Mortality and Cancer Incidence in the Techa River and 1957 Accident Cohorts

- Scientific Implications
- Recent results
- Future directions

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Scientific Impact and Implications

- **Demonstrated persistent chronic low dose rate effects on cancer and other diseases in large unselected general populations of men and women exposed at all ages.**
- **Developed effective innovative follow-up methods in times of great social change and increasing concerns about privacy.**
- **Developed statistical methods and risk models:**
  - Intermittent follow-up
  - Time-dependent effect modifiers (age, age at exposure)
  - Manage and use Monte-Carlo dose realizations to allow for dose uncertainty effects on risk uncertainties
- **Provided quantitative risk estimates that can be used to update radiation risk estimates for radiation protection and other uses**

Recent Findings: Solid Cancer Mortality in the combined Techa and EURT cohort

- **Cohort Summary**

Follow-up Status	Subcohort			Total
	Techa River	Both	EURTC	
Alive	3,108	227	3,014	**6,349**
Dead	17,068	1,044	7,611	**25,723**
Solid Cancer Deaths	*2,461*	*179*	*1,143*	***3,783***
Lost-to-Follow-up	3,335	139	3,895	**7,369**
Migrant	4,600	188	3,721	**8,509**
Total	**28,111**	**1,598**	**18,241**	**47,950**
Person Years	**915,325**	**61,686**	**315,383**	**1,392,394**
Mean dose (mGy	**41**	**271**	**10**	**37**

- **Risk Estimates**

Common ERR	0.06* (0.018; 0.107)	
TRC + EURT-0nly	0.057	0.28
P = 0.07	(0.017; 0.105)	(0.042; 0.57)
EURTC + TRC-only	0.058	0.061
P > 0.5	(-0.004; 0.125)	(0.011; 0.121)
*	ERR/100mGy with 95% CI	

Recent Findings: Solid Cancer Mortality in the combined Techa and EURT cohort (2)

- **Results**
  - Combined cohort increases power for detection of dose-response
  - Dose response seen in each subcohort
  - No significant differences in ERR over subcohorts
  - Average ERR estimates roughly comparable to LSS, but
    - No significant sex differences
    - ERR increases with increasing age at death

Future Work

- **Dosimetry**
  - Finalize the redbone marrow dose estimates
  - Joint efforts by dosimetrists, epidemiologists, and statisticians to reevaluate the nature of the uncertainties
- **Risk estimates in the SUPER cohort**
  - Extended follow-up
  - Updated solid cancer mortality and incidence analyses in the expanded cohort
  - Leukemia analyses

SUPER Cohort Mortality Before 2017

Subcohort	Cohort members	Pre 2017 Deaths				Lost to follow-up	Alive 2017
		Non cancer	Solid cancer	Leukemia	Total Deaths		
Male							
TRC	12,529	7,556	1,351	82	8,989	2,525	1,015
EURT	7,900	3,437	626	29	4,092	2,621	1,187
Added*	**7,499**	**2,545**	**282**	**30**	**2,857**	2,220	**2,422**
Total	27,928	13,538	2,259	141	15,938	7,366	4,624
Female							
TRC	17,128	9,518	1,266	82	10,866	3,830	2,432
EURT	10,079	3,913	505	13	4,431	3,801	1,847
Added*	**7,769**	**1,521**	**191**	**26**	**1,738**	2,598	**3,433**
Total	34,976	14,952	1,962	121	17,035	10,229	7,712
Total M+F	**62,904**	**28,490**	**4,221**	**262**	**32,973**	**17,595**	**12,336**

*** TRC born after 1950-1961 or EURT born between 1957 accident and 1961**

SUPER Cohort Mortality Projections

Subcohort	Alive 2017	2017-2024 deaths				Alive 2025	2025-2029 deaths				Alive 2030
		Non cancer	Solid cancer	Leukemia	Total		Non cancer	Solid cancer	Leukemia	Total	
					Male						
TRC	1,015	557	91	1	649	366	177	19	0	197	169
EURT	1,187	492	103	1	596	591	204	36	0	241	350
Added	2,422	689	192	2	883	1,539	395	96	1	491	1,047
Total M+F	4,624	1,738	385	4	2,128	2,496	777	151	2	929	1,567
					Female						
TRC	2,432	1,242	97	2	1,341	1,091	487	26	1	513	578
EURT	1,847	670	71	1	742	1,105	326	28	1	355	750
Added	3,433	598	118	1	717	2,716	470	71	1	542	2,174
Total F	7,712	2,509	286	5	2,800	4,912	1,283	125	2	1,410	3,502
Total M+F	12,336	4,247	671	9	4,928	7,408	2,060	276	4	2,340	5,068