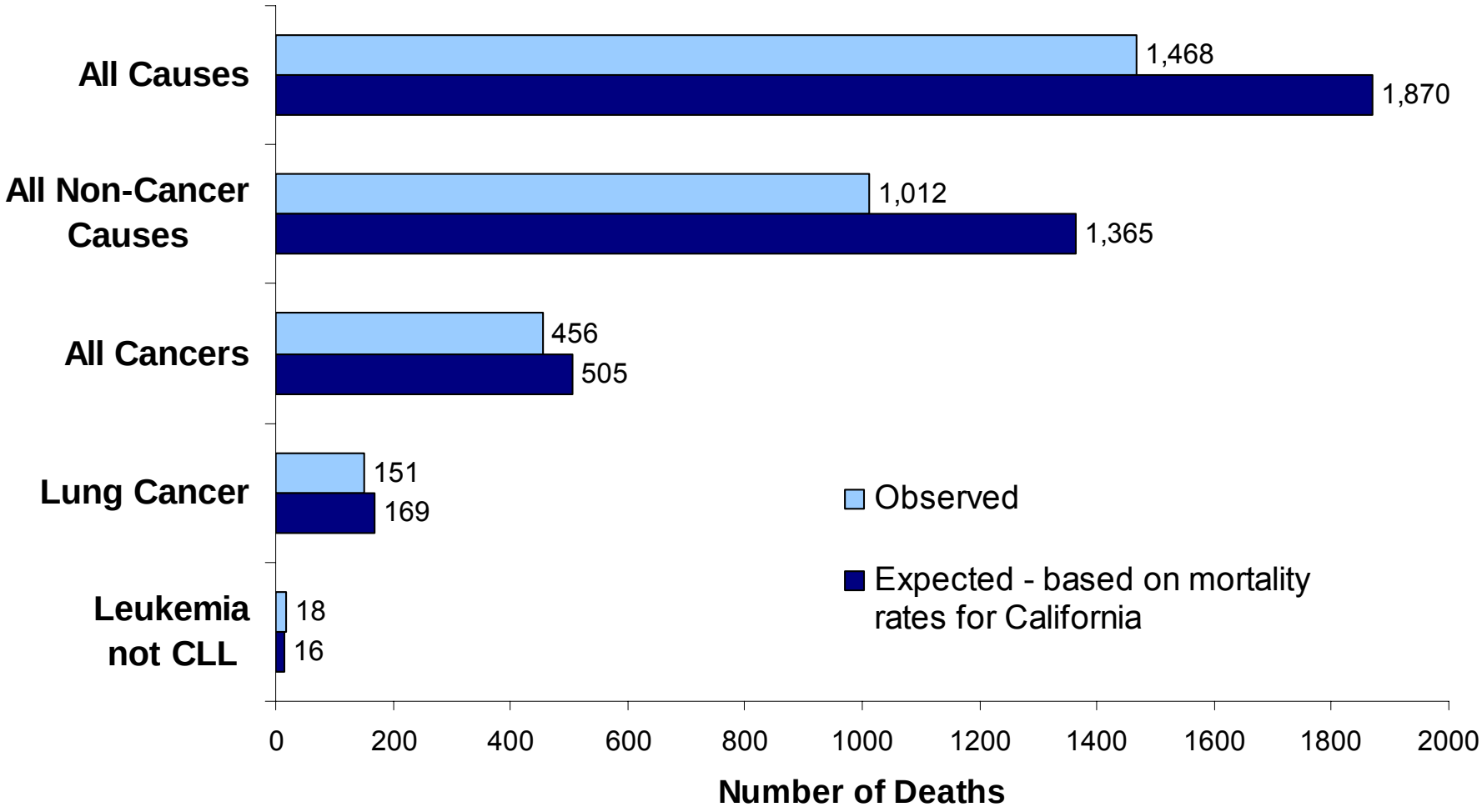
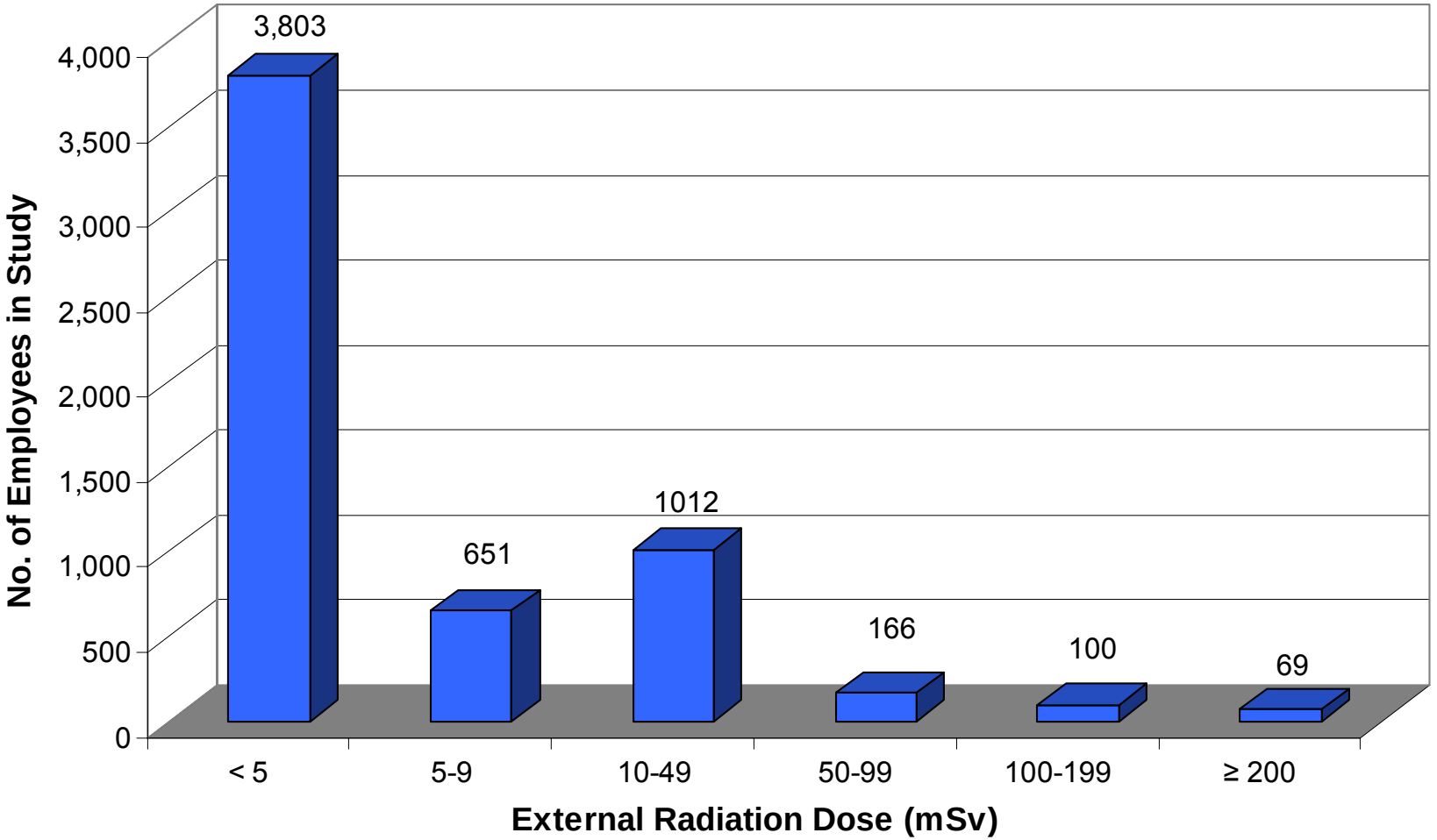
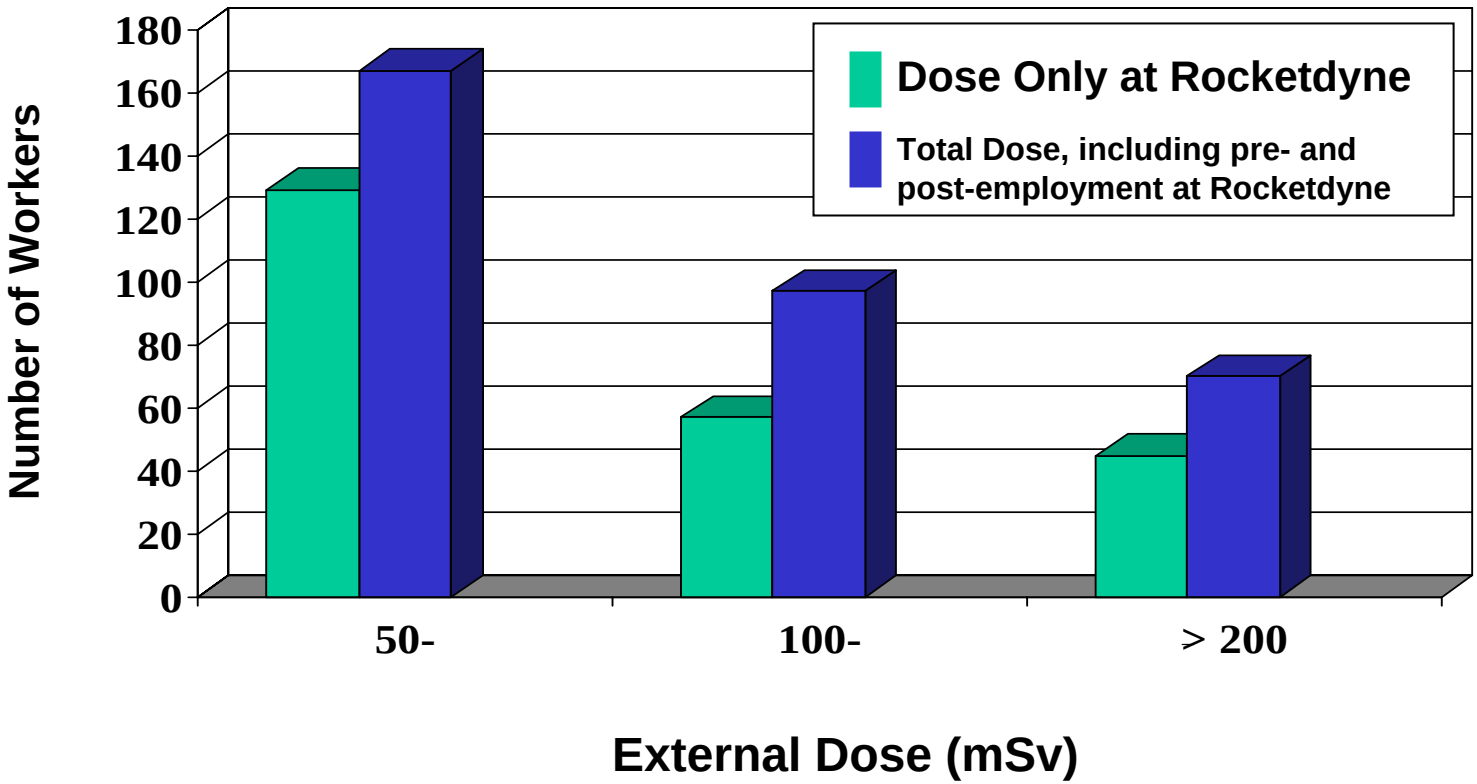


Most radiation workers received very low exposures



1 mSv = 100 mrem

What was the effect of including pre- and post-Rocketdyne radiation dose?

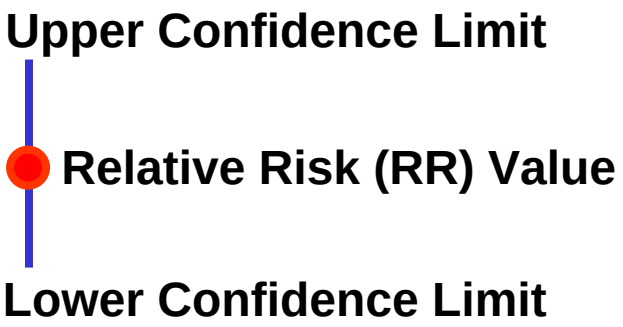


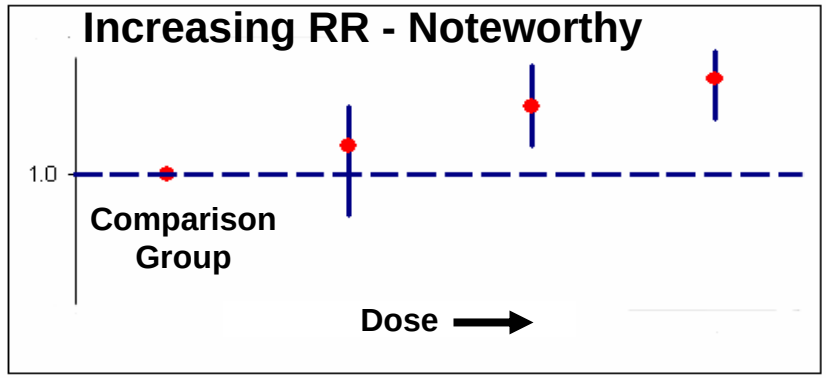
1 mSv = 100 mrem

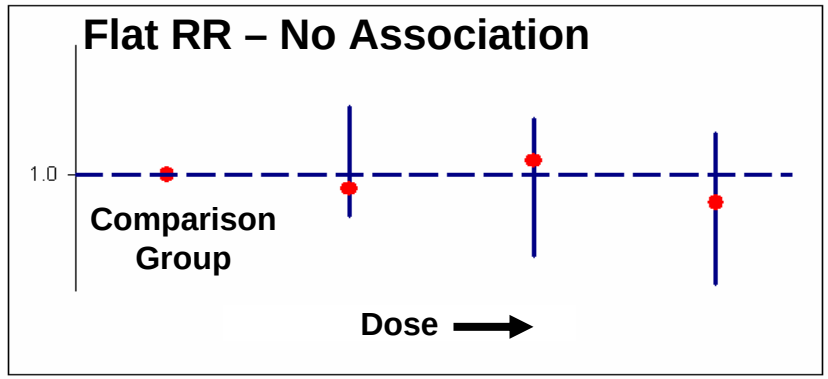
Interpreting Dose Response Graphs

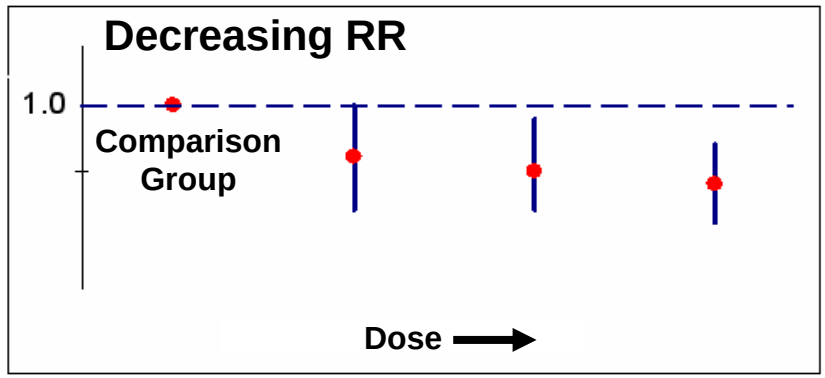
Results are presented with the Confidence Interval:

- **The confidence interval is the range of possible Relative Risk (RR) values.**
- **A Confidence Interval that does not contain 1.0 is statistically significant.**

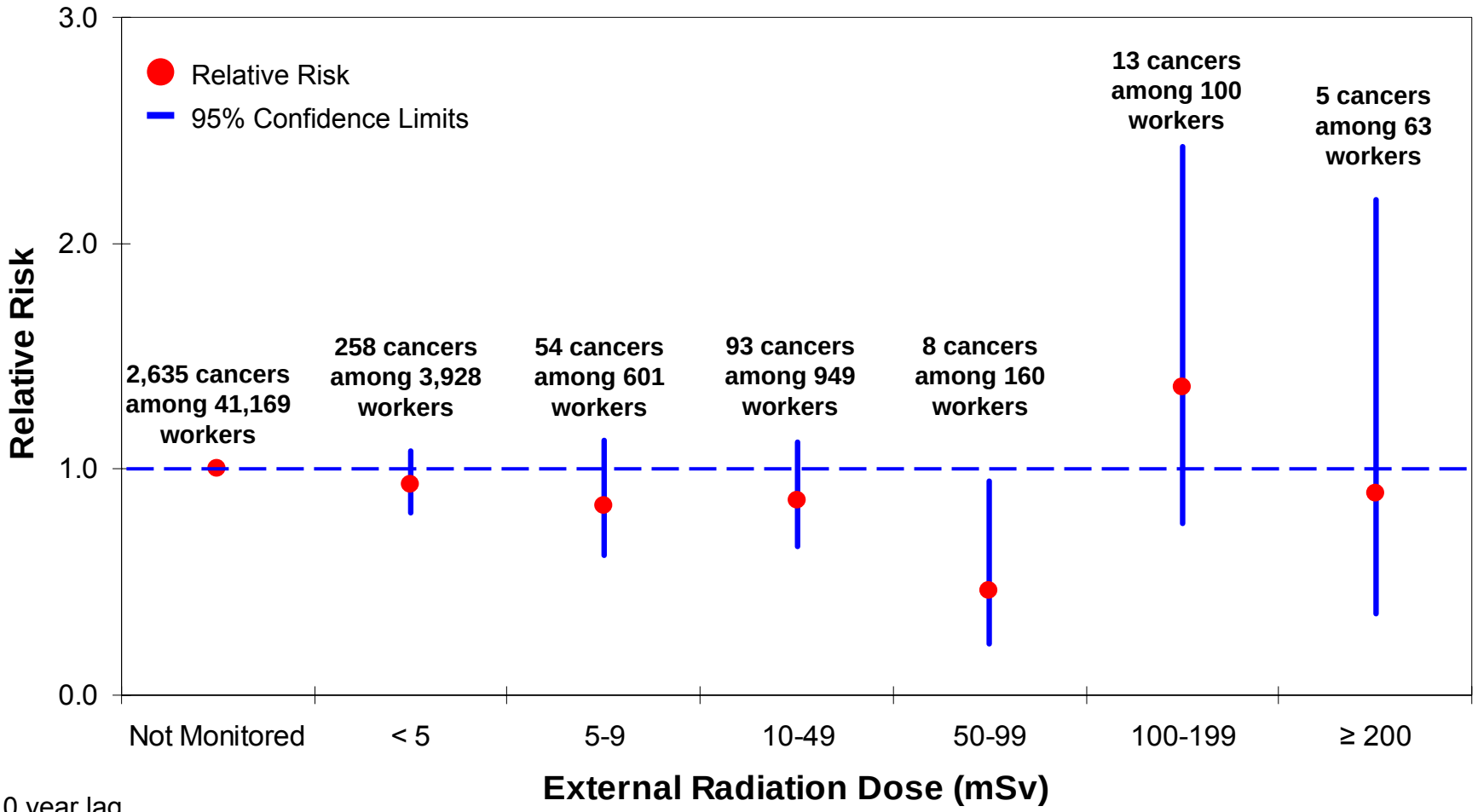






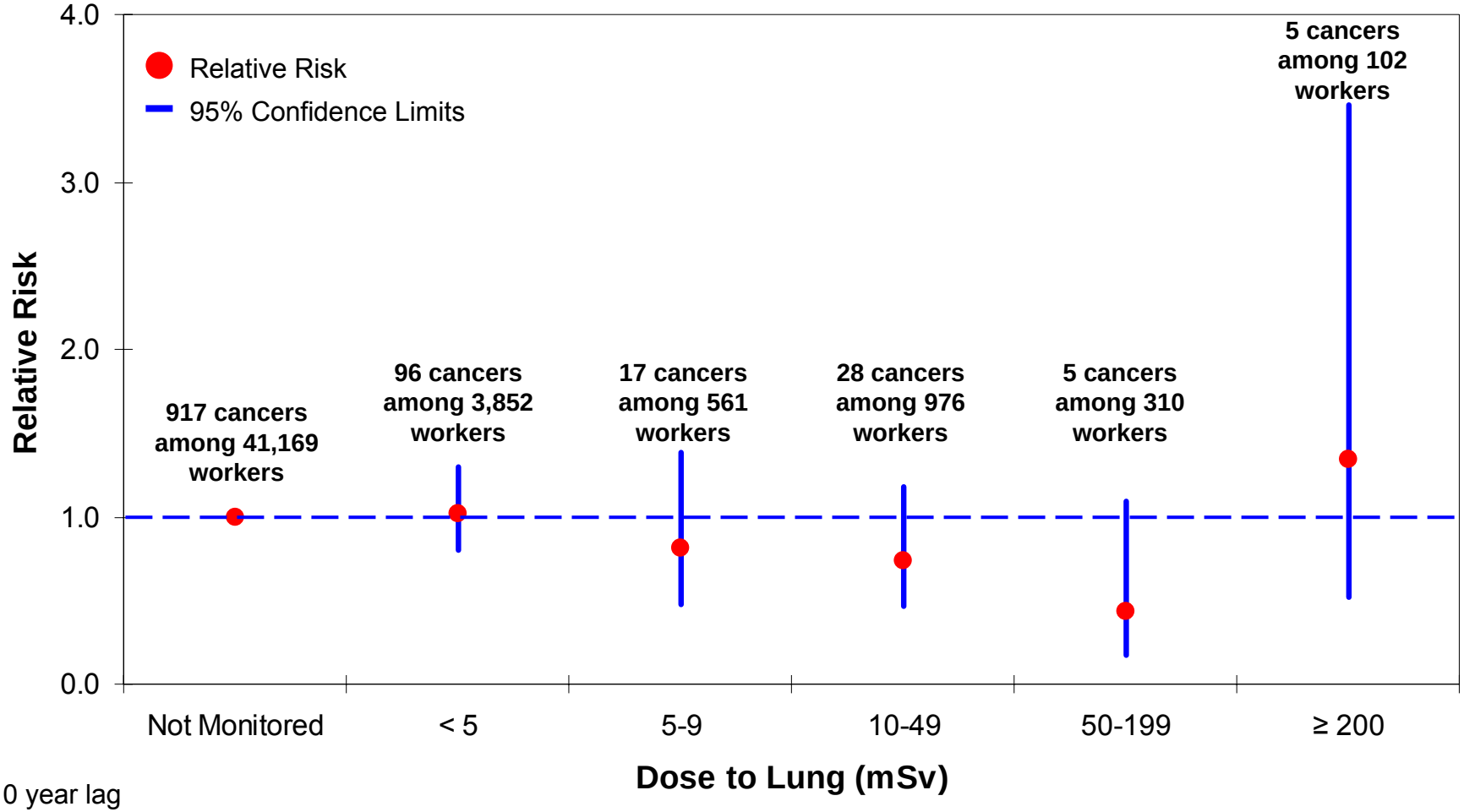


No evidence that radiation increased the risk of dying from cancer (excluding leukemia)



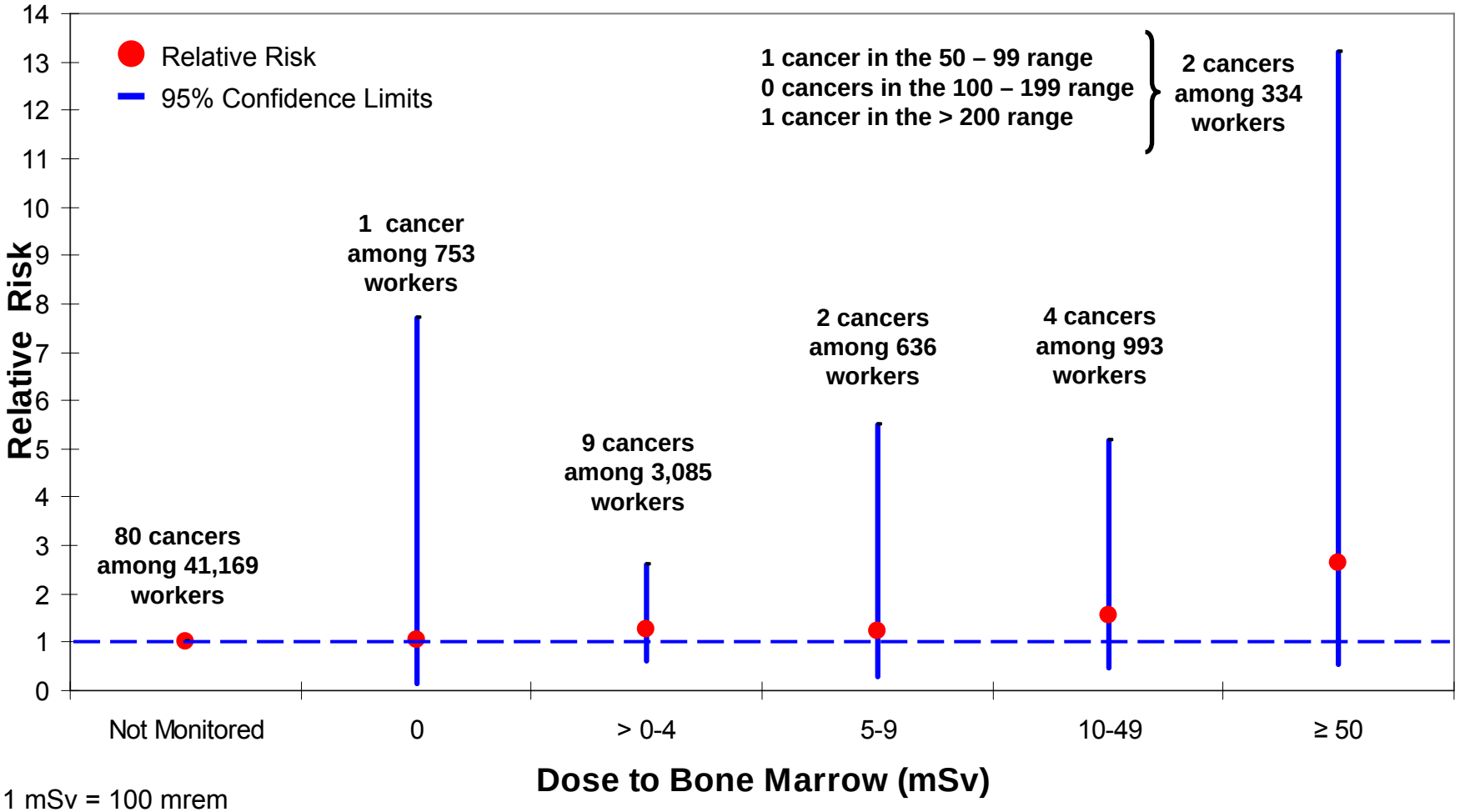
10 year lag
1 mSv = 100 mrem

No evidence that radiation increased the risk of dying from lung cancer



10 year lag
1 mSv = 100 mrem

Suggestive, although not statistically significant, evidence that radiation increased the risk of dying from leukemia



1 mSv = 100 mrem

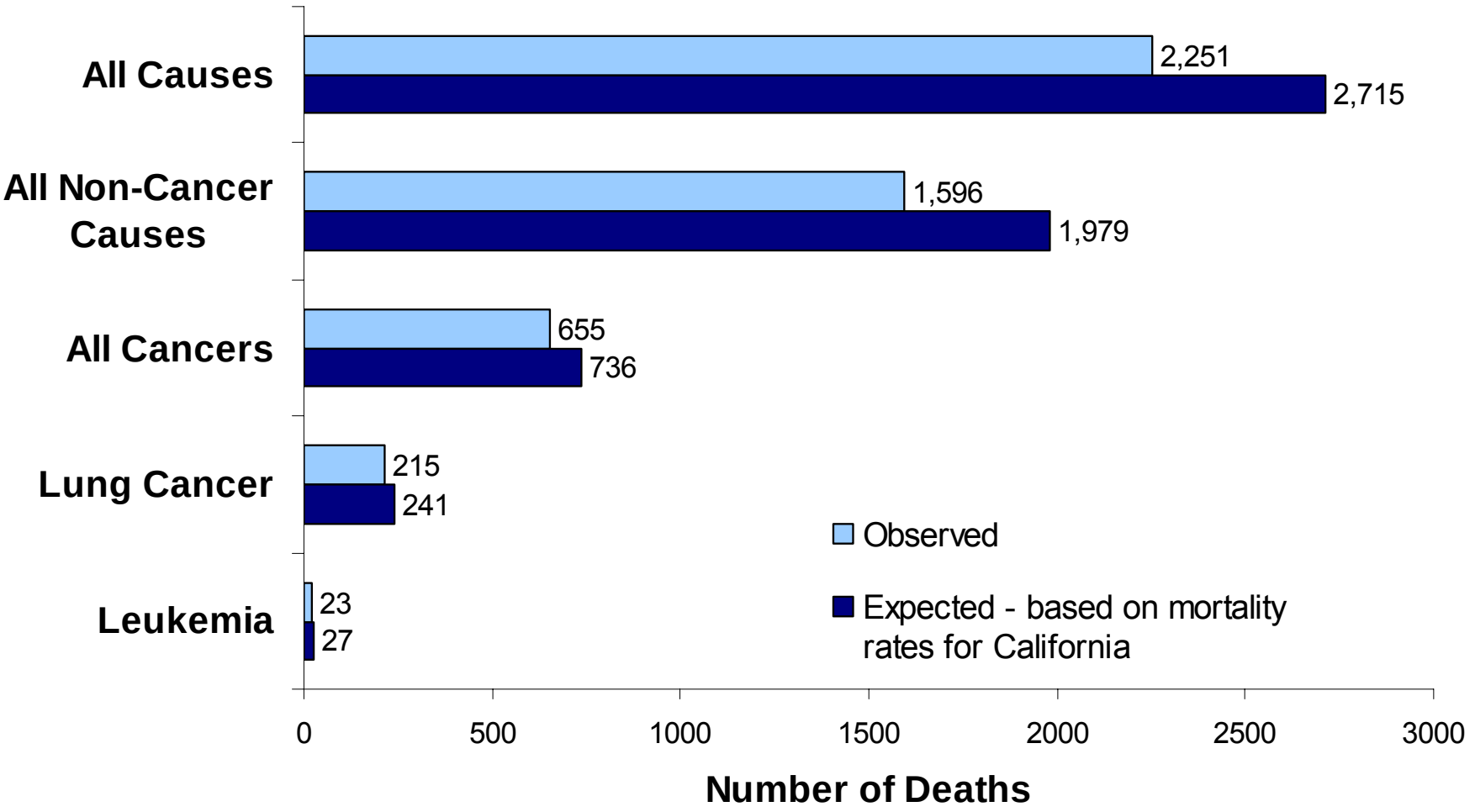
Excludes chronic lymphocytic leukemia

Radiation Summary Findings

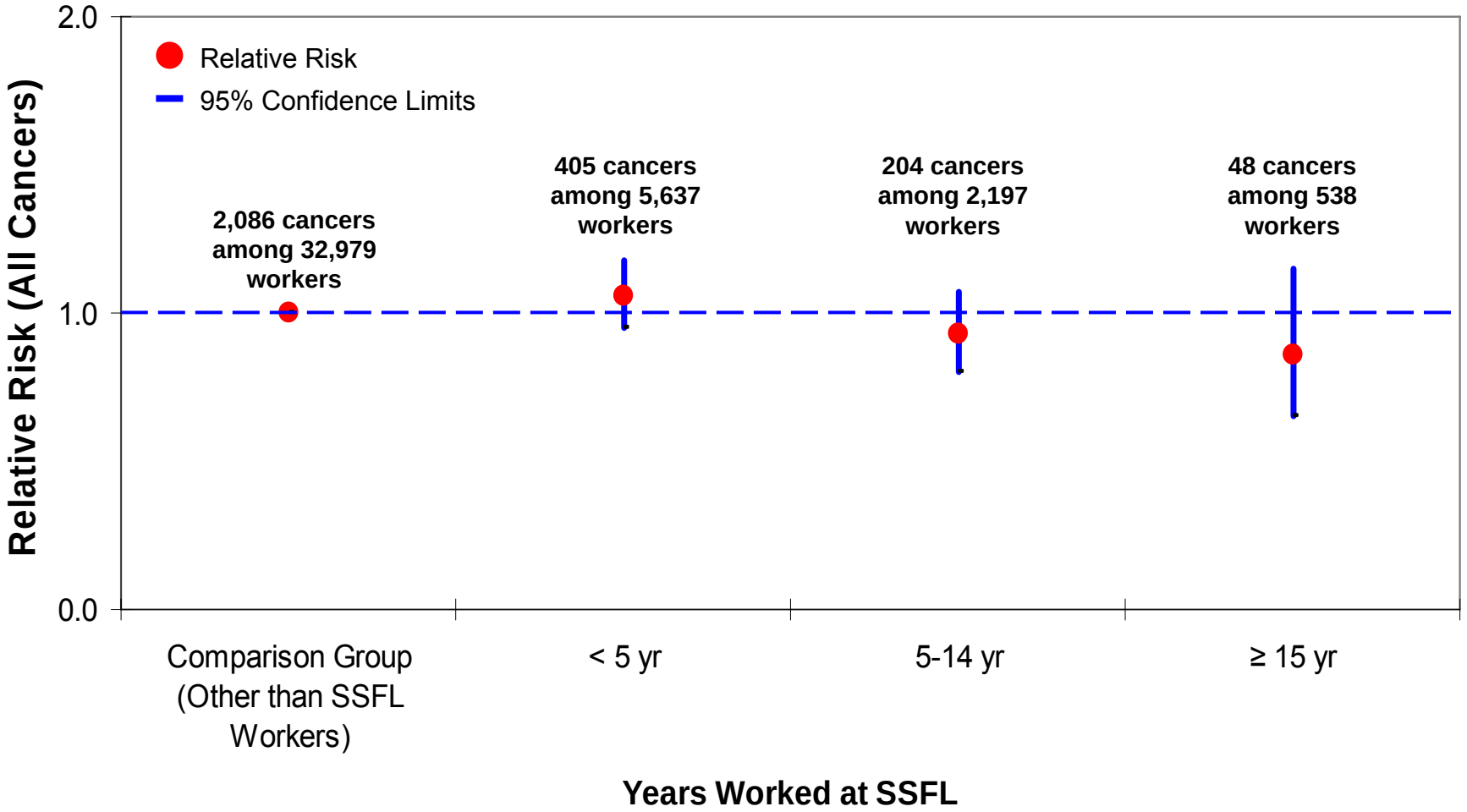
Radiation exposure has not caused a detectable increase in cancer deaths among Rocketdyne workers

- Mean dose was low
- There were no significant trends between radiation dose and any cancer, including lung cancer
- Suggestive trend for leukemia was based on small numbers (18 observed v 15.5 expected) and trend was not statistically significant

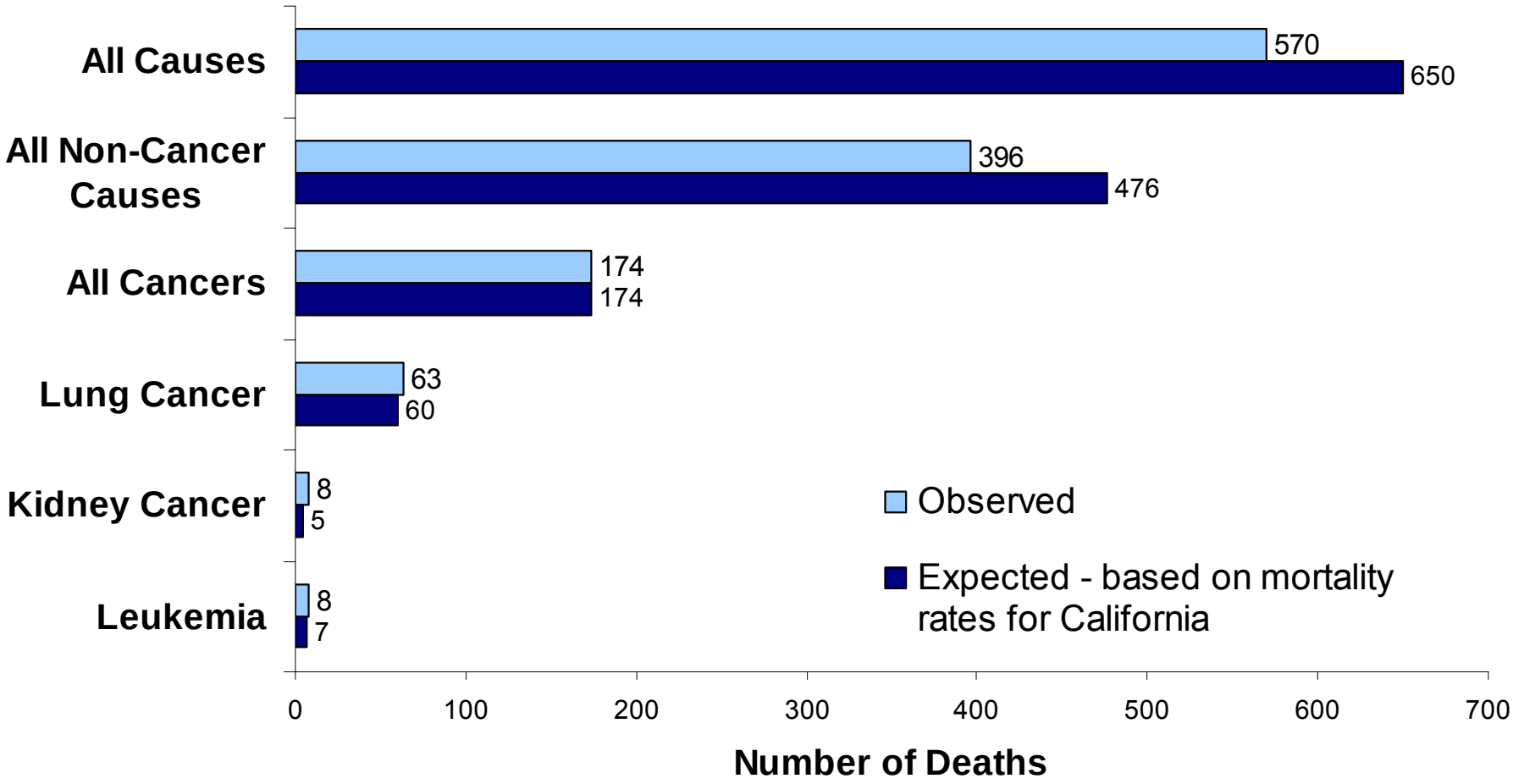
SSFL workers (Chemical Group) had a lower risk of death than the general population of California



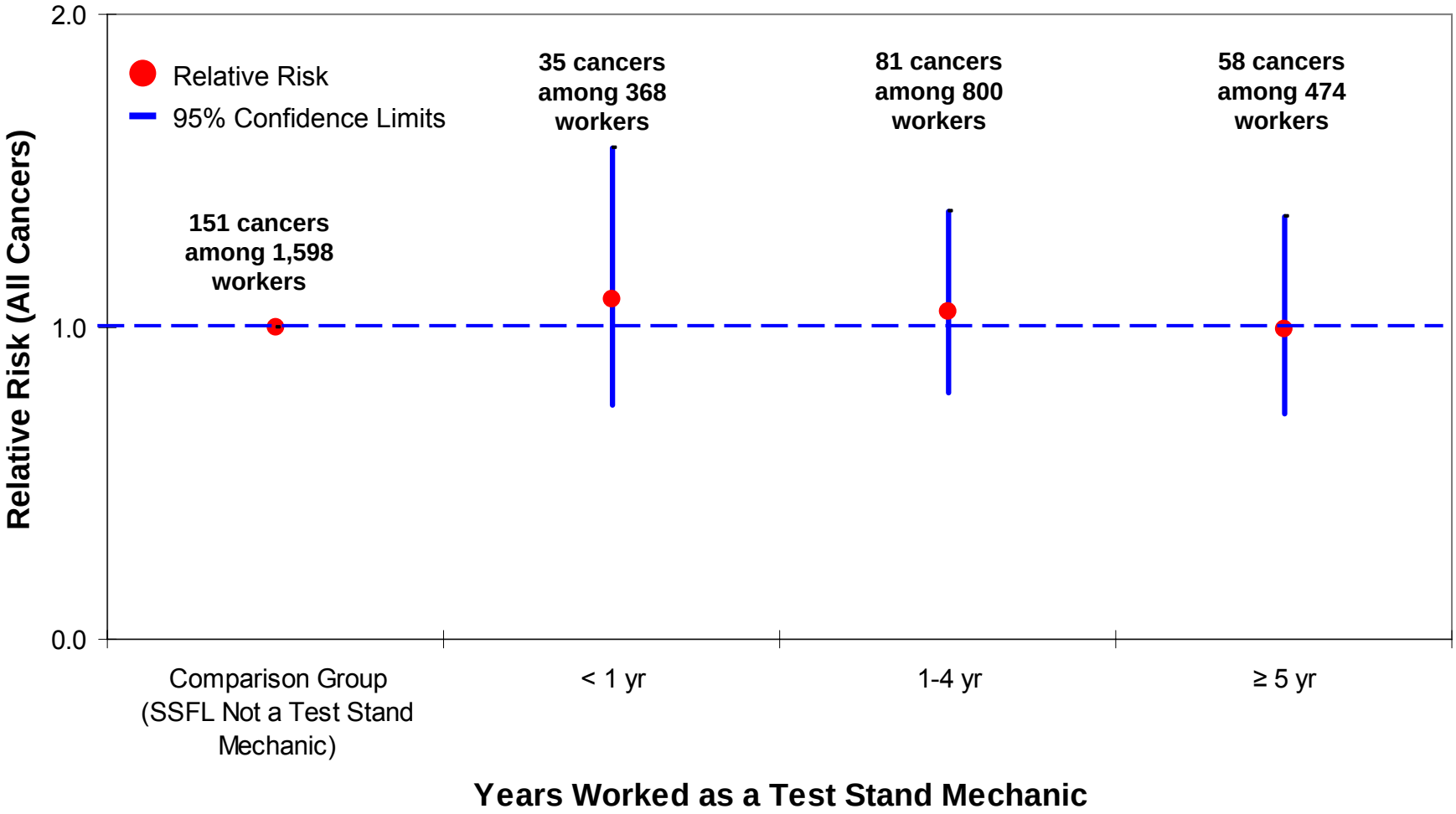
No evidence that working at SSFL increased the risk of dying from all cancers combined



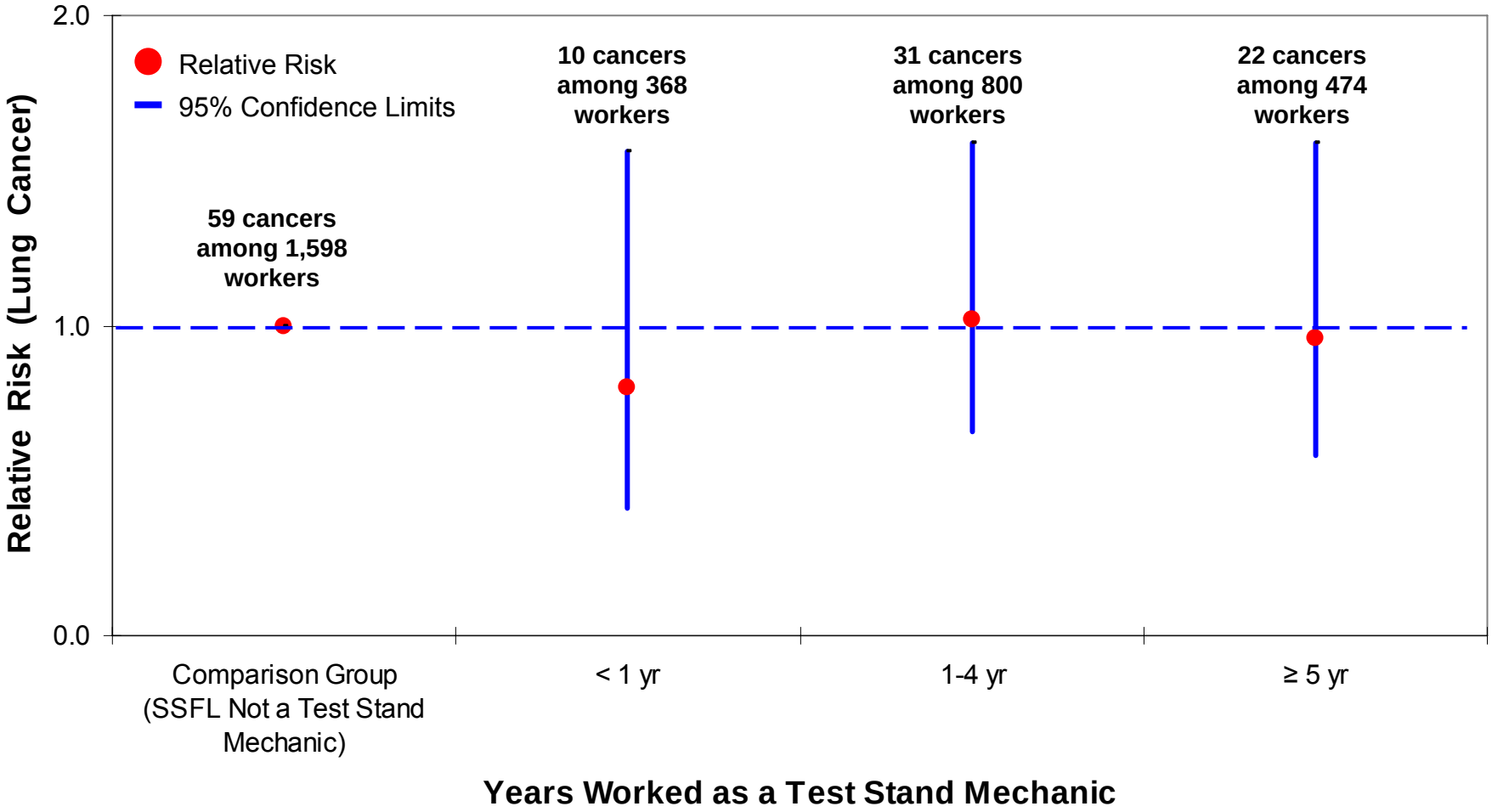
Test stand mechanics had a lower risk of death than the general population of California



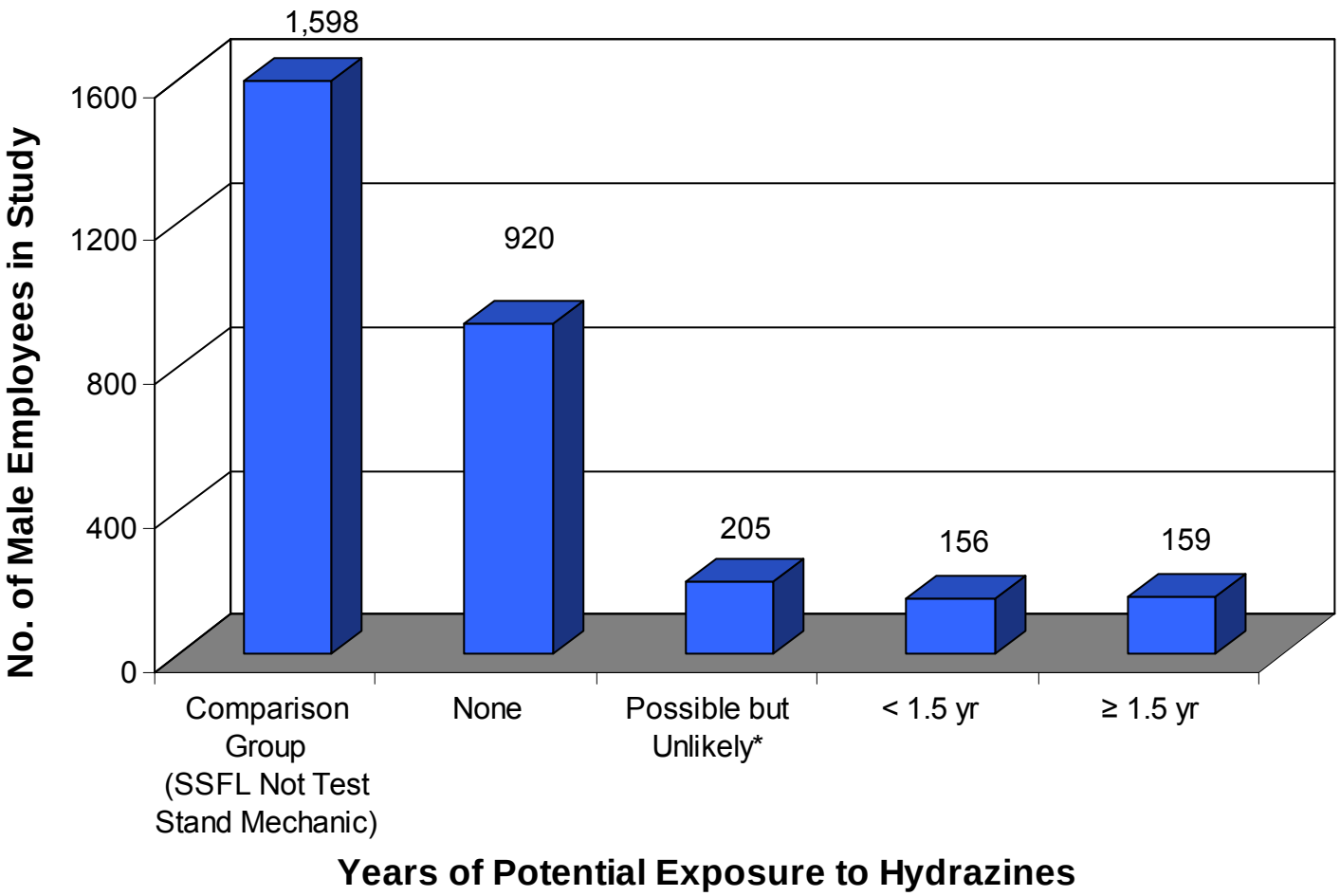
No evidence that working as a test stand mechanic increased the risk of dying from all cancers combined



No evidence that working as a test stand mechanic increased the risk of dying from lung cancer

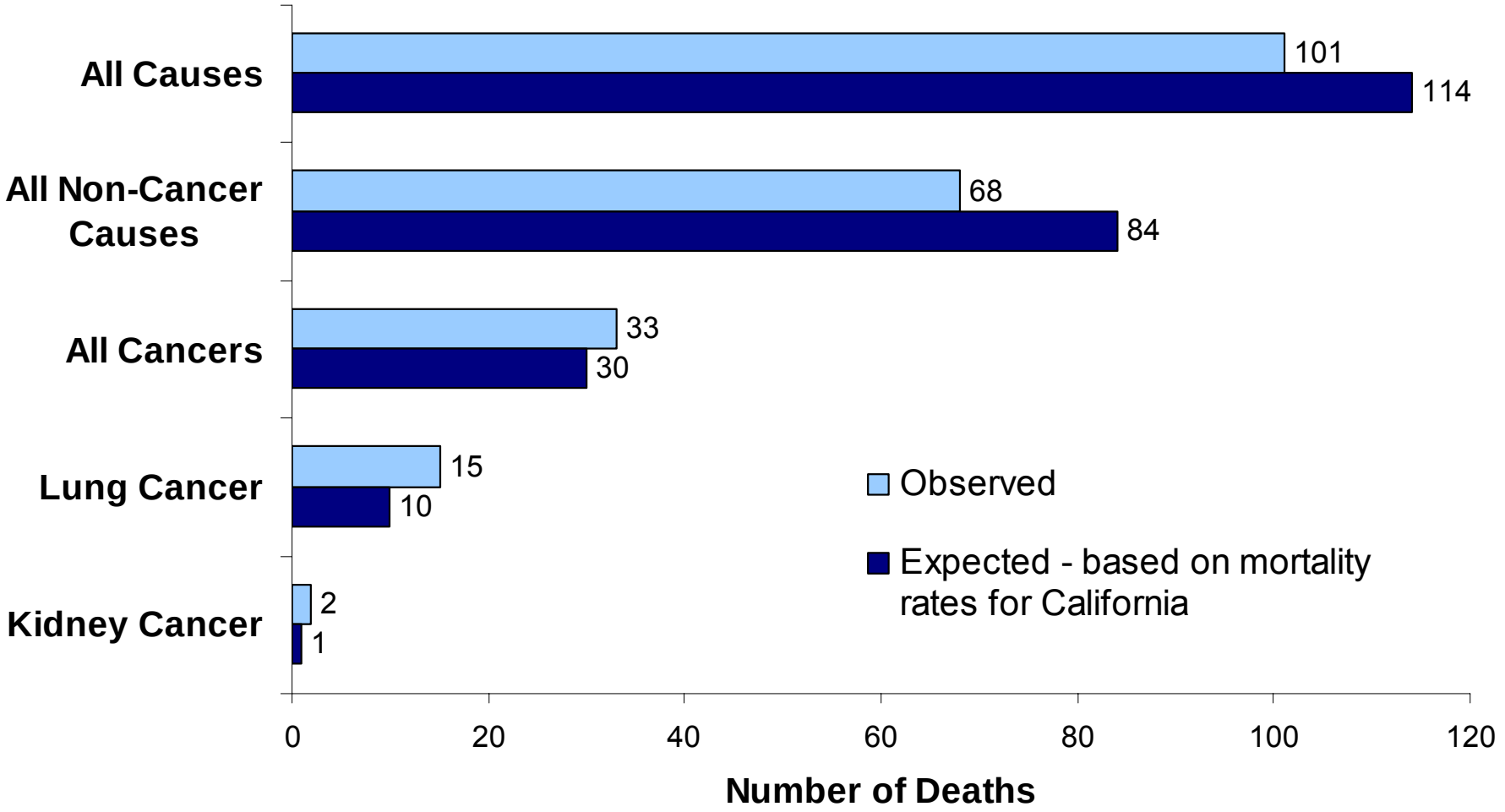


Classification of potential exposure to hydrazines among test stand mechanics based on job title and test stand

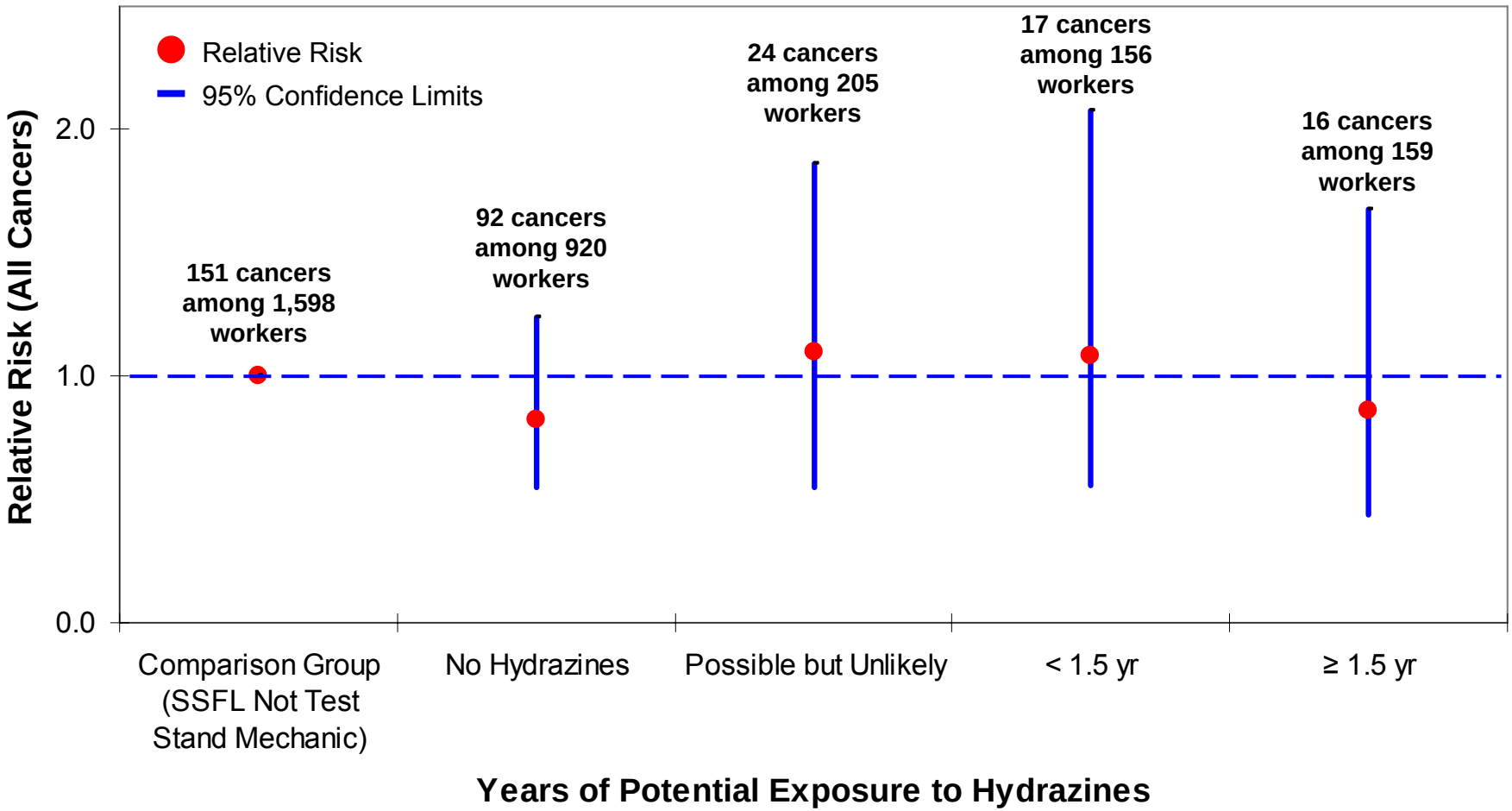


*Most workers (>90%) did not work with hydrazines but could not be distinguished

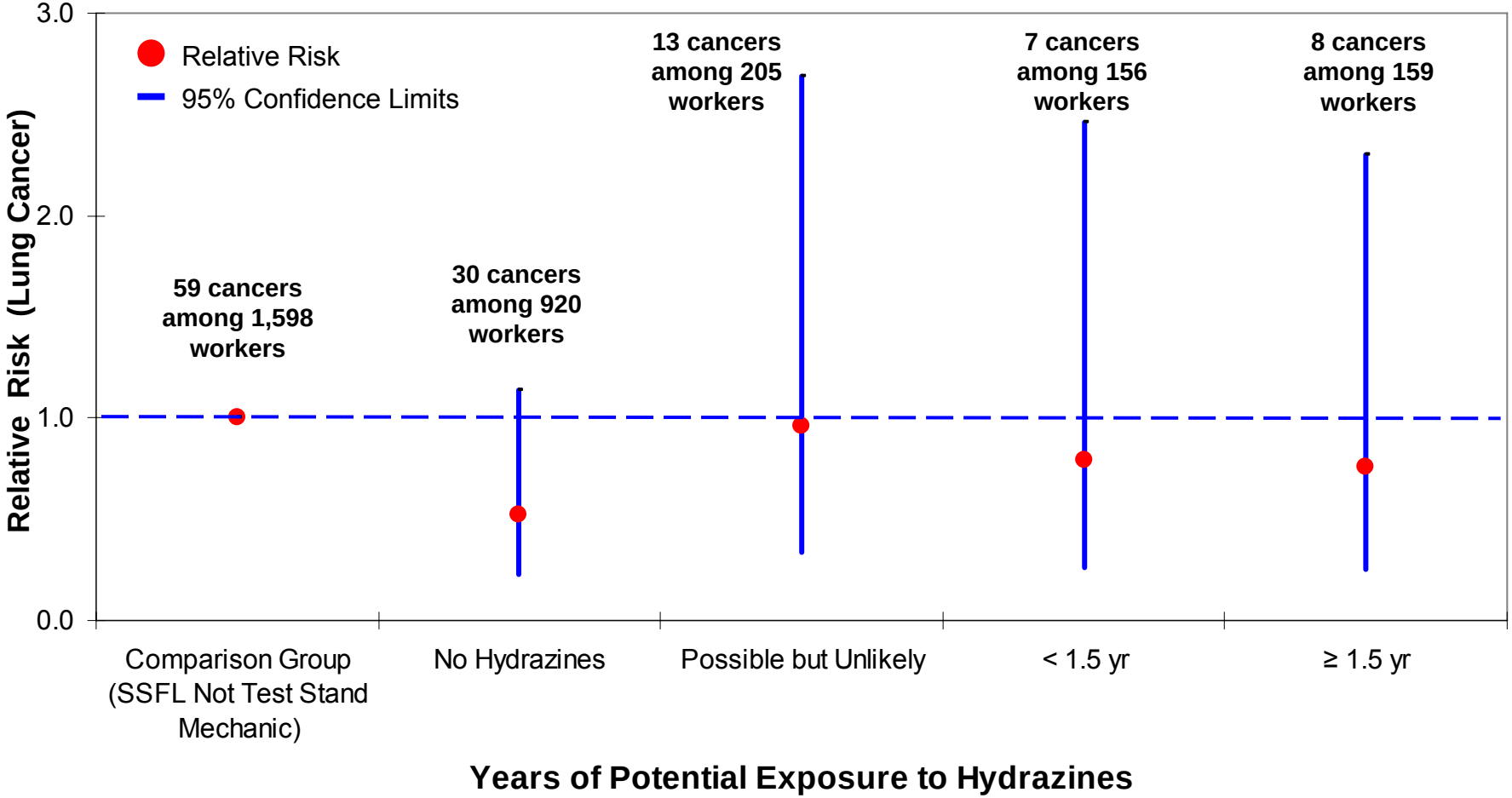
Test stand mechanics potentially exposed to hydrazines had a lower risk of death overall but slight increased risk of dying from cancer compared to the general population of California



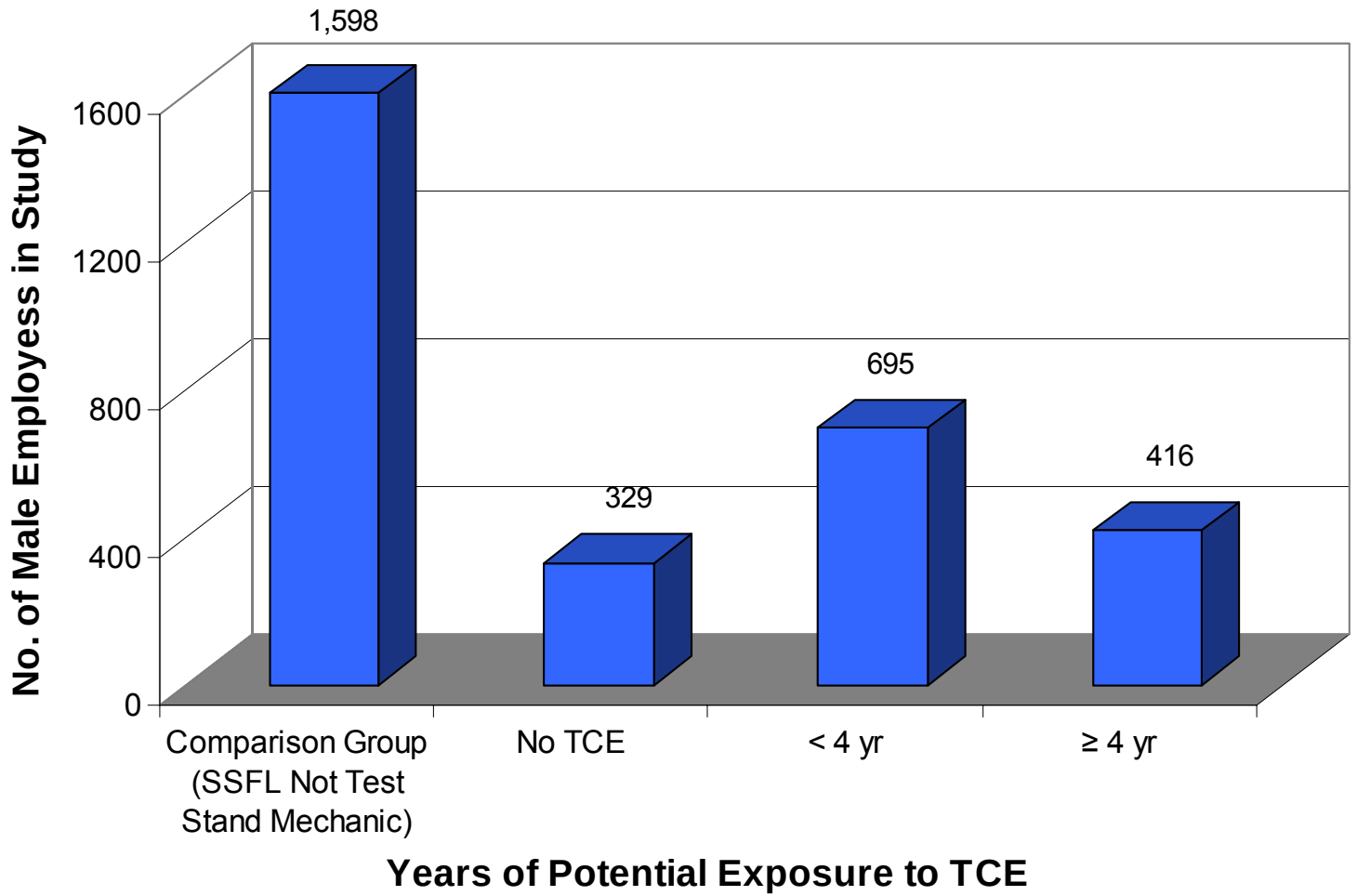
No evidence that test stand mechanics with potential exposure to hydrazines had an increased risk of dying from all cancers combined



Little evidence that test stand mechanics with potential exposure to hydrazines had an increased risk of dying from lung cancers

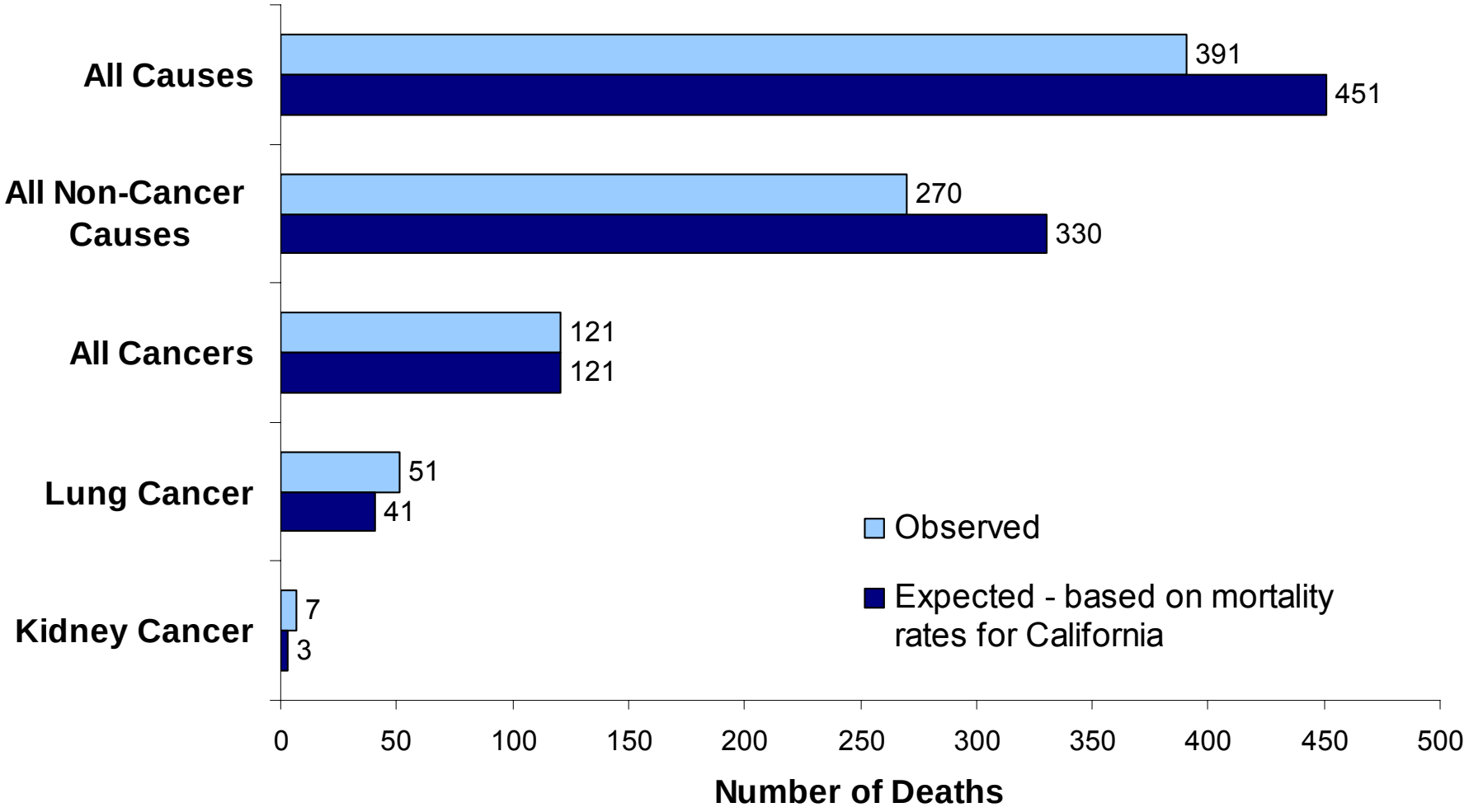


Classification of potential exposure to trichloroethylene (TCE)* among test stand mechanics based on job title and test stand

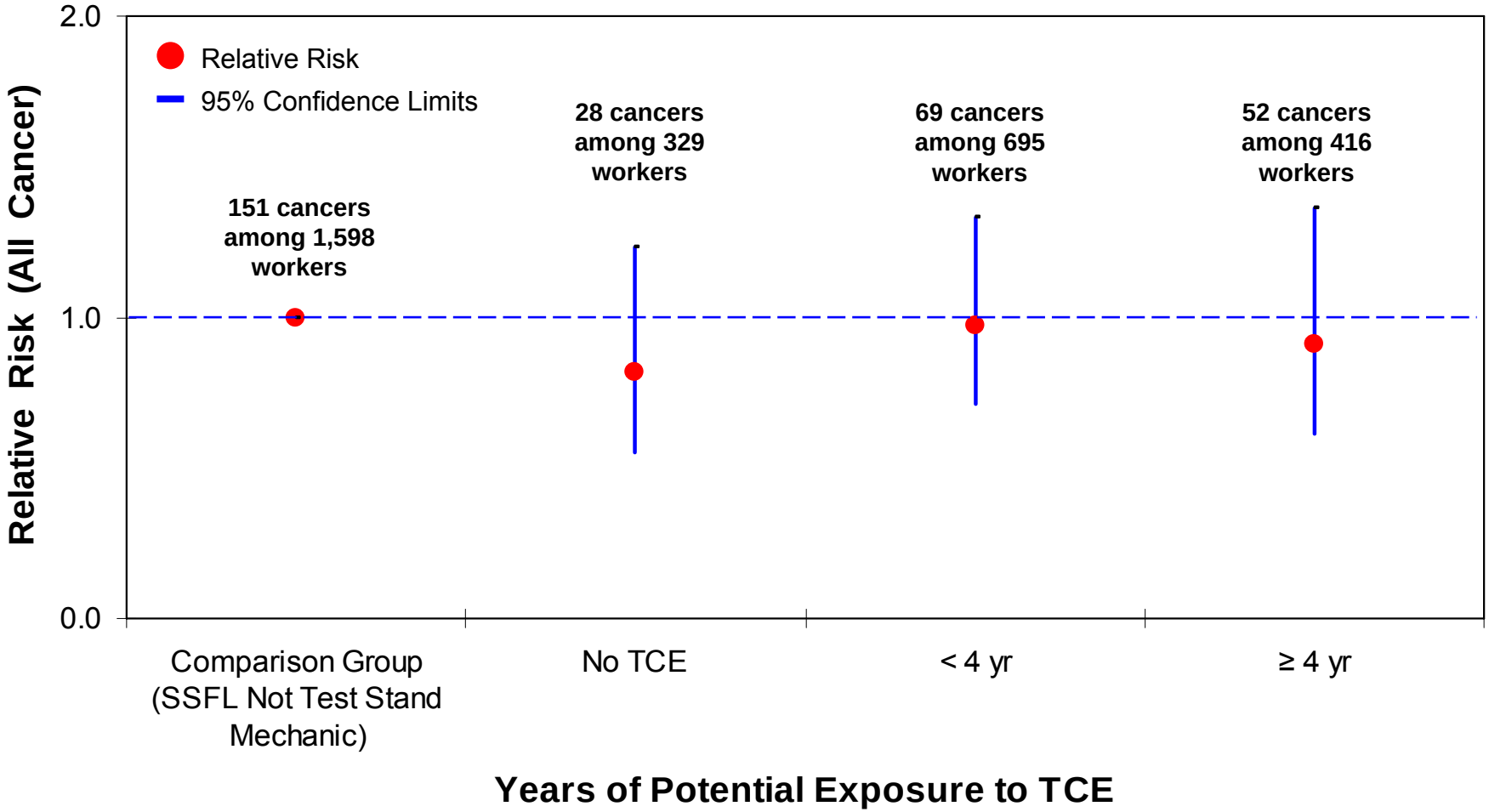


*Includes TCE exposure potential from engine flush and use as a utility solvent

Test stand mechanics potentially exposed to TCE had a lower risk of death overall but similar risk of dying from cancer compared to the general population of California



No evidence that test stand mechanics with potential exposure to TCE had an increased risk of dying from all cancers



Chemical Summary Findings

Work at SSFL, as a test stand mechanic or with specific chemicals, has not caused a detectable increase in cancer deaths among Rocketdyne workers

- There were no significant trends or any significant excesses of cancer among workers at SSFL, or among test stand mechanics
- Hydrazines were not linked to significant increased risk of cancer, although lung cancer elevated compared to general population
- TCE was not linked to any significant increased risks of cancer

Limitations

- Low exposures limit ability to detect increased risks, if they existed
- Chemical exposure only “potential” since few measurements made in early years
- Lifestyle factors such as diet and tobacco use not known
- Mortality rather than illness

Strengths

- Multiple data sources used to identify study groups
  - 99.2% of eligible workers traced
- Comprehensive Radiation Assessment
  - Doses obtained pre and post Rocketdyne
  - Comprehensive estimates of internal radiation doses
- Chemical Exposure Assessment
  - Worker assignments to specific test stands
  - Accurate assessment of hydrazines and TCE exposure
- Additional analyses conducted
  - Including comparisons to other workers at local Rocketdyne facilities such as Canoga Park

Conclusions

The Follow-on Study found no consistent or credible evidence that employment at SSFL adversely affected worker mortality.