

Supplementary Table 1. Age- and sex-specific distributions of the National Health Insurance Service - Health Screening Cohort (NHIS-HEALS) at baseline (2002), all health screening participants in 2002-2003 (the source population of the National Health Information Database), and the entire Korean population in 2002.

Age (years)	Sex	Cohort population at baseline (2002)			All participants to Korea National health screening in 2002-2003		The entire Korean population in 2002	
		N	%	(95% CI)	N	%	N	%
All		514,866	100.0		5,148,695	100.0	17,594,067	100.0
40-49	Men	136,570	26.5	(26.4, 26.6)	1,366,473	26.5	4,018,655	22.8
	Women	100,411	19.5	(19.4, 19.6)	1,002,320	19.5	3,878,118	22.0
50-59	Men	78,109	15.2	(15.1, 15.3)	784,401	15.2	2,259,393	12.8
	Women	66,923	13.0	(12.9, 13.1)	668,362	13.0	2,286,001	13.0
60-69	Men	49,961	9.7	(9.6, 9.8)	499,763	9.7	1,601,308	9.1
	Women	51,195	9.9	(9.9, 10.0)	510,728	9.9	1,917,494	10.9
70-79	Men	14,485	2.8	(2.8, 2.9)	145,547	2.8	598,191	3.4
	Women	17,212	3.3	(3.3, 3.4)	171,101	3.3	1,034,907	5.9

* The information on the entire Korean population came from Statistics Korea.

† The difference between the cohort population at baseline and all participants in the Korea National Health screening was not statistically significant ($p > 0.05$ by the two-proportion Z-test), while the difference between the cohort population at baseline and the entire Korean population was statistically significant ($p < 0.05$ by the two-proportion Z-test), except for women aged 50-59 years.

Supplementary Table 2. Major variables in the National Health Insurance Service-National Health Screening Cohort database (NHIS-HEALS),

Domain	Variables	Measurement methods			Diagnostic tool (devices and method)
		Measured*	Self-reported	Administration data	
Target health problems	Hypertension	Systolic blood pressure	√		Digital or automatic blood pressure monitor
		Diastolic blood pressure	√		
	Diabetes mellitus	Fasting blood glucose	√		Enzymatic method
	Dyslipidemia	Total cholesterol	√		Enzymatic method
		Triglyceride	√		
		HDL cholesterol	√		
		LDL cholesterol	√		
	Anaemia	Hemoglobin	√		Cyanmethemoglobin method
	Kidney/urinary disease	Urine glucose	√		Urine test strip
		Urine blood	√		
		Urine pH	√		
		Urine protein	√		
	Chronic kidney disease	Creatinine	√		Jaffe endpoint or Jaffe kinetic method
	Liver disease	AST (SGOT)	√		NADH UV method
		ALT (SGPT)	√		
		r-GTP	√		
Frailty/lower leg weakness	Neurologic examination for lower leg for subjects at age 40 or 66	√		SZASZ or IFCC (Carboxy-GGNA) method Straight leg raise (SLR) Test Timed up and go (TUG) Test	
Osteoporosis	Bone density for subjects at age 40 or 66	√		DEXA or peripheral DEXA (PDEXA), quantitative CT (QCT), or quantitative US (QUS)	
Periodontal diseases	Dental examination	√	√		
Cognitive	Mental health screening	√	√	Korea Dementia Screening	

impairment, depression			Questionnaire (KDSQ)-C for dementia The Center for Epidemiological Studies (CES)-D (40 years), The Geriatric Depression Scale (GDS) (66 years) for depression
Common and uncommon diseases	Disease diagnosis per ICD-10 codes; Operation and procedure history, Medication history (generic name code, dose, duration of prescription, and material codes)		√
All cause- and cause- specific deaths	Vital statistics including dates and causes of deaths		√
Risk factors	Cigarette smoking	Cigarette smoking status	√
		Daily smoking dose	√
		Past daily smoking dose	√
		Current daily smoking dose	√
		Smoking duration	√
		Smoking duration (ex-smoker)	√
		Smoking duration (current smoker)	√
	Alcohol	Drinking frequency	√
		Days of drinking per week	√
		Amount of drinking per count	√
		Amount of drinking per day	√
	Obesity	Body mass index	√
		Waist circumference	√
Physical activity	Days of activity per week	√	
	Days of vigorous activity per week	√	
	Days of moderate activity per week	√	

		Days of mild activity per week		√
	Dental caries, etc.	Dental examination	√	√
Past medical history and family history	Past medical history	Hypertension, diabetes mellitus, dyslipidemia, pulmonary tuberculosis, stroke, ischemic heart disease, etc.		√
	Family history	Hypertension, diabetes mellitus, stroke, ischemic heart disease, etc.		√
Health care utilisation		Date of visit, types of medical institutions (clinics/hospitals/tertiary hospitals/public health centers), types of visit (inpatient/outpatient/emergency/intensive care), length of stay, medical cost (insurer/patient)		√
Health care provider		Location, type of hospitals, number of beds, medical equipment, human resources, specialties of physicians		√
Socioeconomic and demographic factors		Age, sex, age, residential area, insurance type (the employee insured, the self-employed insured, dependents, medical aid), monthly insurance contributions (a proxy for income), types and grades of disabilities†		√

* Measured only once in the screening programme.

† Types and grades of disabilities are based on the Act on Welfare of Persons With Disabilities, which includes physical and mental disorders (such as visual and hearing impairment, orthopedic impairment, and mental retardation).

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-National Health Screening Cohort database (NHIS-HEALS) (at baseline year, 2002-2003).

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	Acute upper respiratory infections and influenza (J00-J11)	63.5	46.6	46.5	Acute upper respiratory infections and influenza (J00-J11)	57.6	41.6	41.5	Acute upper respiratory infections and influenza (J00-J11)	70.6	52.5	52.3
2	Dyspepsia and other diseases of stomach and duodenum (K29-K31)	43.6	29.5	29.7	Dyspepsia and other diseases of stomach and duodenum (K29-K31)	36.4	24.3	24.5	Dyspepsia and other diseases of stomach and duodenum (K29-K31)	52.2	35.5	35.6
3	Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)	34.0	22.2	22.3	Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)	30.3	19.6	19.7	Other diseases of the eye and adnexa (H00-H59, except H25-H26, H28)	38.5	25.0	25.2
4	Soft tissue disorders (M60-M79)	31.2	19.9	20.1	Other diseases of upper respiratory tract (J30-J34, J36-J39)	27.8	17.5	17.3	Soft tissue disorders (M60-M79)	38.4	24.4	24.6
5	Other acute lower respiratory infections (J20-J22)	31.5	19.7	19.7	Other acute lower respiratory infections (J20-J22)	27.2	17.1	17.2	Other acute lower respiratory infections (J20-J22)	36.5	22.8	22.8
6	Other diseases of upper respiratory tract	30.7	19.3	19.0	Hypertensive diseases (I10-I15)	19.5	17.1	17.8	Other diseases of upper respiratory tract	34.2	21.5	21.3

	(J30-J34, J36-J39)								(J30-J34, J36-J39)			
7	Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)	31.1	18.7	18.7	Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)	28.5	17.0	17.0	Other arthropathies (M00-M15, M18-M22, M24-M25)	31.4	20.6	21.1
8	Hypertensive diseases (I10-I15)	21.3	18.2	19.0	Dermatitis, eczema and papulosquamous disorders (L20-L45)	25.8	16.7	16.8	Other injuries (S10-S51, S53-S71, S73-S81, S83-T14, T79)	34.1	20.5	20.6
9	Dermatitis, eczema and papulosquamous disorders (L20-L45)	28.3	17.8	17.8	Soft tissue disorders (M60-M79)	25.2	16.0	16.2	Dorsalgia (M54)	30.2	19.7	20.1
10	Other symptoms, signs and abnormal clinical and laboratory findings (R00-R99, except R07, R10, R69)	25.7	15.6	15.8	Other infectious and parasitic diseases (A00-B99, except A00-A08, A09, A15-A19, B90, A40-A41, B20-B24)	22.8	13.4	13.3	Dermatitis, eczema and papulosquamous disorders (L20-L45)	31.3	19.3	19.2

* Disease codes were classified according to the International Shortlist for Hospital Morbidity Tabulation (ISHMT) recommended by the World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD)

Life-cycle							
Period	Early childhood	Youth ^a		Adult & Senior			
Eligibility	Under 6 yrs	6-18 yrs (juvenile: 15-19 yrs)		Target group ^b	Employed insured Self-employed insured Dependent older than 40 yrs	40, 66 yrs	
Screening program	Early childhood health screening	Student screening	Juvenile screening	Cancer screening	General health screening	Oral screening	Transitional age health screening

Supplementary Figure 1. National health screening system in Korea.

a) Youth screening programmes are managed by the Ministry of the Education

b) Cancer screening programmes are eligible for targeted groups depending on the cancer type

Gastroscopy or UGI are recommended to men and women aged 40 or older for gastric cancer screening. Occult blood tests and/or rectal examinations are recommended to those aged 50 or older for colorectal cancer. Mammography is recommended to women aged 40 or older for breast cancer. Pap smears are recommended to women aged 20 or older for uterine cervix cancer; the alpha fetoprotein test is recommended to high-risk men and women aged 40 or older for liver cancer, where high risk is defined as: 1) being considered in a high-risk group for liver cancer based on the insurance benefit details over the last two years, or 2) testing positive for hepatitis B surface antigen or hepatitis C antibody in the previous year's health examination

The NHIS-HEALS covers the screening programmes in the black box.