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Supplemental Material

Effects of Radon and UV Exposure on Skin Cancer Mortality in Switzerland

Danielle Vienneau, Kees de Hoogh, Dimitri Hauri, Ana M. Vicedo-Cabrera, Christian Schindler, Anke Huss, and Martin Röösli, for the SNC Study Group

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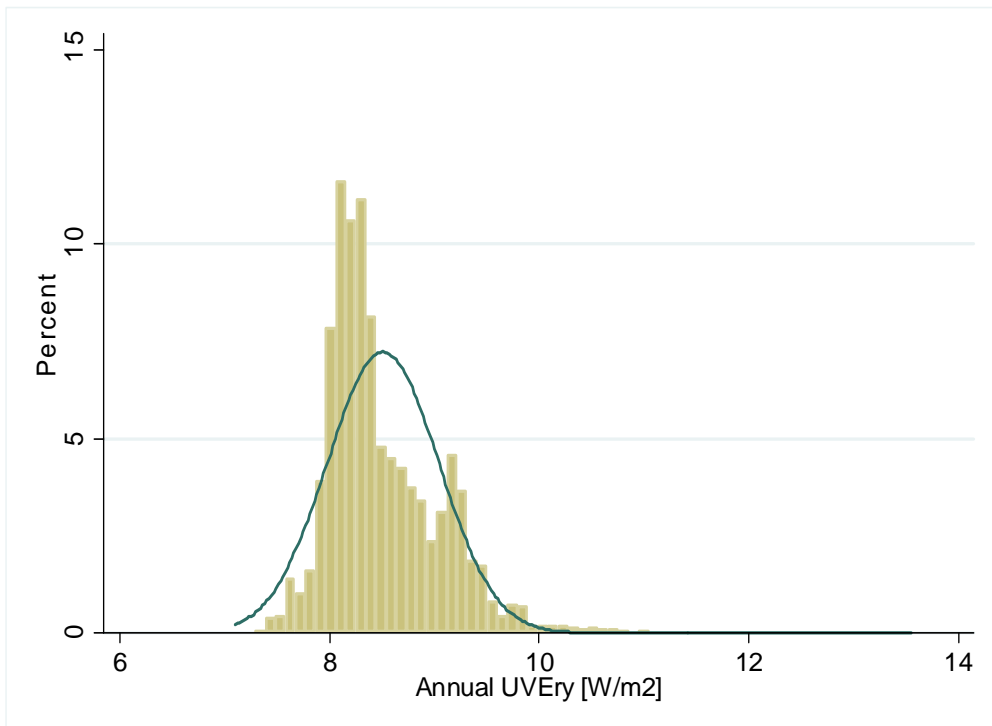
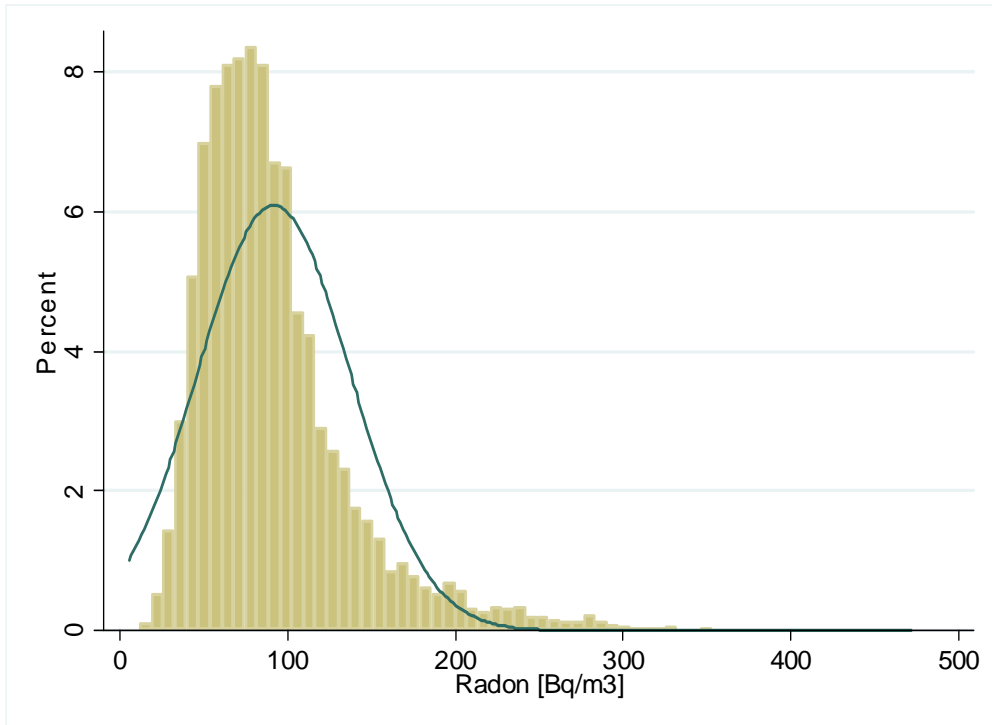


Figure S1. Exposure distributions for radon in Bq/m³ (top) and UV-erythemal dose in W/m² (bottom)

Table S1. Negative control outcome: Population characteristics and number of deaths due to glioma (ICD10: C71, definitive primary cause of death)

Characteristic	Cohort		Deaths
	Full study sample	Non-movers	Glioma
Age			
Mean (SD)	48.2 (17.1)	56.0 (16.8)	60.5 (13.5)
Range	20.0 – 106.1	20.0 – 106.1	20.0 – 93.9
Sex <i>n</i> (%)			
Male	2535842 (48.3)	1183084 (47.4)	1696 (56.5)
Female	2713620 (51.7)	1312931 (52.6)	1308 (43.5)
Civil status <i>n</i> (%)			
Single	1228004 (23.4)	439962 (17.6)	291 (9.7)
Married	3286724 (62.6)	1658643 (66.5)	2156 (71.8)
Widowed	354562 (6.8)	260613 (10.4)	340 (11.3)
Divorced	380172 (7.2)	136797 (5.5)	217 (7.2)
Mother tongue <i>n</i> (%)			
German	3377019 (64.3)	1699651 (68.1)	2054 (68.4)
French	1037545 (19.8)	504472 (20.2)	582 (19.4)
Italian	372662 (7.1)	195761 (7.8)	225 (7.5)
Other	462236 (8.8)	96131 (3.9)	143 (4.8)
Education <i>n</i> (%)^a			
Compulsory education or less	1206261 (23.0)	671863 (26.9)	739 (24.6)
Upper secondary level education	2808528 (53.5)	1372235 (55.0)	1571 (52.3)
Tertiary level education	1092115 (20.8)	427330 (17.1)	660 (22.0)
Not known	142558 (2.7)	24587 (1.0)	34 (1.1)
Geographic region <i>n</i> (%)			
Lake Geneva	936047 (17.8)	430820 (17.3)	508 (16.9)
Espace Mittelland	1208921 (23.0)	613749 (24.6)	721 (24.0)
Northwestern Switzerland	732406 (14.0)	361965 (14.5)	461 (15.3)
Zurich	930514 (17.7)	387148 (15.5)	486 (16.2)
Eastern Switzerland	729672 (13.9)	351222 (14.1)	411 (13.7)
Central Switzerland	473517 (9.0)	232167 (9.3)	276 (9.2)
Ticino	238385 (4.5)	118944 (4.8)	141 (4.7)
Job Position <i>n</i> (%)^b			
High	415846 (7.9)	140618 (5.6)	198 (6.6)
Medium	1863641 (35.5)	737282 (29.5)	650 (21.6)
Low	1121254 (21.4)	457813 (18.3)	450 (15.0)
Other	1848721 (35.2)	1160302 (46.5)	1706 (56.8)
Type of area <i>n</i> (%)			
Urban	3377624 (64.3)	1502255 (60.2)	1893 (63.0)
Intermediate	1192481 (22.7)	609414 (24.4)	695 (23.1)
Rural	679357 (12.9)	384346 (15.4)	416 (13.8)
Outdoor occupation with UV exposure <i>n</i> (%)			
No	5008685 (95.4)	2375368 (95.2)	2902 (96.6)
Yes	240777 (4.6)	120647 (4.8)	102 (3.4)

Radon exposure (Bq/m³)			
Mean (SD)	91.8 (45.6)	95.7 (47.4)	66.0 (32.3)
Range	5.2-472.0	5.6-472.0	8.8-271.8
Interquartile range	47.8	50.2	35.5
UV-erythema dose (W/m²)			
Mean (SD)	8.5 (0.5)	8.5 (0.5)	8.5 (0.5)
Range	7.1-13.6	7.1-12.5	7.1-11.1
Interquartile range	0.7	0.7	0.7

Notes:

a. Highest completed education/training.

b. Other job position refers to: unemployed or not/no longer in paid employment and includes home-makers and pensioners

Table S2. Hazard ratios per IQR (and 95%-confidence intervals) for radon (Bq/m³) and UV-erythemal dose (W/m²) exposure and type of skin cancer mortality, age 60

Population ^a	Model	Deaths (n)	Radon ^b		UV-erythemal dose ^b	
			HR (per 47.8 Bq/m ³)		HR (per 0.7 W/m ²)	
			M1	M2	M1	M2
Full study sample (n=5,249,462)						
MM (primary)	Main	1900	1.06 (1.01-1.11)	1.07 (1.02-1.13)	0.98 (0.93-1.04)	1.08 (1.01-1.15)
MM (all)	S1	2157	1.06 (1.01-1.11)	1.07 (1.02-1.13)	0.96 (0.91-1.02)	1.06 (0.99-1.13)
MM+NMSC (primary)	S2	2349	1.06 (1.02-1.11)	1.08 (1.03-1.13)	1.01 (0.96-1.07)	1.09 (1.02-1.15)
MM+NMSC (all)	S3	2989	1.06 (1.02-1.11)	1.07 (1.03-1.12)	0.99 (0.95-1.04)	1.06 (1.01-1.12)
NMSC (all)	S4	838	1.06 (0.93-1.21)	1.07 (0.93-1.22)	1.07 (0.98-1.17)	1.08 (0.98-1.20)

Notes:

a. MM = malignant melanoma; NMSC = non-melanoma skin cancer; primary = definitive primary cause of death; all = definitive primary cause of death, concomitant, consecutive, or initial disease.

b. M1 = base model (radon, UVery, sex); M2 = adjusted model (M1 + civil status, educational attainment, SSEP, outdoor occupation with UV exposure, mother tongue).

Table S3. Negative control outcome: Hazard ratios (and 95%-confidence intervals) for radon (per 100 Bq/m³) and UV-erythemal dose (per W/m²) exposure and glioma (ICD10: C71, definitive primary cause of death), age 60

Population	Model	Deaths (n)	Radon ^a		UV-erythemal dose ^a	
			HR (per 47.8 Bq/m ³)		HR (per 0.7 W/m ²)	
			M1	M2	M1	M2
Full study sample (n=5,249,462)						
glioma (primary)	Negative control	3004	1.02 (0.94-1.10)	1.02 (0.94-1.10)	0.95 (0.89-1.02)	0.96 (0.89-1.04)

Notes:

a. M1 = base model (radon, UVery, sex); M2 = adjusted model (M1 + civil status, educational attainment, SSEP, outdoor occupation with UV exposure, mother tongue).

Table S4. Sensitivity analyses (S4) stratified according to outdoor occupation with UV exposure, radon and UV-erythemal dose and mortality from all skin cancers, age 60

Subgroup	Radon ^a HR (per 100 Bq/m³)	UV-erythemal dose ^a HR (per 1 W/m²)	N Deaths
Outdoor occupation with UV exposure – main definition			
No	1.17 (1.05-1.31)	1.09 (0.99-1.21)	1849
Yes	0.95 (0.52-1.74)	1.94 (1.17-3.23)	51
<i>p-value for interaction ^b</i>	<i>0.45</i>	<i>0.09</i>	
Outdoor occupation with UV exposure – pensioners moved from “No” to “Unknown”			
No	1.19 (1.06-1.34)	1.07 (0.96-1.21)	1341
Yes	0.95 (0.52-1.74)	1.94 (1.17-3.23)	51
Unknown	1.17 (0.79-1.17)	1.14 (0.95-1.38)	508
<i>p-value for interaction ^b</i>	<i>0.72</i>	<i>0.21</i>	

Notes:

a. Reported HRs and 95%-confidence intervals are for the main model, i.e. fully adjusted M2 models, for deaths from malignant melanoma (ICD10: C43), definitive primary cause of death.

b. p-value of the Chi square test used to assess between-strata heterogeneity