CANCER MORTALITY, 1976-1991, IN THE POPULATION EXPOSED TO 2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN.

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1. INTRODUCTION

The long-term effects of TCDD exposure in the population involved in the Seveso, Italy, accident have been previously examined through a mortality[1)] and cancer incidence[2)] studies in the period 1976-1986. The main result of the ten-year mortality study was an increased cardiovascular mortality in the early period after the accident, possibly related to the stressful post-disaster experience. Cancer incidence findings suggested increased risks for hepatobiliary cancer and neoplasms of the lymphoemopoietic tissue among people living in a highly contaminated area (B zone), and soft tissue sarcoma in R-zone, the most populated although least contaminated. The extension of the cancer incidence study is underway. We present here results for the extended study of cancer mortality covering the period 1976-1991.

2. MATERIALS AND METHODS

Delimitation of the contaminated area was based upon measurements of TCDD levels in soil samples. Three zones (A=750 inhabitants; B=5,000; R=30,000) with decreasing levels of contamination were identified.[3)] Subjects' exposure was classified on the basis of their residence at the date of the accident or their first entry thereafter in the potentially contaminated areas. A surrounding non-contaminated area (over 200,000 inhabitants) was adopted as reference. Death certificates were checked for completeness, quality of certification and coding. Mortality was analyzed for the overall period 1976-1991, in each quinquennium (1976-1981; 1982-1986; 1987-1991), by length of stay separately for males and females, using Poisson Regression techniques.

3. RESULTS

Vital status ascertainment was > 99% successful. In none of the three contamination zones all cause mortality differed from that of the reference population (TABLES). In A-zone, the small size of the population prevents sound interpretation of results.

Among males in B-zone, all cancer mortality was just above expectations. A nearly threefold significant increase was seen for rectal cancer. Moderately increased was mortality from lung cancer. Deaths due to lymphoemopoietic neoplasms were significantly in excess, particularly leukemias. Mortality in R-zone was similar to that of the reference population, but soft tissue sarcomas exhibited a greater than twofold increased risk.

MORTALITY 1976-1991 FROM MALIGNANCIES IN THE SEVESO POPULATION. FEMALES. ALL AGES.

	A ZONE			B ZONE			R ZONE		
CAUSE OF DEATH	OBS	RR	95% CI	OBS	RR	95% CI	OBS	RR	95% CI
All causes (000-999)	31	1.1	0.7-1.5	193	1.0	0.9-1.1	1695	1.0	1.0-1.1
All cancers (140-208)	10	1.2	0.6-2.2	48	0.9	0.7-1.2	401	0.9	0.8-1.0
Digestive (150-159)	5	1.5	0.6-3.6	18	0.8	0.5-1.3	158	0.9	0.8-1.1
Stomach (151)	1	0.9	0.1-6.7	7	1.0	0.5-2.2	58	1.0	0.8-1.3
Colon (153)	2	2.6	0.6-10.5	3	0.6	0.2-1.9	33	0.8	0.6-1.2
Hepatobiliary (155-156)	[0.6]			4	1.1	0.4-3.1	25	0.8	0.6-1.3
Liver (155)	[0.4]			3	1.3	0.4-4.0	12	0.6	0.3-1.1
Other Digestive (159)	2	8.1	2.0-32.8	1	0.6	0.1-4.5	11	0.8	0.4-1.5
Respiratory (160-165)	[0.6]			2	0.5	0.1-2.0	35	1.1	0.8-1.6
Lung (162)	[0.5]			2	0.6	0.1-2.3	29	1.0	0.7-1.6
Bone (170)	[0.1]			1	2.6	0.3-19.4	7	2.4	1.0-5.7
Soft Tissue sarcoma (171)	[0.03]			[0.2]			[1.5]		
Melanoma (172)	1	9.4	1.3-68.8	[0.8]			3	0.6	0.2-2.0
Breast (174)	1	0.6	0.1-3.9	9	0.8	0.4-1.5	67	0.8	0.6-1.0
Uterus (179-182)	[0.5]			1	0.3	0.0-2.4	27	1.1	0.8-1.7
Ovary (183)	1	2.4	0.3-16.5	[2.7]			21	1.0	0.6-1.6
Brain (191)	[0.1]			2	3.2	1.0-10.3	8	1.1.	0.5-2.4
Thyroid gland (193)	[0.05]			1	3.2	0.4-24.5	2	0.8	0.2-3.6
Il defined (195)	[0.1]			[0.6]			12	2.4	1.2-4.6
Lymphoemopoietic (200-208)	[0.6]			7	1.8	0.8-3.8	29	0.9	0.6-1.4
Hodgkin's (201)	[0.04]			2	6.5	1.5-30.0	4	1.9	0.6-5.8
Non-Hodgkin's (200, 202)	[0.02]			[1.2]			8	0.9	0.4-1.8
Myeloma (203)	[0.1]			4	6.6	2.3-18.5	5	1.0	0.4-2.5
Leukemia (204-208)	[0.3]			1	0.6	0.1-4.0	12	0.9	0.5-1.6

[ ] Number of expected deaths when observed = 0

MORTALITY 1976-1991 FROM MALIGNANCIES IN THE SEVESO POPULATION. MALES. ALL AGES.

	A ZONE			B ZONE			R ZONE		
CAUSE OF DEATH	OBS	RR	95% CI	OBS	RR	95% CI	OBS	RR	95% CI
All causes (000-999)	39	1.0	0.7-1.4	275	0.9	0.8-1.1	2032	1.0	1.0-1.1
All cancers (140-208)	6	0.4	0.2-1.0	104	1.1	0.9-1.3	607	0.9	0.8-1.0
Buccal cavity (140-149)	[0.6]			5	1.4	0.6-3.3	23	0.9	0.6-1.4
Digestive (150-159)		0.2	0.0-1.4	33	0.9	0.7-1.3	226	0.9	0.8-1.0
Esophagus (150)	[0.4]			1	0.4	0.1-2.6	30	1.6	1.1-2.4
Stomach (151)	[1.8]			10	0.8	0.4-1.5	76	0.9	0.7-1.1
Colon (153)	[0.8]			5	0.8	0.3-2.0	34	0.8	0.6-1.2
Rectum (154)	[0.3]			7	2.9	1.4-6.2	19	1.1	0.7-1.8
Hepatobiliary (155-156)	[1.0]			4	0.6	0.2-1.5	35	0.7	0.5-1.0
Liver (155)	[0.9]			4	0.6	0.2-1.7	31	0.7	0.5-1.0
Pancreas (157)	1	1.9	0.3-13.5	2	0.6	0.1-2.2	20	0.8	0.5-1.3
Peritoneum and retroperitoneum (158)	[0.04]			[0.3]			4	1.9	0.6-5.9
Respiratory (160-165)	4	0.8	0.3-2.2	40	1.2	0.9-1.7	208	0.9	0.8-1.1
Lung (162)	4	1.0	0.4-2.6	34	1.2	0.9-1.7	176	0.9	0.8-1.1
Pleura (163)	[0.1]			3	5.3	1.6-17.5	3	0.8	0.2-2.5
Soft Tissue sarcoma (171)	[0.04]			[0.3]			4	2.1	0.7-6.5
Genito-urinary tract (185-189)	1	0.7	0.7-5.3	10	1.0	0.5-1.8	73	1.0	0.8-1.3
Prostate (185)	[0.7]			6	1.2	0.6-2.8	39	1.2	0.8-1.7
Bladder (188)	1	2.3	0.3-16.8	3	0.9	0.3-3.0	21	0.9	0.6-1.5
Brain (191)	[0.2]			1	0.8	0.1-5.5	12	1.3	0.7-2.5
Thyroid gland (193)	[0.03]			1	4.9	0.6-39.0	[1.5]		
Lymphoemopoietic (200-208)	[0.7]			12	2.3	1.3-4.2	27	0.8	0.5-1.2
Hodgkin's (201)	[0.1]			2	3.3	0.8-14.0	[4.0]		
Non-Hodgkin's (200, 202)	[0.2]			2	1.5	0.4-6.0	10	1.1	0.5-2.1
Myeloma (203)	[0.1]			1	1.1	0.2-8.2	5	0.8	0.3-2.0
Leukemia (204-208)	[0.3]			7	3.1	1.4-6.7	12	0.8	0.4-1.5
Lymphatic (204)	[0.1]			2	2.9	0.7-12.3	6	1.3	0.5-3.2
Myeloid (205)	[0.1]			3	3.3	1.0-10.6	4	0.6	0.2-1.8

[ ] Number of expected deaths when observed = 0

Females in A-zone exhibited a slightly increased cancer mortality, mainly concerning digestive sites. In B-zone, increased risks were seen particularly for lymphoemopoietic neoplasms, with a sixfold elevated relative risks for Hodgkin's disease and myeloma. Observed deaths from respiratory, breast, uterus and ovary cancer were less than expected. In R-zone, departures from expectations were seen for bone malignancies, but no cases of soft tissue sarcoma were observed.

4. DISCUSSION

The results of the extended mortality study are far from being conclusive because of some inherent limitations of the study. Exposure definition was merely ecological, rather than individual. A few TCDD serum measurements were published,[4] and showed that subjects in zone A had the highest serum levels ever reported in humans, whereas subjects in zone B had levels comparable to other working populations.[5,6] Additional data are becoming available,[7] which confirm the reasonable accuracy of zone delimitation. Study size still represent a limitation, especially for A-zone findings. Latency is less of a problem after an elapsed period of 15 years since the accident occurrence.
Notwithstanding these limitations, results of previous experimental and epidemiological studies[8,9] along with mechanistic knowledge on dioxin toxicity, corroborate the hypothesis that the observed departures from expectations, although based on small numbers of deaths, might be associated with dioxin exposure.

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5. REFERENCES

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