CAUSE-SPECIFIC MORTALITY AMONG ASBESTOS WORKERS AND POTENTIALLY EXPOSED WORKERS IN BELGIUM (2001-2009)

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INTRODUCTION

Asbestos is one of the most severe occupational health problems in the world. The World Health Organization (WHO) estimates that a third of all occupational cancers is caused by asbestos. Recent global estimates indicate occupational asbestos exposure leads to more than 107 000 deaths due asbestos-related lung cancer, mesothelioma and asbestosis every year[1].

The impact of asbestos has long been underestimated in Belgium. Recent study shows Belgium has one of the highest mesothelioma mortality rates in the world[2]. Belgium was once a major international supplier of asbestos products. Manufacturing of asbestos products continued on a large scale until a first formal ban on asbestos use in 1998. One of Europe's biggest asbestos groups, Eternit, had two large production sites in Belgium. Despite substantial exposure, little is known about the life expectancy and health of Belgian asbestos workers. Previous studies rely mainly on biomedical data[3,4] or on claims for compensation[5–7]. Selection bias, differences in diagnostic criteria and low civil awareness of compensation measures make the reliability of these data sources questionable. Eternit S.A. issued a mortality study among workers and inhabitants of the factory regions in 1967. An excess in stomach cancer mortality was found for male asbestos workers[8]. This study investigates recent mortality among Belgian asbestos workers and potentially exposed workers in order to further quantify the impact of occupational asbestos exposure.

METHOD AND MATERIALS

Data was analysed from a census-linked mortality follow-up study. The 1991 Belgian Census contains detailed socio-economic information for the Belgian population. All employed persons between the ages of 18 and 65 have been selected. Because data on asbestos exposure is not available for Belgium, we only included persons who were active in industries related to asbestos exposure at the time of the census. Using the Statistical Classification of Economic Activities in the European Community, we have made three categories containing A) Asbestos workers (asbestos cement manufacturing and asbestos products manufacturing); B) Potentially exposed workers (construction, shipbuilding, rail transport, agriculture, metal extraction, metal production, electro-technical industry, motor vehicle industry); and C) All other workers.

The 1991 Census has been linked to the population register and death certificate data providing us with cause-specific mortality from 1 October 2001 until 31 December 2009. Due to problems in the Belgian regionalization in handling cause-specific mortality data, the mortality data available is restricted to the Flemish and the Brussels region. This has little or no impact on the study given that the majority of asbestos firms are located in these regions: 97% of asbestos workers are Flemish or Brussels.

Standardized mortality rates and their 95% confidence interval have been calculated with reference to the total working population in 1991. The Tenth International Classification of Diseases is used in the death certificates for the period under study. Special attention has been paid to asbestos-related diseases mesothelioma (ICD =C45), lung cancer (ICD=C33-C34) and laryngeal cancer (ICD=C32).

RESULTS

The total working population includes 2 401 086 persons (59,49% males; 40,50% females). During the follow-up period 98 654 deaths (78,01% males; 22,00% females) were observed. Table 1 shows the age and sex distribution of the population under study. The results presented here are based on analyses on asbestos workers, other workers and two types of potentially exposed workers: construction workers and naval workers.

Table 1 Age and sex distribution of the asbestos workers, potentially exposed workers in construction and shipping and other workers.

	Asbestos industry		Construction		Shipping		Other industries	
	M	F	M	F	M	F	M	F
Total	2057	250	122783	7822	18694	2039	1262684	960723
Age group								
15-19	25	2	2612	143	124	24	14051	15568
20-24	244	28	15715	1233	1225	367	119927	133070
25-29	336	30	19818	1440	2464	407	203370	188780
30-34	283	29	19514	1393	2856	375	205793	174313
35-39	266	35	17374	1188	2890	267	189949	150379
40-44	284	48	15944	1030	2899	255	175712	123302
45-49	257	45	12876	677	2455	160	139914	84262
50-54	230	18	10855	421	2272	101	114746	53812
55-59	122	15	6704	244	1316	69	73961	31123
60-64	10	0	1371	53	193	14	25261	6114
Deaths	140	11	6842	150	1243	45	67695	21460

Table 2 presents the SMR's and 95% confidence intervals for males employed in the asbestos industry, construction, shipping and all other industries. All-cause mortality rates are significantly higher than expected among men working in the asbestos industry, construction and shipping in 1991. Mortality due to mesothelioma, a rare type of cancer caused predominantly by asbestos, is more than 30 times higher in the asbestos industry than can be expected from the average male worker. Significant excess in mesothelioma deaths is also found among construction and naval workers indicating substantial occupational asbestos exposure.
Our results show an elevated risk for mortality due to lung cancer in the asbestos industry, construction and shipping. Lung cancer deaths are significantly higher for construction and naval workers than expected from the total working population.
We find laryngeal cancer mortality among asbestos workers is three times higher than expected. Construction workers experience significant excess mortality due to laryngeal cancer. Results show raised SMR's for oral-pharyngeal cancer among asbestos workers and naval workers. Previous research[9,10] with similar results for asbestos workers has suggested a possible effect of asbestos in the development of oral and pharyngeal malignancies.

Table 2: Observed (O) and expected (E) number of deaths for male workers (2001-2009) with corresponding standardized mortality ratios (SMR) and 95% confidence intervals (LL –UL).

Site	Asbestos industry					Construction					Shipping					Other industries				
	O	D	SMR	LL	UL	O	D	SMR	LL	UL	O	D	SMR	LL	UL	O	D	SMR	LL	UL
All deaths	140	108,41	129,14	108,64	152,40	6842	6122,48	111,75	109,12	114,43	1243	1102,26	112,77	106,59	119,22	67695	68506,94	98,81	98,07	99,56
All external causes	13	10,41	124,91	66,51	213,60	755	627,16	120,38	111,95	129,29	129	94,32	136,77	114,19	162,52	6258	6431,93	97,30	94,90	99,74
All natural causes	126	96,55	130,51	108,71	155,39	6018	5412,68	111,18	108,39	114,03	1096	993,56	110,31	103,88	117,04	60521	61170,83	98,94	98,15	99,73
All malignancies	74	46,14	160,37	125,93	201,33	3003	2548,72	117,82	113,65	122,11	530	472,60	112,15	102,80	122,11	28037	28550,20	98,20	97,06	99,36
Mesothelioma	21	0,67	3133,39	1939,61	4789,72	64	36,04	177,59	136,76	226,77	17	6,82	249,24	145,19	399,06	335	400,27	83,69	74,97	93,15
Respiratory system	25	16,85	148,38	96,02	219,04	1265	920,81	137,38	129,91	145,16	207	172,50	120,00	104,21	137,51	9901	10272,89	96,38	94,49	98,30
Lung cancer	22	16,11	136,54	85,57	206,73	1196	879,48	135,99	128,39	143,92	202	164,98	122,44	106,13	140,54	9468	9814,75	96,47	94,53	98,43
Laryngeal cancer	3	0,97	308,36	63,59	901,16	69	41,33	166,94	129,89	211,28	5	7,52	66,51	21,60	155,21	433	458,14	94,51	85,82	103,85
Oral-digestive system	11	9,67	113,70	56,76	203,43	604	536,32	112,62	103,82	121,97	110	98,86	111,27	91,45	134,11	5911	5983,80	98,78	96,28	101,33
Oral -pharyngeal cancer	5	1,64	305,27	99,12	712,39	111	91,94	120,73	99,32	145,39	25	16,53	151,28	97,90	223,31	983	1005,76	97,74	91,72	104,04
Rectal cancer	2	1,15	174,39	21,12	629,94	77	62,62	122,97	97,05	153,69	8	11,68	68,47	29,56	134,91	686	699,59	98,06	90,86	105,68
Esophageal cancer	2	1,98	101,10	12,24	365,20	130	110,33	117,83	98,45	139,92	21	20,17	104,11	64,44	159,14	1202	1221,60	98,40	92,91	104,12
Stomach cancer	1	1,52	65,65	1,66	365,80	101	84,54	119,47	97,31	145,16	18	15,50	116,10	68,81	183,49	921	938,49	98,14	91,90	104,68
Colon cancer	1	3,39	29,51	0,75	164,42	185	186,89	98,99	85,24	114,33	38	34,98	108,65	76,89	149,13	2119	2118,36	100,03	95,82	104,38
Urogenital system	8	5,06	158,23	68,31	311,77	281	281,11	99,96	88,61	112,36	70	52,92	132,27	103,11	167,12	3225	3240,59	99,52	96,11	103,01
Kidney cancer	3	1,38	217,48	44,85	635,56	69	75,25	91,70	71,35	116,05	10	14,10	70,94	34,02	130,46	847	838,77	100,98	94,29	108,02
Prostate cancer	3	2,35	127,83	26,36	373,57	126	132,13	95,36	79,44	113,54	44	25,00	176,02	127,89	236,29	1549	1559,88	99,30	94,42	104,37
Bladder cancer	2	1,30	153,68	18,61	555,14	81	71,83	112,76	89,55	140,15	15	13,58	110,43	61,81	182,14	815	824,39	98,86	92,19	105,89
Testicular cancer	0	0,03	0,00	0,00	10636,88	5	1,90	263,59	85,59	615,13	1	0,24	410,83	10,39	2288,96	14	17,54	79,80	43,62	133,88
Other cancers	9	13,89	64,78	29,62	122,97	789	774,45	101,88	94,89	109,24	126	141,49	89,05	74,18	106,03	8665	8652,64	100,14	98,05	102,27
All non-malignancies	52	50,40	103,17	77,05	135,29	3015	2863,95	105,27	101,55	109,10	566	520,96	108,65	99,88	117,98	32484	32620,63	99,58	98,50	100,67
Circulatory system	29	25,87	112,08	75,06	160,96	1587	1463,33	108,45	103,18	113,92	291	268,19	108,50	96,39	121,71	16565	16698,11	99,20	97,70	100,73
Respiratory system	11	5,14	214,14	106,90	383,15	311	289,08	107,58	95,96	120,23	60	54,30	110,50	84,32	142,23	3335	3377,89	98,73	95,41	102,14
Other	12	19,39	61,88	31,98	108,10	1117	1111,55	100,49	94,68	106,56	215	198,47	108,33	94,33	123,82	12584	12544,64	100,31	98,57	102,08

CONCLUSION

The hazardous health effects of asbestos are not confined to the factory floor. We find higher overall mortality for asbestos workers, but also for workers potentially exposed in industries such as construction and shipping. Our results for the asbestos industry show elevated mortality due to asbestos-related malignancies mesothelioma, lung cancer and laryngeal cancer. Moreover, asbestos workers seem to experience excess mortality due to oral-pharyngeal cancer. Construction workers and naval workers show increased standardized mortality ratios for asbestos-related diseases. A finding that suggests substantial asbestos exposure in these industrial branches. Asbestos has been used extensively in various industries around the world. With production shifting to developing countries, a global ban on asbestos is imperative to prevent further occupational exposure.

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