

242 **Mortality by cause of death of A-bomb Survivors in Nagasaki based on ABS93D**

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A data base of A-bomb survivors in Nagasaki has been maintained at Division of Scientific Data Registry, Atomic Bomb Disease Institute at Nagasaki University School of Medicine. Radiation dose for survivors in Nagasaki have been estimated by Atomic Bomb Survivor 1993 Dose (ABS93D). To study the mortality rates of A-bomb survivors for the period of 1971 through 1994, we selected 2,743 persons (dose estimate available) and age-matched 8,229 persons as control who were alive in 1971. The study resulted in that males exposed to 31-40 cGy showed lower mortality from cerebro-vascular diseases than that of control.

243 **Analysis of Breast Cancer Incidence Among Atomic Bomb Survivors Using a Two-Stage Model of Carcinogenesis**

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The excess relative risk of the early-onset breast cancer seems to be remarkably high for the youngest age-at-exposure groups. A two-stage stochastic model for carcinogenesis was used to analyze the breast cancer incidence among atomic bomb survivors. We fitted the model assuming that radiation acts as an initiator and that the rate of radiation-induced mutation and background initiation mutation leading to baseline cancer are additive. The behavior of the baseline cancer incidence due to birth cohort effects were well described by using a linear equation of the rate of initiation mutation against age at the time of bombing. The analysis showed that the radiation mutation for the youngest age-at-exposure groups below age 10 was higher than for the older groups. On this reason, the calculation based on the two-stage model demonstrated that the excess relative risk for age 5 age at exposure was high in early-onset breast cancer and sharply decreased with time since exposure.

244 **Epidemiological Study of Mental Health among Nagasaki A-Bomb Survivors.**

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We conducted a psychiatric epidemiological study among Nagasaki A-bomb survivors. We investigated their mental health conditions by questionnaire (GHQ; General Health Questionnaire) and interview (CIDI; Composite International Diagnostic Interview). 7,670 persons had accomplished GHQ-12 questionnaire and 251 persons were interviewed by CIDI. We compared the GHQ-12 scores between the proximally (≤ 2.0 km) exposed survivors and distally (≥ 3.1 km) exposed survivors. The mean value of GHQ-12 was higher among the proximally exposed than among the distally exposed ($p < 0.01$), so the proximally exposed had more psychiatric symptoms. By sex subgroups, the GHQ-12 score was statistically associated with exposed location among females ($p < 0.05$), but was not associated among males.