

Appendix 1. Description and results from previous exploratory factor analyses of the Metabolic Syndrome

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Edwards et al (1)	<ul style="list-style-type: none"> • Cross-Sectional • California (USA) • Females (N=281) • Mean age 50 • 90% White 	Diabetes, missing data, medications for high blood pressure	BMI, waist circumference, WHR, fasting and post glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements including LDL peak particle diameter (LDL-PPD), blood pressure measurements	<ul style="list-style-type: none"> • Principal components • Varimax (orthogonal) rotation • Factor loading threshold 0.40 • Components with eigenvalues greater than 1 were included 	<ol style="list-style-type: none"> 1. Fat distribution (Body weight, waist circumference, fasting insulin and glucose) 2. Insulin/Glucose (fasting and post challenge glucose and insulin, systolic blood pressure) 3. Lipid (High LDL-PPD, High Triglycerides and low HDL-Cholesterol) <p>[66%]</p>
Edwards et al (2)	<ul style="list-style-type: none"> • Cross-Sectional • Hawaii (USA) • Elderly Japanese-American Men (N=3,159) • Mean age 78 • 2,760 nondiabetics and 399 diabetics 	Missing data, patients treated with insulin	BMI, waist circumference, WHR, fasting plasmatic insulin and glucose, plasmatic lipid measurements, blood pressure measurements	<ul style="list-style-type: none"> • Principal components • Varimax (orthogonal) rotation • Factor loading threshold 0.40 • Components with eigenvalues greater than 1 were included 	<ol style="list-style-type: none"> 1. Fat distribution (Body weight, waist circumference,) 2. Blood Pressure (Systolic and diastolic Blood Pressure) 3. Lipid (High Triglycerides, low HDL-Cholesterol, fasting glucose) 4. Insulin/Glucose (fasting glucose and insulin) <p>[75%]</p>

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Meigs et al (3)	<ul style="list-style-type: none"> • Cross-sectional • Framingham (USA) • Children and spouses of subjects of the original Framingham cohort (N=1,150 men, 1,308 women) • Mean age 54 	Missing data, patients with diabetes.	BMI, waist circumference, WHR, fasting and post glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements, blood pressure measurements	<ul style="list-style-type: none"> • Principal components • Varimax (orthogonal) rotation • Factor loading threshold 0.40 • Components with eigenvalues greater than 1 were included • Analysis by sex 	<ol style="list-style-type: none"> 1. central metabolic syndrome (BMI, waist-to-hip ratio, high Triglycerides, low HDL-Cholesterol, fasting and post challenge insulin) 2. Impaired glucose tolerance (fasting and post challenge glucose and insulin) 3. Blood Pressure (BMI, Systolic and diastolic Blood Pressure) [64%]
Donahue et al (4)	<ul style="list-style-type: none"> • Cohort • Miami (USA) • Subset of 50 consecutive patients (African American and non-hispanic whites) at baseline • Mean age 35.3 SD: 5.9 • 52% male 	Missing data, patients with diabetes	Uric acid, lipid measurements, blood pressure, BMI, waist circumference, hyperinsulinemia euglycemic clamp	<ul style="list-style-type: none"> • Principal components • Varimax (orthogonal) rotation • Factor loading threshold 0.40 • Components with eigenvalues greater than 1 were included 	<ol style="list-style-type: none"> 1. Factor 1 (uric acid, systolic and diastolic blood pressure, high triglycerides, low HDL-Cholesterol, waist circumference, low insulin sensitivity) 2. Factor 2 (fasting insulin, fasting glucose, diastolic blood pressure, low insulin sensitivity) [55%]

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Leyva et al (5)	<ul style="list-style-type: none"> Cohort (baseline data analysis, 1971) London (England) 742 White males Age range 26-71 	Patients with diabetes or CHD	BMI, waist circumference, WHR, fasting and post glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements, mean arterial pressure, hemoglobin concentration; white cell count, erythrocyte sedimentation rate, uric acid, albumin, globulin, incremental glucose and insulin area	<p>Data were adjusted to the mean age of the cohort using the univariate regression coefficient</p> <ul style="list-style-type: none"> Imputation of missing values Principal components Varimax (orthogonal) rotation Components with eigenvalues greater than 1 were included Factor loading threshold 0.25 	<ol style="list-style-type: none"> Factor 1 (incremental glucose area, incremental insulin area, fasting insulin, BMI, uric acid, triglycerides) Factor 2 (globulin, albumin, white cell count, hemoglobin, potassium) Factor 3 (high triglycerides, low HDL-Cholesterol) Factor 4 (mean arterial pressure, fasting glucose, sodium, potassium, albumin) Factor 5 (hemoglobin concentration, erythrocyte sedimentation rate) <p>[14%]</p>
Leyva et al (6)	<ul style="list-style-type: none"> Cohort (only baseline data analysis, 1988) London (England) 74 males Mean age 48.4 SD: 1.3 	Patients with diabetes, CHD or hypertension	BMI, skinfold thickness ratio, insulin sensitivity, fasting and post glucose challenge plasmatic insulin and glucose, plasmatic lipid measurements, systolic and diastolic blood pressure, uric acid	<ul style="list-style-type: none"> Principal components Varimax (orthogonal) rotation Factor loading threshold 0.40 	<ol style="list-style-type: none"> Metabolic cluster (insulin sensitivity, leptin, post challenge insulin, fasting glucose and insulin, BMI) Factor 2 (post challenge glucose, systolic blood pressure, uric acid, skinfold thickness) Factor 3 (High Triglycerides, low HDL-Cholesterol) <p>[25%]</p>

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Gray et al (7)	<ul style="list-style-type: none"> • Cohort (only baseline data analysis, 1988) • Samples from Arizona, Oklahoma, North and South Dakota (USA) • American Indians (975 men and 1202 women) • Mean age 55 	Diabetic subjects	BMI, waist and hip circumferences, fasting glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure, ECG, ankle brachial index	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included (in one case greater than 0.9) • Factor loading threshold 0.40 • Analyses performed separately by sex 	<ol style="list-style-type: none"> 1. Glucose/obesity factor (BMI, glucose, insulin) 2. Blood pressure factor (systolic and diastolic blood pressure) 3. Dyslipidemia factor (Triglycerides, low HDL-Cholesterol, insulin, but insulin not included for females) <p>Factor 1 and Factor 2 (only in males) associated with prevalent CHD [70%]</p>

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Lempiainen et al (8)	<ul style="list-style-type: none"> Cohort, 7 years of follow-up Kuopio (Finland) Caucasian (396 men and 673 women) 	Diabetes	BMI, waist and hip circumferences, fasting and post oral glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure, alcohol consumption, smoking status, left ventricular hypertrophy, albumin/creatinine ratio, presence of CHD	<ul style="list-style-type: none"> Principal component analysis Varimax (orthogonal) rotation Factor loading threshold 0.40 Eigenvalues not Mentioned Separate analyses for men and women 	<p>Men</p> <ol style="list-style-type: none"> Factor 1 (BMI, waist-to-hip ratio, fasting glucose and fasting insulin, Triglycerides, low HDL-Cholesterol) Factor 2 (alcohol consumption, total cholesterol, triglycerides, low HDL-cholesterol, fasting insulin) Factor 3 (age, left ventricular hypertrophy, systolic blood pressure, albumin/creatinine ratio) Factor 4 (previous stroke, Apolipoprotein e4 allele, total cholesterol, triglycerides) <p>Women</p> <ol style="list-style-type: none"> Factor 1 (BMI, waist-to-hip ratio, fasting glucose and fasting insulin, Triglycerides, low HDL-Cholesterol) Factor 2 (previous stroke, Triglycerides, low HDL-Cholesterol, total cholesterol) Factor 3 (age, left ventricular hypertrophy, systolic blood pressure, albumin/creatinine ratio, cholesterol) Factor 4 (smoking, alcohol consumption, total cholesterol) <p>All factors predicted CHD in men, only factors 2 and 3 predicted CHD in women.</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Chen et al (9)	<ul style="list-style-type: none"> • Cross-sectional, • Bogalussa, LA (USA) • Children aged 5-17 years (2,515) • Young adults aged 18-38 years (2,007) • 65% White, 35% Black • No data available regarding % male/female 	Missing values and non-fasting samples	Ponderal index, blood pressure, lipid measurements, insulin	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.30 • Analyses stratified by race and 3 age groups 	<ol style="list-style-type: none"> 1. Factor 1 (ponderal index, fasting glucose and fasting insulin, Triglycerides, low HDL-Cholesterol) 2. Factor 2 (systolic and diastolic blood pressure, insulin) [54.6%]
Kekalainen et al (10)	<ul style="list-style-type: none"> • Cohort, 8 years of follow-up • Kuopio (Finland) • 309 siblings of diabetic (DM+) or nondiabetic (DM-) probands. • 184 sisters and 125 brothers 	Diabetes	Medical history, BMI, blood pressure, oral glucose tolerance test, lipids, uric acid, urine proteins, 1 and 2 h postchallenge insulin	<ul style="list-style-type: none"> • Principal component analysis • Quatrimax rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.40 	<p>Siblings in DM+ group</p> <ol style="list-style-type: none"> 1. Factor 1 (age, BMI, hypertension, glucose and insulin area, high Triglycerides and low HDL-Cholesterol) 2. Factor 2 (sex, HDL-cholesterol) 3. Factor 3 (total cholesterol, triglycerides) 4. Factor 4 (age, urinary protein) [66.4%] <p>Siblings in DM- group</p> <ol style="list-style-type: none"> 1. Factor 1 (age, BMI, hypertension, glucose and insulin area, high Triglycerides) 2. Factor 2 (sex, HDL-cholesterol) 3. Factor 3 (total cholesterol, triglycerides) 4. Factor 4 (urinary protein) [62.5%] <p>Factor 1 predicted the development of diabetes at 8 years of follow-up</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Pyorala et al (11)	<ul style="list-style-type: none"> • Cohort, 22 years of follow-up • Helsinki (Finland) • 970 Caucasian men • Median age 48 	Cardiovascular diseases, diabetes	BMI, subscapular and triceps skinfold thicknesses, fasting and post oral glucose challenge glucose and insulin, area under the curve (AUC), plasmatic lipid measurements, systolic and diastolic blood pressure, physical activity, predicted maximal O ₂ uptake, smoking status, incidence of cardiovascular diseases	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.40 (noted if ≥ 0.30) 	<ol style="list-style-type: none"> 1. Insulin resistance (BMI, subscapular skinfold, AUC insulin, maximal O₂ uptake, AUC glucose, mean blood pressure, and triglycerides) 2. Lipid factor (cholesterol and triglycerides) 3. Lifestyle factor (smoking and physical activity) <p>[54%]</p> <p>Factors 1 and 2 increased risk of CHD. Factor 1 increased risk of stroke after 15 years of follow-up</p>
Snehalatha et al (12)	<ul style="list-style-type: none"> • Cross-sectional • Madras (India) • Adults 40 years of age or older (N=396 men, 258 women) • Mean (SD) age 46 (8) for men and 47(8) for women. 	Diabetes Missing data	BMI, WHR, fasting and post oral glucose challenge glucose and insulin, HOMA IR, plasmatic lipid measurements, systolic and diastolic blood pressure,	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.30 	<p>Men</p> <ol style="list-style-type: none"> 1. Factor 1(BMI, 2h glucose and insulin, HOMA IR) 2. Factor 2 (BMI, systolic and diastolic blood pressure) <p>Factor 3 (BMI, total cholesterol, triglycerides, WHR)</p> <p>[65%]</p> <p>Women</p> <ol style="list-style-type: none"> 1. Factor 1(BMI, 2h glucose and insulin, HOMA IR) 2. Factor 2 (BMI, systolic and diastolic blood pressure) 3. Factor 3 (total cholesterol and triglycerides) 4. Factor 4 (IR, BMI, WHR) <p>[74%]</p>

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Sakkinen et al (13)	<ul style="list-style-type: none"> Medicare cohort, baseline data analysis only (USA) 65 years of age or older 1,690 women and 991 men Subset of 322 subjects with additional measurements was also analyzed (51% females, mean (SD) age 77 (7.4)) 	Diabetes, warfarin therapy	<p>In the whole population: BMI, waist circumference, fasting and post oral glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure</p> <p>In the subset: Same measurements plus hemostatic and inflammatory variables</p>	<ul style="list-style-type: none"> Principal component analysis Varimax (orthogonal) rotation Components with eigenvalues greater than 1 were included Factor loading threshold 0.40 	<ol style="list-style-type: none"> Body mass (weight, waist circumference, fasting insulin) Insulin/glucose (fasting and post challenge glucose, fasting and post challenge insulin) Lipids (High Triglycerides, low HDL-Cholesterol) Blood pressure (systolic and diastolic blood pressure) <p>[70%] Subset 3 additional factors (inflammation, pro-coagulation, vitamin K-dependent proteins) [66%]</p>
Chen et al (14)	<ul style="list-style-type: none"> Cross-sectional, Kinmen (Taiwan) 3659 men and 4778 women Mean (SD) age 49.2 (12.6) 	Diabetes, missing data	BMI, WHR, fasting glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure	<ul style="list-style-type: none"> Principal component analysis Varimax (orthogonal) rotation Components with eigenvalues greater than 1 were included Factor loading threshold 0.25 	<p>Men</p> <ol style="list-style-type: none"> Factor 1 (systolic and diastolic blood pressure) Factor 2 (fasting insulin, BMI, WHR, high Triglycerides and low HDL-Cholesterol) Factor 3 (fasting glucose) <p>[62%] Women</p> <ol style="list-style-type: none"> Factor 1 (systolic and diastolic blood pressure) Factor 2 (fasting insulin, BMI, WHR, high Triglycerides and low HDL-Cholesterol) Factor 3 (fasting glucose and Triglycerides) <p>[62%]</p>

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Lindblad et al (15)	<ul style="list-style-type: none"> • Cross-sectional, • California (USA) • Elderly men (N = 1,015) and women (N = 1,259) • Median age 70 years 	Sensitivity analysis excluding all hypertensive subjects	BMI, waist circumference, fasting and post oral glucose challenge plasmatic glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure, smoking history, electrocardiographic abnormalities	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.40 	<p>Men</p> <ol style="list-style-type: none"> 1. Syndrome (BMI, fasting and 2h insulin, high Triglycerides and low HDL-Cholesterol) 2. Glucose (fasting and 2h glucose) 3. Blood pressure (systolic and diastolic blood pressure) 4. LDL-Cholesterol (LDL- cholesterol) <p>[66%]</p> <p>Women</p> <ol style="list-style-type: none"> 1. Syndrome (BMI, fasting and 2h insulin, high Triglycerides, LDL-cholesterol, and low HDL-Cholesterol) 2. Glucose (fasting and 2h glucose) 3. Blood pressure (systolic and diastolic blood pressure) <p>[56%]</p> <p>The 3 factors were associated with prevalent CHD (electrocardiogram abnormalities)</p>

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Hodge et al (16)	<ul style="list-style-type: none"> • Cross-sectional • Mauritius Island • Adults (25-74 years of age) • 1414 men with mean (SD) age 41 (0.3); and 1654 women with age 42 (0.3) 	Diabetes	BMI, WHR, waist circumference, fasting and post oral glucose challenge glucose and insulin, leptin, plasmatic lipid measurements, uric acid, blood pressure, smoking history, electrocardiographic abnormalities	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.40 	<p>Men</p> <ol style="list-style-type: none"> 1. Factor 1 (BMI, WHR, leptin, fasting and 2h insulin, high triglycerides and low HDL-Cholesterol) 2. Factor 2 (systolic and diastolic blood pressure, uric acid) 3. Factor 3 (fasting and 2h insulin, fasting and 2 h glucose) <p>[55%]</p> <p>4.</p> <p>Women</p> <ol style="list-style-type: none"> 1. Factor 1 (BMI, WHR, leptin, fasting and 2h insulin, high triglycerides and low HDL-Cholesterol, uric acid) 2. Factor 2 (systolic and diastolic blood pressure, fasting glucose) 3. Factor 3 (fasting and 2h insulin, fasting and 2 h glucose) <p>[54%]</p>
Shmulewitz et al (17)	<ul style="list-style-type: none"> • Cross-sectional • Kosrae (Micronesia) • 2,188 participants (90% of the whole population) • Age 20-85, mean (SD) age 42 (14) 	<p>Missing data, diabetes</p> <p>Factor analysis of 255 males and 373 females without missing data</p>	BMI, WHR, waist circumference, fasting plasmatic glucose and insulin, plasmatic leptin and lipid measurements, apolipoproteins, blood pressure, smoking history (only in males)	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Factor loading threshold 0.40 	<ol style="list-style-type: none"> 1. Factor 1 (weight, waist, fasting insulin, leptin) 2. Factor 2 (total cholesterol, triglycerides, apo B, apo A-1) 3. Factor 3 (fasting glucose, systolic and diastolic blood pressure) 4. Factor 4 (leptin, triglycerides, apo A-1) <p>[73.1%]</p>

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Lakka et al (18)	<ul style="list-style-type: none"> Population-based cohort, 14 years of follow-up Kuopio (Finland) 1,209 men Mean (SD) Age 51.9 (5.9) 	CVD, diabetes, and cancer	BMI, waist circumference, WHR, fibrinogen, white blood cells, fasting plasmatic glucose and insulin, plasmatic lipid measurements, systolic and diastolic blood pressure, smoking and alcohol history,	<ul style="list-style-type: none"> Principal component analysis Varimax (orthogonal) rotation Components with eigenvalues greater than 1 were included Factor loading threshold 0.30 	<ol style="list-style-type: none"> Metabolic Syndrome (BMI, WHR, fasting insulin and glucose, systolic blood pressure, high Triglycerides and low HDL-Cholesterol) Factor 2 (smoking, fibrinogen, white blood cells) Factor 3 (fasting glucose, alcohol, systolic blood pressure, low triglycerides and LDL-cholesterol, and high HDL-Cholesterol) Factor 4 (LDL- cholesterol, ischemic heart disease in family) <p>[53%] The metabolic syndrome significantly increased (RRs between 3.77 and 2.43) the risk of coronary, cardiovascular, and all-cause mortality</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Hanson et al (19)	<ul style="list-style-type: none"> • Cohort • Gila River Indian Community (Arizona) • Community residents who were 20 years of age or older • 1,448 nondiabetic individuals (856 women and 592 men) with mean (SD) age 34.6 (11.7) • 470 diabetic individuals (303 women and 167 men) with mean (SD) age 43.5 (12.8) • For final analysis, both groups were combined. 	Pregnancy, insulin treatment	Fasting and 2-h plasma glucose concentrations, fasting and 2-h serum insulin concentrations, systolic and diastolic blood pressure, body weight, waist circumference, serum triglycerides, and HDL cholesterol concentrations.	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.40 	<ol style="list-style-type: none"> 1. Insulinemia (fasting insulin*glucose, 2h insulin*glucose, fasting insulin/glucose, 2h insulin/glucose) 2. Body size (body weight, waist circumference, fasting insulin*glucose) 3. Blood pressure (systolic and diastolic blood pressure) 4. Lipidemia (high Triglycerides and low HDL-Cholesterol) [79%] <p>Insulinemia, body size, and lipidemia significantly increased the risk of type 2 diabetes. (Incidence rate ratios of 1.81, 1.52, and 1.37 respectively)</p>

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Hanley et al (20)	<ul style="list-style-type: none"> • Multicenter cohort (2 centers in California and 2 in Texas (USA)) • Analysis of baseline data • 1087 nondiabetic subjects (56,4% female) • Mean (SD) age 54.8 (8.4) 	Diabetes, missing data	Glucose tolerance test, insulin sensitivity, HOMA-IR, systolic and diastolic blood pressure, BMI, waist circumference, plasma lipid and lipoproteins concentrations, urinary albumin and creatinine	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Scree plots and eigenvalues (0.9) were used to select components to be retained. included • Factor loading threshold 0.40 • Analyses performed overall and by sex, glucose tolerance status, and ethnicity. 	<ol style="list-style-type: none"> 1. Metabolic factor (BMI, waist, fasting glucose, 2 h glucose, insulin sensitivity-or HOMA IR-, high triglycerides and low HDL-Cholesterol) 2. Blood pressure (Systolic and diastolic blood pressure) <p>Men [37.7%] Women [38.9%]</p> <p>Analyses by subgroups had similar results</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Choi et al (21)	<ul style="list-style-type: none"> • Cross-sectional • Seoul (South Korea) • 1314 subjects over the age of 60 years (249 men and 1065 women) • Mean (SD) age 71.3 (6.0) for men and 70.2 (5.8) for women 	Diabetes, missing data	Fasting and 2-h plasma glucose, fasting and 2-h serum insulin, HOMA IR, BMI, systolic and diastolic blood pressure, WHR, serum triglyceride, total cholesterol and HDL cholesterol	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.30 	<p>Men</p> <ol style="list-style-type: none"> 1. Factor 1 (BMI, WHR, high triglycerides and low HDL-cholesterol, fasting and 2h insulin) 2. Factor 2 (systolic and diastolic blood pressure) 3. Factor 3 (2h insulin and glucose) 4. Factor 4 (fasting insulin and glucose) [68%] <p>Women</p> <ol style="list-style-type: none"> 1. Factor 1 (systolic and diastolic blood pressure) 2. Factor 2 (high triglycerides and low HDL-cholesterol) 3. Factor 3 (2h insulin and fasting glucose) 4. Factor 4 (BMI, WHR, fasting insulin and fasting glucose) [65%]
Howard et al (22)	<ul style="list-style-type: none"> • Cohort (Women's Health Initiative). • Participants enrolled in one or 2 clinical trials. • Six percent were sampled from the baseline participants (aged 50 to 79). • 1,635 white women, 802 Black women, 390 Hispanic women, and 256 Asian/Pacific Islander women (total 3,083) • 40 clinical centers throughout the US. • Mean (SD) age 63.1 (6.9) 	Exclusion criteria for the clinical trial plus diabetes, treatment with insulin or oral hypoglycemic agents	BMI, waist and hip circumference, blood pressure, medical and reproductive history, life-style habits, electrocardiograms, cardiovascular history, fasting glucose, lipids, insulin, HOMA IR, factor VII activity, and fibrinogen	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Components with eigenvalues greater than 1 were included • Factor loading threshold 0.30 	<p>Age adjusted factors in White women</p> <ol style="list-style-type: none"> 1. Obesity (BMI, hip, waist, HOMA IR, glucose) 2. Dyslipidemia (HOMA IR, insulin, high triglycerides, HDL distribution, and low HDL-cholesterol) 3. LDL (total cholesterol and LDL) 4. Blood pressure (systolic and diastolic blood pressure) [84.2%] <p>Factors 1, 2, and 4 were associated with the prevalence of CVD and CHD</p>

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Zitzmann et al (23)	<ul style="list-style-type: none"> • Cross-Sectional • 106 male volunteers • Munster (Germany) • Age 20 to 50 years old, median 28 	Androgen use, diabetes, dyslipidemia, hypertension, atherosclerosis, drug abuse, any medication	BMI, blood pressure, medical and reproductive history, smoking and alcohol use, physical activity, body fat content by bioimpedence measurements, hormones and lipids, leptin, insulin and C-peptide, CAG repeats, fasting glucose, lipids, insulin, HOMA IR, factor VII activity, and fibrinogen	<ul style="list-style-type: none"> • Principal component analysis • Varimax (orthogonal) rotation • Factor loading threshold 0.35 	<ol style="list-style-type: none"> 1. Body composition (Fat content, CAGr, insulin, leptin, physical activity) 2. Lipid profile (CAGr, LDL, cigarettes consumption, high triglycerides and low HDL-cholesterol) 3. Blood pressure (systolic and diastolic blood pressure) 4. Lifestyle/age (age, physical activity, LDL, cigarettes consumption, alcohol) 5. Sexual hormones (estradiol, testosterone, sex hormone binding globulin levels) <p>Cumulative variance not reported.</p>

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Hanley et al (24)	<ul style="list-style-type: none"> Multicenter cohort, 2 centers in California and 2 in Texas (USA) Analysis only on data at baseline 1087 nondiabetic subjects (56,4% female) Mean (SD) age 54.8 (8.4) <p>Reanalysis of Hanley (66)</p>	Diabetes, missing data	Glucose tolerance test, insulin sensitivity, HOMA-IR, systolic and diastolic blood pressure, BMI, waist circumference, plasma lipid and lipoprotein concentrations, CRP, fibrinogen, and PAI-1 urinary albumin and creatinine.	<ul style="list-style-type: none"> Principal factor analysis Varimax (orthogonal) rotation Factors above the break in the curve, proportion of common variance explained (> 10%), and factor interpretability criteria were used to select components to be retained. Factor loading threshold 0.40 Analyses performed overall and by sex, glucose tolerance status, and ethnicity. 	<ol style="list-style-type: none"> Metabolic factor (BMI, waist, 2 h glucose, insulin sensitivity, high triglycerides and low HDL-Cholesterol, PAI-1) Inflammation (BMI, waist, insulin sensitivity, Fibrinogen, CRP) Blood pressure (Systolic and diastolic blood pressure) <p>[41.8%] Analyses by subgroups had similar results</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Oh et al (25)	<ul style="list-style-type: none"> • Cross-sectional, random sampling • Mokdong, (South Korea) • 269 men and 505 women aged 30–80 years • 43% participation rate • Mean (SD) age Men: 47.7 (12.2); Women: 46.6 (12.2) 	63 men and 56 women taking medication for hypertension, diabetes, or dyslipidemia	Fasting and 2-h plasma glucose, fasting insulin, HOMA IR, BMI, systolic and diastolic blood pressure, WHR, waist circumference, serum triglyceride, total cholesterol and HDL cholesterol.	<ul style="list-style-type: none"> • Principal component analysis • Orthogonal (varimax) rotation • Factor loading threshold 0.30 	<p>Men</p> <ol style="list-style-type: none"> 1. Factor 1 (BMI, waist, and fasting insulin) 2. Factor 2 (Fasting glucose and 2h glucose, fasting insulin) 3. Factor 3 (systolic and diastolic blood pressure) 4. Factor 4 (high triglycerides and low HDL-cholesterol, fasting insulin) <p>[64.2%]</p> <p>Women</p> <ol style="list-style-type: none"> 1. Factor 1 (systolic and diastolic blood pressure, BMI, waist) 2. Factor 2 (fasting and 2h glucose) 3. Factor 3 (BMI, waist, fasting insulin, high triglycerides and low HDL-cholesterol) <p>[66.8%]</p>
Austin et al (26)	<ul style="list-style-type: none"> • Probands cross-sectional study • Washington (Seattle, USA) • Japanese Americans • N= 432, 56% Women • Mean (SD) age 54.2 (15.8) 	Type 2 diabetes, CRP > 10 mg/l, or missing glucose, insulin, blood pressure, or waist measurements	Fasting glucose, fasting insulin, BMI, systolic and diastolic blood pressure, waist circumference, serum triglyceride and HDL cholesterol, CRP, and LDL particle size	<ul style="list-style-type: none"> • Standardized residuals (adjusted by age and sex by regression analysis) were used in the factor analysis • Principal components analysis • Varimax rotation • Factor loading threshold 0.40. 	<ol style="list-style-type: none"> 1. Lipids (LDL size, triglycerides, HDL-cholesterol) 2. Bodyfat/insulin/glucose/CRP (waist, fasting insulin and glucose, CRP) 3. Blood pressure (systolic and diastolic blood pressure) <p>[64.6%]</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Weiss et al (27)	<ul style="list-style-type: none"> • Cross-sectional • New Haven, CT and Cincinnati, OH (USA) • Comparable proportions of White, African American, and Hispanic • Obese and overweight children and adolescents (N=470) • 59% female • Mean age : 12 years 	Diabetes and the use of medication that alters blood pressure or glucose or lipid metabolism.	Blood pressure, BMI, Tanner stage of development, glucose, insulin, lipids, adiponectin (in the 328 most recently enrolled subjects), CRP, and interleukin-6 (in the 293 most recently enrolled subjects), oral glucose-tolerance test.	<ul style="list-style-type: none"> • Principal-component factor analysis • Orthogonal rotation • Number of components retained was based on Scree plot analysis and Eigenvalues > 1 • Factor loadings from 0.2-0.4 indicated marginal correlations and loadings > 0.4 indicated strong correlation. 	<ol style="list-style-type: none"> 1. Obesity and glucose metabolism (BMI, HOMA-IR, baseline and 2h glucose) 2. Dyslipidemia (HOMA IR, high triglycerides and low HDL cholesterol) 3. Blood pressure (systolic and diastolic blood pressure) <p>[58%]</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Tang et al (28)	<ul style="list-style-type: none"> Multi-center population based family study Participants Recruited from the Framingham Heart Study, Utah Health Family Tree Study, and the Atherosclerosis Risk in Communities Study. Individuals and their families participated including individuals with family history of coronary heart disease and those without. (N= 2831) Mean age: Men: 51.7, Women: 52.5 	Individuals with any missing phenotype data. Twelve subjects with BMI, WHR, or HOMA outliers	Blood pressure, lipids, lipoproteins, BMI, WHR, fibrinolytic activities, insulin, glucose, insulin resistance, PAI-1 antigen, uric acid	<ul style="list-style-type: none"> Factor loadings of $\geq .40$ with 15% variance were included in a factor Eigenvalues > 1.0 used to determine contribution of each factor to the set of variables Maximum likelihood analysis used to determine factor patterns 	<ol style="list-style-type: none"> Factor 1 (BMI, WHR, subscapular skinfold, triglycerides, HDL-cholesterol, HOMA, PAI-1, serum uric acid) Factor 2 (Triglycerides, LDL, total cholesterol) Factor 3 (BMI, subscapular skinfold) Factor 4 (Triglycerides, LDL cholesterol) [47.4%]

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Ford (29)	<ul style="list-style-type: none"> NHANES III 1988-94 participants 3410 men, 3458 women Age 20-90 Subanalysis of 4641 participants with leptin measurements 	2227 participants without leptin measures were excluded from subanalysis	BMI, waist circumference, WHR, fasting glucose, fasting insulin, blood pressure, plasmatic lipids, uric acid, urinary albumin creatinine ratio	<ul style="list-style-type: none"> Principal components analysis Factors with Eigen values \geq 1.0 retained Varimax rotation to obtain uncorrelated components Factors with loadings \geq retained in components Scree plots used to help select components 2 additional models developed using only waist circumference or BMI rather than 3 measures of obesity 	<p>Men</p> <ol style="list-style-type: none"> Factor 1 (Triglycerides, insulin, systolic blood pressure, waist circumference, uric acid, leptin) Factor 2 (Glucose, urinary albumin creatinine ratio) Factor 3 (HDL, triglycerides, Systolic blood pressure) <p>[32.5%]</p> <p>Women</p> <ol style="list-style-type: none"> Factor 1 (Insulin, waist circumference, uric acid, leptin) Factor 2 (HDL, triglycerides, glucose) Factor 3 (Systolic blood pressure, urinary albumin creatinine ratio) <p>[33.5%]</p>

Study (reference #)	Design, Location, Population	Exclusion criteria	Variables studied	Factor analysis methods	Factors (components) [cumulative variance explained]
Salmenniemi et al (30)	<ul style="list-style-type: none"> • Cross-sectional • Kuopio (Finland) • 119 offspring of probands with type 2 diabetes • Age 25-50 • Mean (SD) age 35.5 (6.0) 	Spouses of probands with abnormal glucose tolerance test	Oral and intravenous glucose tolerance test, whole body glucose uptake (WBGU), fasting and post challenge insulin, systolic and diastolic blood pressure, BMI, waist and hip circumference, intra-abdominal and subcutaneous fat measured by computerized tomography (CT), plasma adiponectin, plasma lipid and lipoprotein concentrations, CRP, fibrinogen, TNF-alpha, cytokines, CRP, levels of soluble adhesion molecules, oxygen uptake	<ul style="list-style-type: none"> • Principal components analysis • Factors with Eigen values \geq 1.0 retained • Varimax rotation to obtain uncorrelated components • Factors with loadings \geq 0.4 retained in components • The factor score from the analysis was categorized into the factor tertiles 	<p>Model 1</p> <p>1. Factor 1 (120-min plasma glucose, fasting insulin, BMI, waist, HDL-cholesterol, triglycerides, mean BP) [46.2%]</p> <p>Model 2</p> <p>4. Factor 1 (120-min plasma glucose, BMI, HDL-cholesterol, triglycerides, mean BP, WBGU, intra-abdominal fat measured by CT) [43.3%]</p> <p>The metabolic syndrome (factor scores) was associated with hypoadiponectinemia, multiple defects in glucose and energy metabolism, CRP, and elevated levels of cytokines and adhesion molecules.</p>

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