

Radiation risk estimates adjusted for smoking in a Japanese nuclear worker cohort

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Despite several radiation epidemiological studies, some uncertainty remains regarding the health effects of exposure to low dose radiation. One reason for this uncertainty is the possibility that radiation risk estimates are biased by confounding factors, such as smoking. The J-EPISODE study (a Japanese epidemiological study on low-dose radiation effects) initiated by the Radiation Effects Association in 1990, undertook two lifestyle questionnaire surveys in 1997 and 2003 to obtain information on potential factors confounding the relationship between radiation and mortality.

Two requirements must be met for a factor to be confounding: it must itself be a risk of death, and it must show a correlation with radiation exposure. We examined the magnitude of risks to cancer mortality and correlations with cumulative dose in conjunction with other factors, such as smoking, alcohol consumption, job category, job title, and years of education. Smoking showed the largest risk and a strong correlation with radiation exposure. Adjustments for smoking resulted in the largest reduction in radiation risk estimates.

The third lifestyle questionnaire survey is currently ongoing, and we found that, despite the current decreasing trends in the smoking rate in Japan, the correlation between cumulative dose and smoking rate still remains. One reason for this correlation was that blue collar workers who have high cumulative doses also tend to smoke. These results suggest that even in a country with a low smoking rate, the possibility of a correlation between radiation and smoking still exists.

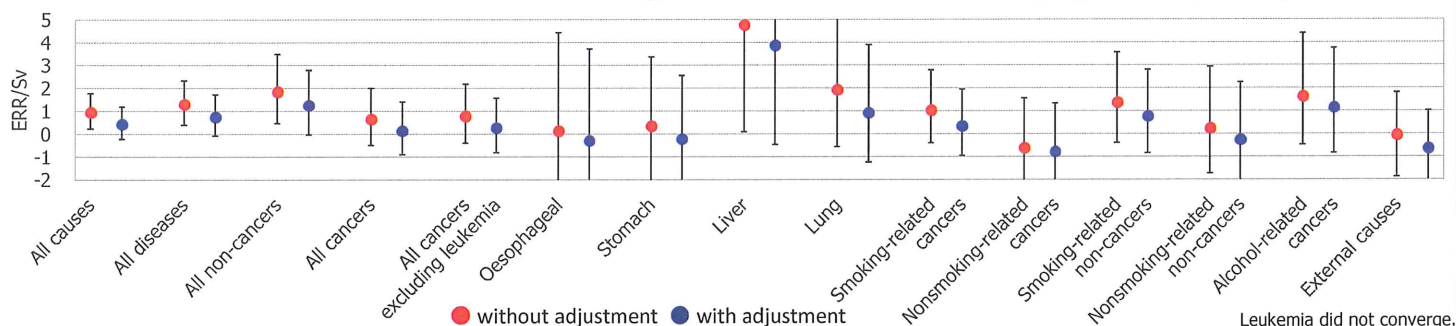
We demonstrated that adjustment for smoking strongly decreased the radiation risk estimates due to the large risk of smoking itself and its correlation with radiation exposure. This suggests the importance of adjustment for smoking when quantifying low-dose radiation risk among nuclear workers.

Keywords: cohort study, cancer mortality, confounding factor

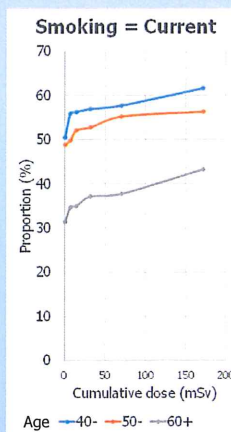
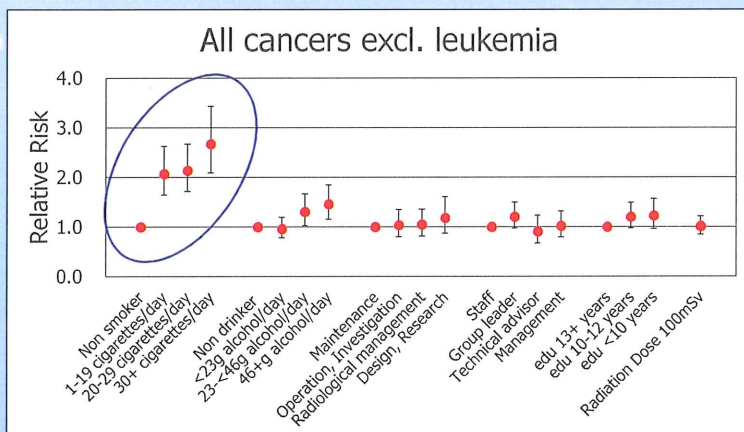
**Why adjustments for smoking reduce ERRs.****Radiation risk estimates adjusted for smoking in a Japanese nuclear worker cohort**

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ERRs with and without adjustment for smoking (N=71,733)**Question: Why does adjusting for smoking reduce ERRs?**

- Answer:**
- 1) Smoking is a risk factor.
 - 2) Smoking has a correlation with cumulative dose.

**Question: Why does smoking correlate with cumulative dose?**

- Answer:**
- 1) Blue collar workers (with high doses) tend to smoke.
 - 2) A correlation between smoking and cumulative dose exists in each job category.
- (It may reflect differences of SES by dose category.)

