

Latency Analysis in Epidemiologic Studies of Occupational Exposures: Application to the Colorado Plateau Uranium Miners Cohort

Bryan Langholz, PhD, Duncan Thomas, PhD, Anny Xiang, PhD, and Daniel Stram, PhD

ABSTRACT

Background: Latency effects are an important factor in assessing the public health implications of an occupational or environmental exposure. Usually, however, latency results as described in the literature are insufficient to answer public health related questions. Alternative approaches to the analysis of latency effects are warranted.

Methods: A general statistical framework for modeling latency effects is described. We then propose bilinear and exponential decay latency models for analyzing latency effects as they have parameters that address questions of public health interests. Methods are described for fitting these models to cohort or case-control data; statistical inference is based on standard likelihood methods.

Application: A latency analysis of radon exposure and lung cancer in the Colorado Plateau uranium miners cohort was performed. We first analyzed the entire cohort and found that the relative risk associated with exposure increases for about 8.5 years and thereafter decreases until it reaches background levels after about 34 years. The hypothesis that the relative risk remains at its peak level is strongly rejected ($P < 0.001$). Next, we investigated the variation in the latency effects over subsets of the cohort based on attained age, level and rate of exposure, and smoking. Age was the only factor for which effect modification was demonstrated ($P = 0.014$). We found that the decline in effects is much steeper at older ages (60 + years) than younger.

Conclusion: The proposed methods can provide much more information about the exposure-disease latency effects than generally used.

Langholz B, Thomas D, Xiang A, Stram DO [1999]. Latency Analysis in Epidemiologic Studies of Occupational Exposures: Application to the Colorado Plateau Uranium Miners Cohort. *Am. J Ind Med.*, 35:246-56.