

**Supplementary Table 1. Age- and sex-specific distributions of the National Health Insurance Service-Senior (NHIS-Senior) cohort at baseline (2002) and the entire Korean population in 2002**

Age (years)	Sex	Cohort population at baseline (2002)			The entire Korean population in 2002 *	
		N	%	(95% CI)	N	%
All		558,147	100.0		5,725,238	100.0
60-69	Men	156,311	28.0	(27.9, 28.1)	1,601,308	28.0
	Women	187,166	33.5	(33.4, 33.7)	1,917,494	33.5
70-79	Men	58,156	10.4	(10.3, 10.5)	598,191	10.4
	Women	100,718	18.0	(17.9, 18.1)	1,034,907	18.1
80-89	Men	14,993	2.7	(2.6, 2.7)	152,953	2.7
	Women	35,181	6.3	(6.2, 6.4)	361,188	6.3
90+	Men	1,122	0.2	(0.2, 0.2)	11,867	0.2
	Women	4,500	0.8	(0.8, 0.8)	47,330	0.8

\* The information on the entire Korean population came from Statistics of Residence Registration Population (Ministry of Security and Public Administration).

† The difference between the cohort population at baseline and the entire population was not statistically significant ( $p > 0.05$  by the 2-proportion Z-test).

**Supplementary table 2. The number of participants in the NHIS-Senior cohort database by year**

Year	Eligibility DB <sup>1)</sup>		Health Screening DB <sup>2)</sup>		Healthcare utilization DB		Long-term care insurance DB <sup>3)</sup>	
	N	%	N	%	N	%	N	%
2002	558,147	100.0%	137,357	24.6%	469,800	84.2%		
2003	557,195	100.0%			474,663	85.2%		
2004	539,278	100.0%	157,275	29.2%	466,044	86.4%		
2005	521,967	100.0%			487,928	93.5%		
2006	504,417	100.0%	193,790	38.3%	482,542	95.7%		
2007	487,460	100.0%			469,032	96.2%		
2008	470,005	100.0%	206,443	43.9%	455,246	96.9%	32,484	6.9%
2009	452,631	100.0%			440,036	97.2%	37,177	8.2%
2010	436,395	100.0%	200,335	45.9%	425,990	97.6%	38,401	8.8%
2011	422,171	100.0%			410,751	97.3%	33,763	8.0%
2012	405,614	100.0%	177,592	43.8%	395,319	97.5%	33,306	8.2%
2013	388,493	100.0%			379,077	97.6%	35,533	9.1%
2014	369,307	100.0%	163,675	44.3%	362,502	98.2%	36,204	9.8%
2015	352,869	100.0%			346,839	98.3%	36,773	10.4%

1) The loss of eligibility is due to death of participants.

2) The health screening program is performed every two years for participants.

3) Long-term care insurance was introduced in 2008.

**Supplementary Table 3. Crude and age-standardised health care utilisation rates (with the Korean 2005 census and world standard populations as references, per 100 person-years) of major 10 diseases based on the health care utilisation database of the National Health Insurance Service-Senior (NHIS-Senior) cohort (at baseline year, 2002)**

Rank	All			Men			Women					
	ICD-10 Code	Crude rates	Age-standardised rates		ICD-10 code	Crude rates	Age-standardised rates		ICD-10 code	Crude rates	Age-standardised rates	
			Census	WHO			Census	WHO			Census	WHO
1	<b>Acute upper respiratory infections and influenza (J00-J11)</b>	76.6	76.2	75.2	<b>Acute upper respiratory infections and influenza (J00-J11)</b>	63.1	62.4	61.8	<b>Acute upper respiratory infections and influenza (J00-J11)</b>	86.1	86.9	85.7
2	<b>Disorders of teeth and supporting structures (K00-K08)</b>	42.0	41.5	40.8	<b>Disorders of teeth and supporting structures (K00-K08)</b>	48.8	47.2	46.6	<b>Disorders of teeth and supporting structures (K00-K08)</b>	37.3	37.6	37.1
3	<b>Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)</b>	31.2	31.2	30.8	<b>Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)</b>	24.6	24.8	24.6	<b>Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)</b>	35.8	36.1	35.6
4	<b>Hypertensive diseases (I10-I15)</b>	24.4	24.7	24.5	<b>Hypertensive diseases (I10-I15)</b>	20.8	21.3	21.2	<b>Hypertensive diseases (I10-I15)</b>	26.9	27.1	26.9
5	<b>Other arthropathies (M00-M15, M18-M22, M24-M25)</b>	18.1	18.4	18.2	<b>Dermatitis, eczema and papulosquamous disorders (L20-L45)</b>	17.0	17.1	17.1	<b>Other arthropathies (M00-M15, M18-M22, M24-M25)</b>	22.5	22.7	22.4
6	<b>Dorsalgia (M54)</b>	16.2	16.4	16.2	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14,</b>	15.3	15.0	14.9	<b>Dorsalgia (M54)</b>	19.7	19.9	19.7

7	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)</b>	16.1	16.0	15.9	<b>T79) Other acute lower respiratory infections (J20-J22)</b>	14.1	14.0	13.9	<b>Gonarthrosis [arthrosis of knee] (M17)</b>	19.2	19.5	19.2
8	<b>Soft tissue disorders (M60-M79)</b>	15.7	15.7	15.5	<b>Diabetes mellitus (E10-E14)</b>	13.6	13.4	13.2	<b>Soft tissue disorders (M60-M79)</b>	17.4	17.6	17.3
9	<b>Other acute lower respiratory infections (J20-J22)</b>	15.4	15.3	15.1	<b>Soft tissue disorders (M60-M79)</b>	13.2	13.1	13.0	<b>Dyspepsia and other diseases of stomach and duodenum (K29-K31)</b>	16.8	17.0	16.8
10	<b>Dermatitis, eczema and papulosquamous disorders (L20-L45)</b>	15.3	15.3	15.2	<b>Dyspepsia and other diseases of stomach and duodenum (K29-K31)</b>	12.9	12.9	12.8	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)</b>	16.6	16.7	16.6

\* Disease codes were classified according to the International Shortlist for Hospital Morbidity Tabulation recommended by the World Health Organisation (WHO) and the Organisation for Economic Co-operation and Development. ICD, International Classification of Diseases.

**Supplementary Table 4. Crude and age-standardised admission rates (with the Korean 2005 census and world standard populations as references, per 100,000 person-years) of major 10 diseases based on the health care utilisation database of the National Health Insurance Service-Senior (NHIS-Senior) cohort (at baseline year, 2002)**

Rank	All				Men				Women			
	ICD-10 Code	Crude rates	Age-standardised rates		ICD-10 code	Crude rates	Age-standardised rates		ICD-10 code	Crude rates	Age-standardised rates	
			Census	WHO			Census	WHO			Census	WHO
1	<b>Cataract (H25-H26, H28)</b>	1604.4	1679.9	1675.2	<b>Cataract (H25-H26, H28)</b>	1245.2	1375.4	1385.8	<b>Cataract (H25-H26, H28)</b>	1857.4	1884.4	1870.3
2	<b>Cerebrovascular diseases (I60-I69)</b>	711.7	734.8	734.2	<b>Other malignant neoplasms (remainder of C00-C97)</b>	1027.0	1033.1	1015.7	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)</b>	680.5	684.2	684.4
3	<b>Other malignant neoplasms (remainder of C00-C97)</b>	644.1	647.4	636.1	<b>Cerebrovascular diseases (I60-I69)</b>	757.3	817.8	818.9	<b>Cerebrovascular diseases (I60-I69)</b>	679.6	684.0	683.5
4	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)</b>	611.2	624.9	625.4	<b>the circulatory system (remainder of I00-I99)</b>	513.5	496.7	491.2	<b>Other malignant neoplasms (remainder of C00-C97)</b>	374.5	379.2	373.5
5	<b>Other diseases of the circulatory system (remainder of I00-I99)</b>	374.9	368.2	363.8	<b>Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)</b>	512.6	518.8	517.9	<b>Diabetes mellitus (E10-E14)</b>	367.8	373.6	368.0
6	<b>Diabetes mellitus (E10-E14)</b>	349.5	354.8	351.2	<b>Angina pectoris (I20)</b>	359.5	358.4	351.5	<b>Deforming dorsopathies and spondylopathies (M40-M49)</b>	322.9	326.4	322.5
7	<b>Angina pectoris (I20)</b>	297.0	297.6	292.2	<b>Chronic obstructive pulmonary disease</b>	325.3	366.6	372.6	<b>the circulatory system (remainder of I00-I99)</b>	277.3	278.5	275.5

					<b>and bronchiectasis (J40-J44, J47)</b>							
8	<b>Deforming dorsopathies and spondylopathies (M40-M49)</b>	282.3	286.0	283.7	<b>Diabetes mellitus (E10-E14)</b>	323.6	326.7	327.1	<b>Gonarthrosis [arthrosis of knee] (M17)</b>	256.3	262.9	255.5
9	<b>Pneumonia (J12- J18)</b>	242.5	251.4	255.7	<b>Pneumonia (J12- J18)</b>	302.3	341.0	348.3	<b>Angina pectoris (I20)</b>	252.9	256.0	251.9
10	<b>Chronic obstructive pulmonary disease and bronchiectasis (J40-J44, J47)</b>	212.6	222.0	223.6	<b>Malignant neoplasms of trachea, bronchus and lung (C33-C34)</b>	286.3	292.6	289.3	<b>Hypertensive diseases (I10-I15)</b>	213.8	214.4	215.7

\* Disease codes were classified according to the International Shortlist for Hospital Morbidity Tabulation recommended by the World Health Organisation (WHO) and the Organisation for Economic Co-operation and Development. ICD, International Classification of Diseases.

**Supplementary Table 5. Judgment results and functional impairment score of long-term care service database in the National Health Insurance Service-Senior (NHIS-Senior) cohort (at baseline year, 2008)**

		N	%
<b>Number of applicants</b>		34,483	100.0%
<b>Judgment results*</b>	First grade	6,161	17.9%
	Second grade	5,786	16.8%
	Third grade	9,682	28.1%
	Non-rating	5,228	15.2%
	Dismissal	7,626	22.1%
<b>Functional impairment score</b>			
Physical function	0	3,665	10.6%
	1-19	3,864	11.2%
	20-39	8,794	25.5%
	40-59	10,270	29.8%
	60-79	4,473	13.0%
	80+	3,417	9.9%
Cognitive function	0	2,196	6.4%
	1-19	4,545	13.2%
	20-39	5,341	15.5%
	40-59	9,697	28.1%
	60-79	5,180	15.0%
	80+	7,524	21.8%
Behavioural change score	0	18,720	54.3%
	1-19	5,285	15.3%
	20-39	6,722	19.5%
	40-59	3,340	9.7%
	60+	416	1.2%
Nursing care score	0	30,331	88.0%
	1-19	3,147	9.1%
	20-39	576	1.7%
	40+	429	1.2%
Rehabilitation score	0	9,878	28.6%

1-19	6,718	19.5%
20-39	10,669	30.9%
40-59	5,247	15.2%
60+	1,448	4.2%

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\* Grade 1: A person who is completely dependent on the help of another person to go about daily life (overall functional impairment score over 95).

Grade 2: A person who is mostly dependent on the help of another person to go about daily life (overall functional impairment score between 75 and 95).

Grade 3: A person who is in partial need of the help of another person to go about daily life (overall functional impairment score between 51 and 75).