

Mortality in a cohort of German uranium millers, 1946-2008

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German uranium millers cohort

- Sub-cohort of the WISMUT uranium miners cohort (n = 58 982)
- Selection of all men who worked at some time in a milling facility, but never underground or in open pit mines
⇒ to avoid high radon concentrations
- n = 4 054 millers



Wismut underground workers in the 1950ies

Assessment of radiation exposure

- Comprehensive job-exposure matrix
- Based on area measurements 1963-1989, expert rating 1946-1962

Cumulative exposure to	Mean	Max
Radon progeny [WLM]	8	127
External gamma radiation [mSv]	26	667
Long-lived radionuclides in uranium ore dust [kBqh/m ³]	5	37

WLM: Working Level Months

Excess relative risk per unit of exposure - for selected deaths from cancer -

Cause of death	# of deaths	Radon progeny	Ext. γ -radiation	LL radionuclides
		ERR/WLM (p-value)	ERR/Sv (p-value)	ERR/ kBqh/m ³ (p-value)
All mal. cancers	457	0.017 (0.02)	1.6 (0.09)	-0.001 (>0.5)
All solid cancers	434	0.017 (0.02)	1.9 (0.06)	-0.000 (>0.5)
Lung	159	0.034 (0.05)	2.5 (0.16)	-0.006 (0.13)
Stomach	49	0.036 (0.27)	10.0 (0.12)	0.026 (0.22)
Prostate	30	0.027 (0.42)	-0.8 (>0.5)	-0.002 (>0.5)
Rectum	26	0.017 (>0.5)	-0.4 (>0.5)	0.006 (>0.5)
Colon	22	0.005 (>0.5)	n. conv.	-0.001 (>0.5)
Pancreas	20	0.000 (>0.5)	1.7 (>0.5)	n.c.-
Brain and others	14	0.028 (>0.5)	-1.5 (>0.5)	n. c.-
Kidney	12	0.069 (0.49)	4.7 (>0.5)	0.074 (0.44)
Haematopoetic and lymphatic system	23	0.008 (>0.5)	-1.5 (0.22)	-0.007 (>0.5)

Excess relative risk per unit of exposure - other disease groups -

Cause of death	# of deaths	Radon progeny	Ext. γ -radiation	LL radionuclides
		ERR/WLM (p-value)	ERR/Sv (p-value)	ERR/ kBqh/m ³ (p-value)
Cardiovascular dis.	717	0.001 (>0.5)	-0.1 (>0.5)	-0.002 (0.35)
Ischemic heart	341	0.002 (>0.5)	-0.1 (>0.5)	-0.001 (>0.5)
Cerebrovascular	171	0.004 (>0.5)	0.6 (>0.5)	-0.002 (>0.5)
Respiratory dis.	111	0.002 (0.35)	-0.7 (0.50)	0.004 (>0.5)
Pneumonia	37	-0.005 (>0.5)	-0.9 (>0.5)	0.009 (>0.5)
COPD	57	0.004 (>0.5)	0.1 (>0.5)	-0.001 (>0.5)
Urogenital system	13	0.009 (>0.5)	3.2 (>0.5)	not conv.

