

SUPPLEMENTARY METHODS

Part 1

Predicted appendicular skeletal muscle mass index (kg/m^2)

<men> $-2.236 - 0.011 \times (\text{age}) + 0.081 \times (\text{height, cm}) + 0.324 \times (\text{weight, kg}) - 0.121 \times (\text{waist circumference, cm}) - 0.008 \times (\text{serum creatinine, mg/dL}) + 0.200 \times (\text{moderate physical activity}) + 0.587 \times (\text{vigorous physical activity}) - 0.195 \times (\text{past smoker}) - 0.016 \times (\text{current smoker}) + 0.004 \times (\text{moderate drinker}) + 0.151 \times (\text{heavy drinker})$

<women> $-8.447 + 0.002 \times (\text{age}) + 0.091 \times (\text{height, cm}) + 0.203 \times (\text{weight, kg}) - 0.034 \times (\text{waist circumference, cm}) + 0.539 \times (\text{serum creatinine, mg/dL}) + 0.103 \times (\text{moderate physical activity}) + 0.362 \times (\text{vigorous physical activity}) - 0.203 \times (\text{past smoker}) + 0.000 \times (\text{current smoker}) + 0.103 \times (\text{moderate drinker}) + 0.031 \times (\text{heavy drinker})$

Predicted body fat mass index (kg/m^2)

<men> $0.561 - 0.012 \times (\text{age}) - 0.133 \times (\text{height, cm}) + 0.310 \times (\text{weight, kg}) + 0.199 \times (\text{waist circumference, cm}) + 0.253 \times (\text{serum creatinine, mg/dL}) - 0.247 \times (\text{moderate physical activity}) - 0.878 \times (\text{vigorous physical activity}) + 0.708 \times (\text{past smoker}) - 0.275 \times (\text{current smoker}) + 0.077 \times (\text{moderate drinker}) - 0.291 \times (\text{heavy drinker})$

<women> $12.269 - 0.014 \times (\text{age}) - 0.172 \times (\text{height, cm}) + 0.530 \times (\text{weight, kg}) + 0.058 \times (\text{waist circumference, cm}) - 0.314 \times (\text{serum creatinine, mg/dL}) - 0.123 \times (\text{moderate physical activity}) - 0.541 \times (\text{vigorous physical activity}) + 0.261 \times (\text{past smoker}) - 0.242 \times (\text{current smoker}) - 0.218 \times (\text{moderate drinker}) - 0.182 \times (\text{heavy drinker})$

Predicted lean body mass index (kg/m^2)

<men> $-0.296 + 0.012 \times (\text{age}) + 0.134 \times (\text{height, cm}) + 0.675 \times (\text{weight, kg}) - 0.201 \times (\text{waist circumference, cm}) - 0.249 \times (\text{serum creatinine, mg/dL}) + 0.270 \times (\text{moderate physical activity}) + 0.924 \times (\text{vigorous physical activity}) - 0.559 \times (\text{past smoker}) + 0.234 \times (\text{current smoker}) - 0.046 \times (\text{moderate drinker}) + 0.324 \times (\text{heavy drinker})$

<women> $-11.941 + 0.015 \times (\text{age}) + 0.171 \times (\text{height, cm}) + 0.457 \times (\text{weight, kg}) - 0.060 \times (\text{waist circumference, cm}) + 0.428 \times (\text{serum creatinine, mg/dL}) + 0.181 \times (\text{moderate physical activity}) + 0.654 \times (\text{vigorous physical activity}) - 0.254 \times (\text{past smoker}) + 0.221 \times (\text{current smoker}) + 0.209 \times (\text{moderate drinker}) + 0.126 \times (\text{heavy drinker})$

Part 2

Definition of covariates

1) Smoking history (never, former, and current)

Definition and measurement of variables like usual smoking habits were obtained by questionnaire in the health examination program. Smoking status was used to categorize participants into three groups: none, former smoker, and current smoker. Current smoker was classified according to the World Health Organization definition as a person who has smoked more than five packs (100 cigarettes) in a lifetime and smoked daily or occasionally for the last 28 days. Former smoker was defined as a person who had smoked more than 100 cigarettes in a lifetime and had not smoked in the last 28 days [1].

2) Alcohol consumption (none, moderate, and heavy)

Definition and measurement of variables like usual alcohol consumption were obtained by questionnaire in the health examination program. Alcohol consumption was categorized into three groups: none, moderate drinker, and heavy drinker. Differentiation between moderate and heavy drinker was based on whether a patient usually takes more than 14 drinks/7 drinks per week for men/women. The drinks were calculated by multiplying the average drinking frequency per week by the number of drinks per occasion.

3) Physical activity (low, moderate)

Physical activity was assessed using the Korean version of the International Physical Activity Questionnaire-short form. We created composite physical activity based on Metabolic Equivalent Task (MET)-minutes/week (walking: 3.3 METs; moderate physical activity: 4.0 METs; vigorous physical activity: 8.0 METs), which was categorized as follows based on total physical activity metabolic equivalents: low (<600 METs), moderate (600–2,999 METs), and vigorous ($\geq 3,000$ METs) [2,3].

Comorbidities

1) Hypertension

Hypertension was defined as using at least one claim of International Classification of Diseases, 10th Revision (ICD-10) code (I10–I15) with the prescription of an anti-hypertensive agent, claims of ICD-10 code (I10–I15) more than two times, a systolic blood pressure of ≥ 140 mm Hg and a diastolic blood pressure of ≥ 90 mm Hg or positive checking in self-report questionnaire on hypertension in the health examination program.

2) Diabetes mellitus

Diabetes mellitus was as defined using at least one claim of ICD-10 code (E11–14) with the prescription of an anti-diabetic agent, claims of ICD-10 code (E11–14) more than two times, fasting serum glucose concentration of ≥ 7.0 mmol/L or positive checking in self-report questionnaire on diabetes mellitus in the health examination program.

3) Dyslipidemia

Dyslipidemia was defined as using at least one claim of ICD-10 code (E78) with the prescription of an anti-dyslipidemic agent, claims of ICD-10 code (E78) more than two times or total cholesterol level of ≥ 240 mg/dL.

4) Cancer

Cancer was defined as using claims of ICD-10 code (C00–C97) more than two times with cancer specific deductible code (V027, V193–4) from the Health Insurance Review and Assessment Service.

5) Renal disease

Renal disease was defined as using claims of ICD-10 codes (N17–19, I12–13, E08.2, E10.2, E11.2, E13.2) more than two times or estimated glomerular filtration rate of < 60 mL/min/

1.73 m².

6) Charlson comorbidity index (0, 1, or ≥ 2).

The Charlson comorbidity index score was calculated for each subject based on diseases [4] diagnosed before index date and divided into three groups (0, 1, and ≥ 2 scores).

SUPPLEMENTARY REFERENCES

1. Lee KH, Lee CM, Kwon HT, Oh S. Relationship between obesity and smoking in Korean men: data analyses from the third and fourth Korea National Health and Nutrition Examination Surveys (KNHANES). *J Korean Soc Res Nicotine Tob* 2010;1:115-23.
2. Kim DH, Lee EJ, Lee JY, Lee DC. The association and the characteristics of the smoking status and differences in physical activity level in Korean adults: the Sixth Korea National Health and Nutrition Examination Survey (KNHANES VI-1), 2013. *Korean J Fam Pract* 2015;5(Suppl 3):S510-6.
3. Oh JY, Yang YJ, Kim BS, Kang JH. Validity and reliability of Korean version of International Physical Activity Questionnaire (IPAQ) short form. *J Korean Acad Fam Med* 2007;28:532-41.
4. Kim KH. Comorbidity adjustment in health insurance claim database. *Health Policy Manag* 2016;26:71-8.