

## Data supplement

**Table S1.** Demographic characteristics by study area (Unit: number of persons)

Age group	Area 1		Area 2		Area 3		Area 4		Boryeong islands	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0 - 9	220	189	361	321	96	90	1,751	1,641	139	115
10 - 19	334	321	416	417	192	151	2,425	2,177	192	158
20 - 29	509	339	706	439	279	228	2,531	1,963	230	153
30 - 39	536	296	697	387	248	162	2,697	2,410	238	167
40 - 49	667	547	758	606	329	311	3,268	2,960	287	227
50 - 59	767	848	876	940	425	436	2,856	3,039	281	271
60 - 69	660	733	1,001	1,084	397	432	2,266	2,550	247	247
70 - 79	445	578	707	1,001	251	366	1,311	1,906	155	198
80 +	102	257	164	391	65	139	323	762	37	79
Sum	4,240	4,108	5,686	5,586	2,282	2,315	19,428	19,408	1,805	1,615
Total : 66,473										

Area 1: less than 1.1 km away; Area 2: 1.1-4.2 km away; Area 3: 4.2-23 km away; Area 4: more than 23 km from the contaminated coastline.

**Table S2.** Prevalence of disease for adults by age, sex, and area (%).

Disease	Age group	Area 1		Area 2		Area 3		Boryeong islands		Area 4	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Asthma	19-44	18.2	8.2	10.9	11.1	9.4	10.0	16.1	27.5	6.7	3.4
	45-49	16.7	18.8	8.8	11.6	0.0	18.2	20.0	36.8	8.3	5.7
	50-54	20.9	18.3	10.7	7.1	0.0	0.0	33.3	30.0	12.0	4.9
	55-59	20.2	18.3	14.4	7.8	13.3	0.0	12.1	28.6	2.0	4.1
	60-64	20.0	23.7	11.3	9.9	10.0	9.5	25.5	23.2	6.7	8.2
	65-69	20.6	24.5	14.4	9.8	12.5	8.3	22.4	29.3	9.0	8.3
	70-74	26.9	23.8	19.5	14.9	10.0	17.9	25.0	25.4	13.1	11.0
	75+	27.8	16.9	22.2	18.2	11.1	13.3	39.1	27.3	10.7	10.5
Rhinitis	19-44	31.8	41.2	25.2	20.2	26.7	24.4	41.9	54.9	17.4	19.3
	45-49	45.2	43.6	34.8	51.1	24.5	30.0	33.3	42.1	13.5	13.0
	50-54	40.7	38.2	20.6	30.4	50.0	27.3	51.9	56.7	20.0	20.3
	55-59	45.0	33.5	21.3	18.4	22.2	23.1	51.5	34.8	19.4	16.1
	60-64	43.0	37.2	25.6	20.9	20.0	38.5	41.2	35.4	20.6	11.2
	65-69	33.9	29.9	28.7	23.2	30.0	19.0	36.7	37.9	18.5	16.3
	70-74	41.4	34.1	24.0	17.3	37.5	20.8	41.7	30.6	26.4	15.5
	75+	49.5	25.4	24.5	20.0	25.0	25.0	43.5	30.3	17.4	17.0
Dermatiti s	19-44	27.3	15.3	6.5	11.1	9.4	0.0	9.7	11.8	4.4	6.9
	45-49	7.1	27.7	2.9	10.1	0.0	0.0	6.7	16.2	0.0	5.7
	50-54	16.5	23.0	5.3	2.4	0.0	0.0	22.2	26.7	2.7	4.9
	55-59	21.7	23.9	4.4	6.5	6.7	0.0	6.1	12.9	4.0	7.6
	60-64	14.5	30.2	4.0	6.2	5.0	9.5	11.8	12.2	0.0	4.7
	65-69	15.2	26.4	4.3	5.1	12.5	0.0	10.2	8.6	1.9	2.2
	70-74	30.3	27.4	4.5	7.3	5.0	7.1	6.3	19.0	2.8	2.9
	75+	21.5	18.5	9.4	4.7	0.0	0.0	8.7	12.1	4.8	3.5
Conjuncti vitis	19-44	29.5	36.5	21.7	20.0	13.2	10.0	6.5	23.5	4.4	8.6
	45-49	31.0	40.6	11.8	10.1	0.0	27.3	20.0	15.8	10.8	8.7
	50-54	37.4	44.5	6.6	10.5	0.0	0.0	18.5	33.3	9.1	10.6
	55-59	28.7	37.2	10.8	12.7	33.3	0.0	25.0	31.4	11.4	9.0
	60-64	33.9	38.6	15.2	13.3	5.0	4.8	21.6	17.3	7.3	16.0
	65-69	27.3	41.0	12.6	14.2	12.5	37.5	10.2	19.0	9.4	8.4
	70-74	35.2	38.1	11.5	12.9	10.0	25.0	22.9	30.6	13.2	9.8
	75+	32.7	29.2	13.2	9.0	0.0	6.7	8.7	21.2	4.7	7.1
PTSD	19-44	40.0	25.6	3.9	12.0	0.0	0.0	9.5	10.1	2.1	7.6
	45-49	42.9	44.1	12.5	16.2	0.0	25.0	12.5	14.0	17.5	12.3
	50-54	31.5	38.2	16.5	10.5	0.0	0.0	15.0	18.1	12.2	5.3
	55-59	37.1	35.3	7.1	10.4	12.5	0.0	4.8	8.9	4.5	6.3
	60-64	36.7	38.4	10.3	7.7	4.5	0.0	7.5	12.2	5.7	0.6
	65-69	35.9	35.5	7.1	7.7	0.0	0.0	8.5	14.9	4.1	2.5
	70-74	30.4	36.6	4.7	5.6	8.7	6.3	17.5	15.1	1.9	1.8
	75+	18.4	20.5	3.3	2.3	0.0	0.0	12.5	15.6	0.0	0.0
Depressio n	19-44	29.5	27.9	6.5	15.6	7.4	20.0	12.9	28.6	6.7	25.9
	45-49	42.9	33.0	20.0	21.7	0.0	25.0	21.4	21.1	8.1	20.0
	50-54	23.3	29.3	14.7	15.0	0.0	7.7	23.1	27.1	7.8	14.6
	55-59	24.8	26.7	8.8	10.4	20.0	7.7	15.6	14.3	7.8	11.2
	60-64	24.8	29.8	9.3	11.8	10.0	9.5	18.0	22.5	4.9	8.2
	65-69	19.4	30.3	5.6	18.6	12.5	20.8	26.5	25.9	3.8	8.7
	70-74	22.8	29.6	6.3	14.4	10.0	14.3	27.7	30.6	4.8	10.0
	75+	15.5	35.2	12.4	13.7	0.0	6.7	21.7	39.4	2.4	9.6

For young people under 19 years old, we used results from 925 school students (male: 505; female: 420) living in the study area. Prevalence of asthma for elementary school student was 18.2% and 7.6% for highly contaminated area and less contaminated area, respectively. In particular, the Taean Environmental Health Center (TEHC) surveyed the incidence of asthma newly occurred after the oil spill. That is, the asthma incidence for 2008 was 6.7% and 1.0% for highly contaminated area and less contaminated area, respectively. Therefore we used the incidence (6.7%) in highly contaminated area for Area 1 and Boryeong island and that (1.0%) in less contaminated area for Area 2 and Area 3. For 13~18 years old, new incidence of asthma for 2008 was 5.1%. We used the asthma incidence for elementary school student for 0-9 age group and the incidence for 13-18 years old for 10-19 age group.

Prevalence of rhinitis was 38.3% and 32.4% for elementary school student in highly contaminated area and less contaminated area, respectively, and 34.7% for the 13-18 years old. There was no difference in prevalence between highly contaminated area and less contaminated area. We, therefore, used only the prevalence of elementary school student for 0-9 age group.

Prevalence of dermatitis was 19.5% and 16.4% for elementary school student in highly contaminated area and less contaminated area, respectively, and 8.4% and 5.8% for the 13-18 years old in highly contaminated area and less contaminated area, respectively. We used the prevalence difference in dermatitis for elementary school student for 0-9 age group and that for 13-18 years old for 10-19 age group to calculate the incidence in 2008.

Prevalence of conjunctivitis was 12.4% and 14.7% for elementary school student in highly contaminated area and less contaminated area, respectively, and 18.7% and 15.2% for the 13-18 years old in highly contaminated area and less contaminated area, respectively.

Prevalence of post-traumatic stress disorder (PTSD) was 5.1% and 1.8% for elementary school student in highly contaminated area and less contaminated area, respectively, and 4.7%

and 2.1% for the 13-18 years old in highly contaminated area and less contaminated area, respectively. Considering that children under 10 years old did not participate in clean-up work which is crucial factor to cause the PTSD according to the TEHC report, we assumed no new incidence of PTSD in 0-9 age group and used the averaged prevalence of elementary school student and 13-18 years old as the incidence of 10-19 age group.

Prevalence of mild depression was 8.3% and 2.9% for the elementary school student in highly contaminated area and less contaminated area, respectively, and 5.9% for the 13-18 years old in the whole area. We used the difference in prevalence of the elementary school student as the incidence of 10-19 age group.

**Table S3.** Excess incidence of disease due to Hebei Spirit oil spill by age, sex, and area (%).

Disease	Age group	Area 1		Area 2		Area 3		Boryeong islands	
		Male	Female	Male	Female	Male	Female	Male	Female
Asthma	0~9	6.7	6.7	1.0	1.0	1.0	1.0	6.7	6.7
	10~19	5.1	5.1	1.0	1.0	1.0	1.0	5.1	5.1
	20~49	9.9	8.9	2.3	6.8	1.4	9.5	10.6	27.6
	50~59	13.5	13.8	6.2	3.0	5.7	0.0	15.7	24.8
	60~69	12.4	15.9	5.0	1.6	3.4	0.7	16.1	18.0
	70+	15.4	9.6	9.0	5.8	0.2	4.9	20.2	15.6
Rhinitis	0~9	5.9	5.9	0.0	0.0	0.0	0.0	5.9	5.9
	10~19	-	-	-	-	-	-	-	-
	20~49	23.1	26.2	14.5	19.5	10.2	11.1	22.2	32.3
	50~59	23.1	17.7	1.3	6.2	16.4	7.0	32.0	27.5
	60~69	18.9	19.8	7.6	8.3	5.8	15.0	19.4	22.9
	70+	23.6	13.5	3.6	2.4	9.4	6.7	20.7	14.3
Dermatitis	0~9	3.1	3.1	-	-	-	-	3.1	3.1
	10~19	2.6	2.6	-	-	-	-	2.6	2.6
	20~49	15.0	15.2	3.6	2.7	5.9	0.0	5.9	7.7
	50~59	15.8	17.2	0.8	2.6	0.0	0.0	10.8	13.5
	60~69	13.9	24.9	3.3	2.9	4.9	3.7	10.0	7.0
	70+	22.2	19.7	0.8	3.0	5.0	1.8	3.7	12.4
Conjunctivitis	0~9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10~19	3.5	3.5	0.0	0.0	0.0	0.0	3.5	3.5
	20~49	22.6	29.9	9.5	7.7	4.8	4.5	5.6	11.0
	50~59	22.8	31.0	1.3	0.7	0.0	8.3	11.5	22.5
	60~69	22.3	27.6	4.6	2.5	13	0.0	7.5	5.9
	70+	25.0	25.2	3.4	5.1	2.7	22.8	6.9	17.5
PTSD <sup>a</sup>	0~9	-	-	-	-	-	-	-	-
	10~19	4.9	2.0	4.9	2.0	0.0	0.0	4.9	2.0
	20~49	31.6	24.9	0.9	4.2	0.0	0.0	3.7	2.1
	50~59	26.0	31.0	3.4	4.7	0.0	0.0	1.5	7.7
	60~69	31.4	35.4	3.7	6.2	0.0	0.0	3.0	12.0
	70+	23.4	27.6	3.0	3.1	0.0	0.0	14.0	14.5
Depression	0~9	-	-	-	-	-	-	-	-
	10~19	5.4	5.4	0.0	0.0	0.0	0.0	5.4	5.4
	20~49	28.8	7.5	5.9	0.9	0.4	2.5	9.8	1.9
	50~59	16.3	15.1	3.9	0.2	6.1	0.0	11.5	7.8
	60~69	17.8	21.6	3.1	6.8	6.9	6.7	17.9	15.7
	70+	15.5	22.6	5.7	4.2	2.6	2.2	21.1	25.2

a: post-traumatic stress disorder

**Table S4.** Years lived with disability (YLDs) attributable to Hebei Spirit oil spill by disease, sex, and age (Unit: DALY)

Age	Asthma		Allergy						Mental disease			
	Male	Female	Rhinitis		Dermatitis		Conjunctivitis		PTSD <sup>a</sup>		Depression	
			Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0~9	101.3	88.2	16.2	18.5	19.9	17.5	0.0	0.0	- <sup>b</sup>	-	-	-
10~19	144.8	137.3	0.0	0.0	23.9	22.5	0.1	0.1	65.0	27.4	126.9	120.6
20~29	540.8	724.6	213.9	231.3	62.5	36.3	1.8	1.4	328.8	197.4	339.1	60.6
30~39	505.6	599.9	210.5	196.7	124.0	63.1	1.8	1.2	316.8	160.0	269.8	40.2
40~49	469.4	738.1	225.9	273.4	176.2	127.2	1.8	1.8	321.5	234.1	266.9	58.6
50~59	602.9	589.4	201.7	198.2	133.8	178.1	1.3	2.2	238.3	335.4	154.5	107.7
60~69	305.9	323.3	164.1	286.6	103.2	158.5	1.2	1.1	197.7	279.4	94.9	129.1
70+	117.0	149.2	72.5	110.6	60.8	109.5	0.7	1.6	65.9	101.5	33.3	59.6
Sum	2787.7	3350.0	1104.8	1315.3	704.3	712.7	8.7	9.4	1534.0	1335.2	1285.4	576.4
<b>Total</b>	<b>6,137.7</b>		<b>2,420.0</b>		<b>1,416.9</b>		<b>18.2</b>		<b>2,869.2</b>		<b>1,861.9</b>	

a: post-traumatic stress disorder; b: Data not available