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Atomic Bomb Survivor Cataract Surgery Prevalence Data are Consistent with Non-zero Threshold Dose – Comment on Article by Nakashima et al. 2013

Mohan Doss^a, Brian L. Egleston^b, and Samuel Litwin^b

^a Diagnostic Imaging, Fox Chase Cancer Center, Philadelphia, PA

^b Biostatistics, Fox Chase Cancer Center, Philadelphia, PA

This comment is with reference to the recent article entitled “Radiation Dose Responses, Thresholds, and False Negative Rates in a Series of Cataract Surgery Prevalence Studies among Atomic Bomb Survivors” by Nakashima et al. in *Health Physics* (Nakashima et al. 2013). In this study estimating the dose threshold for cataract surgery in atomic bomb survivors, the authors concluded that the data for each two year period is compatible with zero dose threshold. This conclusion is surprising since it contradicts the recognition of a threshold dose of 0.5 Gy for cataracts in a recent statement by ICRP (Stewart et al. 2012). Another reason why the possibility of zero threshold is not credible is that the eye lens has a high concentration of reduced glutathione (Ganea and Harding 2006) which would protect the lens from the oxidative damage that may be caused by a small increase in radiation exposure. Since the authors’ conclusion on the compatibility of zero threshold dose was based on examining data for individual two year periods, we decided to investigate whether a similar conclusion would be reached if the whole dataset were considered.

We used the reported thresholds and 95% confidence intervals to estimate the standard errors for each 2 year estimate. We then calculated the grand mean using an inverse variance estimator (Greenland and Longnecker 1992). In this analysis, we estimated an intercept only regression weighted by the inverse variance of each point estimate. In this case, the intercept estimates the mean. The variance was the square of the standard error. We used robust standard errors for calculation of the 95% confidence interval (CI). The calculations were performed using STATA version 12. Our analysis showed that the mean threshold dose for all the 2 year periods is 0.32 Gy, with 95% CI of 0.21-0.43 Gy. Since the lower limit of the 95% CI for the dose-threshold is 0.21 Gy, our analysis using a meta-analytic approach to combine data from all years indicates the atomic bomb survivor data do indeed indicate the presence of a significant non-zero dose threshold for cataract surgery, contrary to the conclusion of (Nakashima et al. 2013).

In conclusion, contrary to the picture presented in the article by Nakashima et al. (Nakashima et al. 2013), the atomic bomb survivor data do indicate the presence of a non-zero threshold dose for cataracts, when all of the presented data are considered.

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