

**Excess deaths due to occupational exposure
among Japanese nuclear facility workers**

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Declaration There is no conflict of interest.

Background There are no studies that have analyzed the number of excess deaths due to radiation exposure among Japanese nuclear facility workers. Therefore, we used RERF data to calculate excess deaths for cancer* and non-cancer. (cancer* means all cancer excluding leukemia.)

Method of analysis

1. Divide the cohort into 6 dose groups by 5, 10, 20, 50, and 100 mSv, and calculate each O/E ,adjusting by age, calendar year, and resident, where O means obserbed death.
2. Calculate the relative risks (RR) for the dose groups to the first group below 5 mSv(the average dose is 0.6mSv).
3. Calculate excess deaths (ED) by $ED=O \cdot (RR-1)/RR$
4. Calculate attribution fraction (AF) by $AF=ED/O$

Data Used data is follow-up of 204,103 male workers from 1991 to 2010 at Japanese nuclear facilities. (the mean dose is 9.1mSv), which include 75,422 workers whose smoking habits are known.

Result

cancer*							
dose(mSv)	O	E	O/E	RR	ED	O($\geq 5mSv$)	AF
<5 (unexposed)	5,249	5,436	0.97	1.00			
5-	688	649	1.06	1.10	62		
10-	709	665	1.07	1.10	67		
20-	738	683	1.08	1.12	79		
50-	367	318	1.15	1.19	60		
100+	178	179	0.99	1.03	5		
total	7,929	7,929			273	2,680	10%

noncancer							
dose(mSv)	O	E	O/E	RR	ED	O($\geq 5mSv$)	AF
<5 (unexposed)	6,244	6,526	0.96	1.00			
5-	868	766	1.13	1.18	135		
10-	912	789	1.16	1.21	157		
20-	868	816	1.06	1.11	87		
50-	382	377	1.01	1.06	22		
100+	209	210	1.00	1.04	8		
total	9,483	9,483			409	3,239	13%

Concluding Remarks

- ED of cancer* is 273 during 20 years.
- ED of non-cancer is 409 during 20 years.
- Most of them appear lower than 100mSv.
- ED of non-cancer is greater than ED of cancer*.

Additive Remark

The effect of smoking habits on calculating excess deaths was estimated using data of person with known smoking habits. After smoking adjustment, AF of cancer* moves from 11% to 12%, and AF of non-cancer moves from 11% to 10%. It was revealed that impact of smoking habit on ED and AF was small.