

Supplementary Table SI. Baseline characteristics are summarized based on MetS and No MetS

Variables	Overall	No MetS	MetS	<i>P</i>
N	7063	6143	920	
Age, years	58.0 [51.0, 65.0]	58.0 [51.0, 65.0]	57.0 [51.0, 63.0]	<0.001
Sex (N, %)				
Female	3238 (45.8)	2628 (42.8)	610 (66.3)	<0.001
Male	3825 (54.2)	3515 (57.2)	310 (33.7)	
Education level (N, %)				0.080
College or above	237 (3.4)	199 (3.2)	38 (4.1)	
High school	1972 (27.9)	1695 (27.6)	277 (30.1)	
Primary school or below	4854 (68.7)	4249 (69.2)	605 (65.8)	
Location (N, %)				<0.001
City/town	1128 (16.0)	939 (15.3)	189 (20.6)	
Village	5925 (84.0)	5197 (84.7)	728 (79.4)	
Marital status (N, %)				0.173
Married	6260 (88.7)	5432 (88.5)	828 (90.1)	
Never-married/separated/widowed	796 (11.3)	705 (11.5)	91 (9.9)	
Smoking (N, %)				<0.001
Current	2381 (34.7)	2198 (36.9)	183 (20.4)	
Former	574 (8.4)	511 (8.6)	63 (7.0)	
Never	3906 (56.9)	3254 (54.6)	652 (72.6)	
Drinking (N, %)				<0.001
Drinking	2123 (32.4)	1932 (33.9)	191 (22.4)	
Never	4421 (67.6)	3759 (66.1)	662 (77.6)	
BMI (kg/m ²)	21.9 [20.1, 24.0]	21.6 [19.9, 23.7]	24.0 [22.4, 26.1]	<0.001
Heart Disease (N, %)	747 (10.7)	622 (10.2)	125 (13.8)	0.001
Stroke (N, %)	159 (2.3)	137 (2.2)	22 (2.4)	0.842
Cancer (N, %)	48 (0.7)	42 (0.7)	6 (0.7)	1.000
Arthritis (N, %)	2418 (34.5)	2107 (34.5)	311 (34.2)	0.886
Kidney disease (N, %)	419 (6.0)	374 (6.2)	45 (5.0)	0.182
Lipid-lowering drugs (N, %)	235 (3.4)	168 (2.8)	67 (7.5)	<0.001
hsCRP (mg/l)	0.9 [0.5, 1.9]	0.9 [0.5, 1.8]	1.1 [0.6, 2.1]	<0.001
RC (mg/dl)	17.0 [9.7, 26.7]	16.2 [9.7, 25.5]	20.9 [12.4, 32.9]	<0.001
RCII	1.5 [0.6, 3.8]	1.4 [0.6, 3.5]	2.3 [1.0, 5.9]	<0.001
Quartiles of RCII (N, %)				<0.001
Q1	2238 (31.7)	2042 (33.2)	196 (21.3)	
Q2	1996 (28.3)	1760 (28.7)	236 (25.7)	

Q3	1596 (22.6)	1346 (21.9)	250 (27.2)	<0.001
Q4	1233 (17.5)	995 (16.2)	238 (25.9)	
The combination of RC and hsCRP				
Group1	2060 (29.2)	1866 (30.4)	194 (21.1)	
Group2	1467 (20.8)	1311 (21.3)	156 (17.0)	
Group3	1782 (25.2)	1565 (25.5)	217 (23.6)	
Group4	1754 (24.8)	1401 (22.8)	353 (38.4)	
Abbreviations: BMI, body mass index; RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; MetS, metabolic syndrome				

Supplementary Table SII. Association of combination hsCRP and RC levels with new-onset MetS stratified by age

	Age < 60			Age ≥ 60			<i>P</i> for interaction
	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	
The combination of RC and hsCRP		4117		2946			0.296
Group1	124 (9.9)	ref		70 (8.6)	ref		
Group2	94 (12.5)	1.36 (0.95-1.93)	0.092	62 (8.7)	1.15 (0.74-1.79)	0.529	
Group3	143 (12.9)	1.37 (0.99-1.89)	0.056	74 (11.0)	1.49 (0.98-2.27)	0.063	
Group4	221 (21.9)	2.73 (2.01-3.73)	<0.001	132 (17.7)	2.12 (1.43-3.17)	0.001	
<i>P</i> for trend			<0.001			<0.001	
Quartiles of RCII							0.63
Q1	128 (9.4)			68 (7.8)			
Q2	151 (13.0)	1.45 (1.06-1.89)	0.020	85 (10.2)	1.44 (0.96-2.18)	0.080	
Q3	157 (17.4)	2.37 (1.73-3.24)	<0.001	93 (13.4)	1.91 (1.27-2.91)	0.002	
Q4	146 (21.2)	2.46 (1.73-3.49)	<0.001	92 (16.9)	2.42 (1.57-3.74)	<0.001	
<i>P</i> for trend			<0.001			<0.001	

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval.
Adjusted for sex, education level, residence, and marital status, smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SIII. Association of combination hsCRP and RC levels with new-onset MetS stratified by sex

	Female			Male			<i>P</i> for interaction
	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	
The combination of RC and hsCRP		3238		3825			0.461
Group1	137 (13.1)	ref		57 (5.6)	ref		
Group2	111 (18.3)	1.28 (0.92-1.78)	0.139	45 (5.2)	1.15 (0.69-1.93)	0.591	
Group3	141 (16.8)	1.25 (0.92-1.69)	0.149	76 (8.1)	1.66 (1.04-2.68)	0.036	
Group4	221 (29.6)	2.28 (1.69-3.07)	<0.001	132 (13.1)	2.60 (1.69-4.08)	0.001	
<i>P</i> for trend			<0.001			<0.001	
Quartiles of RCII							0.735
Q1	144 (12.5)			52 (4.8)			
Q2	168 (18.1)	1.33 (1.00-1.78)	0.054	68 (6.4)	1.66 (1.03-2.70)	0.040	
Q3	156 (23.9)	2.00 (1.48-2.71)	<0.001	94 (10.0)	2.36 (1.50-3.81)	<0.001	
Q4	142 (27.9)	2.09 (1.49-2.94)	<0.001	96 (13.3)	3.03 (1.89-4.95)	<0.001	
<i>P</i> for trend			<0.001			<0.001	

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval.

Adjusted for age, education level, residence, and marital status, smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SIV. Association of combination hsCRP and RC levels with new-onset MetS stratified by BMI

	Not overweight			Overweight / Obesity			<i>P</i> for interaction
	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	Events (<i>N</i> , %)	OR (95% CI)	<i>P</i>	
The combination of RC and hsCRP		4234		1417			0.767
Group1	85 (6.2)	ref		65 (18.2)	ref		
Group2	50 (5.7)	0.98 (0.65-1.46)	0.923	67 (20.2)	1.23 (0.82-1.85)	0.322	
Group3	82 (7.6)	1.34 (0.96-1.88)	0.085	73 (21.5)	1.29 (0.87-1.93)	0.211	
Group4	102 (11.3)	2.26 (1.62-3.16)	<0.001	119 (30.5)	2.09 (1.44-3.07)	0.001	
<i>P</i> for trend			<0.001			<0.001	
Quartiles of RCII							0.93
Q1	86 (5.8)	ref		66 (17.7)	ref		
Q2	90 (7.4)	1.33 (0.95-1.85)	0.096	82 (19.6)	1.28 (0.87-1.88)	0.213	
Q3	75 (8.6)	1.77 (1.25-2.52)	0.001	105 (26.7)	1.89 (1.30-2.78)	0.001	

Q4	68 (10.4)	2.36 (1.63-3.40)	<0.001	71 (30.5)	2.09 (1.37-3.20)	<0.001
<i>P</i> for trend			<0.001			<0.001

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval.

Adjusted for age, sex, education level, residence, and marital status, smoking status, alcohol consumption, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SV. Association of combination hsCRP and RC levels with new-onset MetS after excluding participants using lipid-lowering medications

	Events (N, %)	Model I		Model II		Model III	
		OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
The combination of RC and hsCRP							
Group1	174 (8.9)	Ref		Ref		Ref	
Group2	148 (10.7)	1.23 (0.97-1.55)	0.082	1.39 (1.10-1.76)	0.006	1.35 (1.01-1.79)	0.041
Group3	202 (11.9)	1.38 (1.12-1.71)	0.003	1.45 (1.17-1.81)	<0.001	1.49 (1.15-1.93)	0.003
Group4	301 (18.7)	2.36 (1.93-2.88)	<0.001	2.68 (2.18-3.29)	<0.001	2.64 (2.05-3.40)	<0.001
<i>P</i> for trend			<0.001		<0.001		<0.001
Quartiles of RCII							
Q1	180 (8.5)	Ref		Ref		Ref	
Q2	219 (11.5)	1.40 (1.14-1.72)	0.002	1.49 (1.20-1.84)	<0.001	1.48 (1.15-1.90)	0.002
Q3	224 (15.1)	1.91 (1.55-2.36)	<0.001	2.22 (1.80-2.76)	<0.001	2.31 (1.79-2.99)	<0.001
Q4	202 (17.9)	2.35 (1.89-2.91)	<0.001	2.76 (2.21-3.44)	<0.001	2.55 (1.93-3.37)	<0.001
<i>P</i> for trend			<0.001		<0.001		<0.001

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval.

Model I was unadjusted;

Model II adjusted for age, sex, education level, residence, and marital status;

Model III further adjusted for smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer and kidney disease.

Supplementary Table SVI. Association of combination hsCRP and RC levels with new-onset MetS after imputation

	Events (N, %)	Model I		Model II		Model III	
		OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
The combination of RC and hsCRP							
Group1	194 (21.1)	Ref		Ref		Ref	
Group2	156 (17.0)	1.14 (0.92-1.43)	0.234	1.30 (1.03-1.63)	0.024	1.28 (1.02-1.61)	0.033
Group3	217 (23.6)	1.33 (1.09-1.64)	0.006	1.40 (1.14-1.72)	0.002	1.40 (1.14-1.73)	0.002
Group4	353 (38.4)	2.42 (2.01-2.93)	<0.001	2.74 (2.26-3.33)	<0.001	2.68 (2.21-3.27)	<0.001
<i>P</i> for trend			<0.001		<0.001		<0.001

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; OR, odds ratio; 95% CI, 95% confidence interval.

Model I was unadjusted;

Model II adjusted for age, sex, education level, residence, and marital status;

Model III further adjusted for smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SVII. Joint association of hsCRP and RC categories with new-onset MetS after multiple imputation

	Events (N, %)	Model I		Model II		Model III	
		OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
The combination of RC and hsCRP							
hsCRP < 1 mg/L and RC < 17 mg/dL	194 (21.1)	Ref	Ref	Ref	Ref	Ref	Ref
3 mg/L > hsCRP ≥ 1 mg/L and RC < 17 mg/dL	117 (12.7)	1.31 (1.03-1.67)	0.028	1.46 (1.14-1.87)	0.003	1.43 (1.11-1.83)	0.005
hsCRP ≥ 3 mg/L and RC < 17 mg/dL	39 (4.2)	0.82 (0.57-1.17)	0.292	0.98 (0.67-1.39)	0.899	0.98 (0.67-1.40)	0.906
hsCRP < 1 mg/L and RC ≥ 17 mg/dL	217 (23.6)	1.33 (1.09-1.64)	0.006	1.40 (1.14-1.72)	0.002	1.40 (1.14-1.73)	0.002

3mg/L > hsCRP ≥ 1							
mg/L and RC ≥ 17	238 (25.9)	2.41 (1.97-2.97)	<0.001	2.70 (2.19-3.33)	<0.001	2.64 (2.14-3.26)	<0.001
mg/dL							
hsCRP ≥ 3 mg/L	115 (12.5)	2.44 (1.89-3.14)	<0.001	2.83 (2.18-3.66)	<0.001	2.78 (2.14-3.61)	<0.001
and RC ≥ 17 mg/dL							
<i>P</i> for trend			<0.001		<0.001		<0.001

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; OR, odds ratio; 95% CI, 95% confidence interval.

Model I was unadjusted;

Model II adjusted for age, sex, education level, residence, and marital status;

Model III further adjusted for smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SVIII. Independent associations of RC and hsCRP with new-onset MetS after multiple imputation

	Events (<i>N</i> , %)	Unadjusted model		Adjusted model	
		OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
hsCRP < 1 mg/L					
RC < 17 mg/dL	194 (47.2)	Ref	Ref	Ref	Ref
RC ≥ 17 mg/dL	217 (52.8)	1.33 (1.09-1.64)	0.006	1.39 (1.12-1.71)	0.002
hsCRP ≥ 1 mg/L					
RC < 17 mg/dL	156 (30.6)	Ref	Ref	Ref	Ref
RC ≥ 17 mg/dL	353 (69.4)	2.12 (1.73-2.60)	<0.001	2.12 (1.72-2.62)	<0.001
RC < 17 mg/dL					
hsCRP < 1 mg/L	194 (55.4)	Ref	Ref	Ref	Ref
hsCRP ≥ 1 mg/L	156 (44.6)	1.14 (0.92-1.43)	0.234	1.31 (1.04-1.64)	0.024
RC ≥ 17 mg/dL					
hsCRP < 1 mg/L	217 (38.1)	Ref	Ref	Ref	Ref
hsCRP ≥ 1 mg/L	353 (61.9)	1.82 (1.51-2.19)	<0.001	1.94 (1.60-2.35)	<0.001

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; OR, odds ratio; 95% CI, 95% confidence interval.

Unadjusted model was unadjusted;

Adjusted model adjusted for age, sex, education level, residence, and marital status, smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SIX. Association between RCII and new-onset MetS after multiple imputation

	Events (<i>N</i> , %)	Model I		Model II		Model III	
		OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Quartiles of RCII							
Q1	196 (21.3)	Ref		Ref		Ref	
Q2	236 (25.7)	1.40 (1.14-1.71)	0.001	1.49 (1.22-1.82)	<0.001	1.50 (1.22-1.84)	<0.001
Q3	250 (27.2)	1.94 (1.59-2.36)	<0.001	2.23 (1.82-2.74)	<0.001	2.20 (1.80-2.71)	<0.001
Q4	238 (25.9)	2.49 (2.03-3.06)	<0.001	2.91 (2.36-3.59)	<0.001	2.86 (2.31-3.53)	<0.001
<i>P</i> for trend		<0.001		<0.001		<0.001	

Abbreviations: RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval.

Model I was unadjusted;

Model II adjusted for age, sex, education level, residence, and marital status;

Model III further adjusted for smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.

Supplementary Table SX. Associations of RC, hsCRP and RCII with individual components of MetS

	RC			hsCRP			RCII		
	OR (95% CI)	<i>P</i>	AUC (95% CI)	OR (95% CI)	<i>P</i>	AUC (95% CI)	OR (95% CI)	<i>P</i>	AUC (95% CI)
AO	1.003 (0.999-1.006)	0.169	0.527 (0.513-0.541)	1.002 (0.992-1.012)	0.626	0.532 (0.519-0.546)	1.000 (0.996-1.002)	0.824	0.536 (0.522-0.550)
HTG	1.029 (1.025-1.034)	<0.001	0.669 (0.652-0.686)	1.002 (0.991-1.011)	0.675	0.554 (0.537-0.571)	1.002 (0.999-1.005)	0.174	0.635 (0.618-0.651)
HTN	1.004 (1.001-1.008)	0.007	0.523 (0.509-0.537)	1.000 (0.992-1.008)	0.968	0.523 (0.509-0.537)	1.000 (0.996-1.002)	0.698	0.531 (0.517-0.546)
LHDL	1.010 (1.006-1.014)	<0.001	0.567 (0.549-0.584)	0.997 (0.983-1.007)	0.559	0.533 (0.516-0.550)	1.000 (0.996-1.002)	0.802	0.559 (0.542-0.576)
HG	1.007 (1.003-1.011)	<0.001	0.559 (0.541-0.577)	0.998 (0.986-1.008)	0.707	0.531 (0.513-0.549)	1.000 (0.996-1.002)	0.951	0.560 (0.542-0.578)

Abbreviations: RC, residual cholesterol; hsCRP, high-sensitivity C-reactive protein; RCII, residual cholesterol inflammation index; OR, odds ratio; 95% CI, 95% confidence interval; AUC, area under the receiver operating characteristic curve; AO, abdominal obesity; HTG,

hypertriglyceridemia; HTN, hypertension; LHD_L, low high-density lipoprotein cholesterol; HG, hyperglycemia.

All adjusted for age, sex, education level, residence, marital status, smoking status, alcohol consumption, BMI, heart disease, stroke, arthritis, cancer, kidney disease, and use of lipid-lowering medications.