Dose Reconstruction
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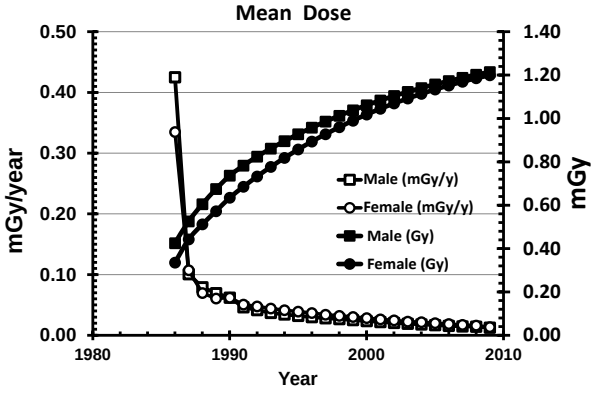
A process was developed to reconstruct the dose from penetrating gamma rays emitted by radioactivity deposited on the ground to each individual in the survey as a function of time. The radiation source term was obtained from the *Comprehensive Atlas of Caesium Deposition on Europe after the Chernobyl Accident* (1998) [D1]. This *Atlas* contains maps that are available as vector graphics with multiple layers of information, including contour lines representing intervals of equal ^{137}Cs deposition. These maps are presented in the *Atlas* as equal-area Lambert oblique azimuthal projections. The maps also contain a labeled grid corresponding to intersections of latitude and longitude (properly referred to as the *conjugate graticule*). The conjugate graticule provides a coordinate system which was used to develop an inverse transform of the original Lambert projection that effectively stretches the oblique azimuthal projection into an equirectangular projection corresponding to the surface of the earth. This process was also used to transform the isolines defining contours of ^{137}Cs deposition. Software was developed to recover the contour color that specifies the ^{137}Cs concentration at a specified latitude and longitude.

A model was created to determine the dose rate at an arbitrary time t for any individual in the study. This model is based on the following sequence of factors

^{137}Cs concentration at a location (Lat. Long.) at the time of the accident, $C(t_o)$.
^{137}Cs concentration, at time, t, based of decay, mixing and weathering, C(t).
Dose rate to air, K(t), from penetrating gamma rays based on C(t)
Dose conversion factors from air-to-person, as a function of age, at time t
Modifying factors for time spent outdoors based on occupation.
Shielding factors based on residency indoors.

The data are integrated and presented as the annual dose rate received by each individual in units of mGy/year.

Fig. 1 shows the results of the dose reconstruction for males and females in terms of annual dose rate (mGy/y) and time integrated cumulative dose (mGy).



The results are summarized in Table 1

Table 1
Summary statistics of external dose reconstruction based on ^{137}Cs deposition following the accident in Chernobyl

	Ending Date		
	12/31/1986	12/31/1996	12/31/2009
Lowest value of External Dose received by an individual (mSv)	0.0074	0.036	0.047
Largest value of External Dose received by an individual (mSv)	28.0	30.0	31.0
95^{th} Quantile of External Dose received in the sample (mSv)	0.037 - 1.4	0.14 - 3.4	0.19 – 4.4
Average value of External Dose received in the sample (mSv)	0.38	0.93	1.2
Median value of External Dose received in the sample (mSv)	0.28	0.69	0.91
Geometric Mean value of External Dose received in the sample (mSv)	0.23	0.61	0.84
Estimated Average value of External Dose from Natural Background (mSv)	0.33	5.3	12.0

D1. De Cort, M., et al., *Atlas of Caesium Deposition on Europe after the Chernobyl Accident*1998, Luxembourg: Office for Official Publications of the European Communities.

D2. Likhtarev, I.A., et al., *Chernobyl accident: Retrospective and prospective estimates of external dose of the population of Ukraine.* Health Physics, 2002. **82**(3): p. 290-303.

D3. Likhtariov, I., et al., *Effective doses due to external irradiation from the Chernobyl accident for different population groups of Ukraine.* Health Physics, 1996. **70**(1): p. 87-98.

D4. Saito, K., et al., *Calculation of organ doses from environmental gamma rays using human phantoms and Monte Carlo methods. Part 1: Monoenergetic sources and natural radionuclides in the ground.*1990: Gesellschaft fèur Strahlen- und Umweltforschung.

D5. Jacob, P., H.G. Paretzke, and H. Rosenbaum, *Organ doses from radionuclides on the ground. Part II. Non-trivial time dependences.* Health Physics, 1988. **55**(1): p. 37-49.

D6. Jacob, P., et al., *Organ doses from radionuclides on the ground. Part I. Simple time dependences.* Health Physics, 1988. **54**(6): p. 617-33.