

# What components drive the metabolic syndrome? Results from the population-based LifeLines Cohort Study



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## Background

The metabolic syndrome (MetS) is a combination of unfavourable health factors including visceral obesity, dyslipidaemia, hypertension and impaired fasting glucose. It is also strongly associated with increased risk of cardiovascular disease (CVD) and type 2 diabetes (1).

## Aim

We assessed which factors contribute to the prevalence of MetS in people within different weight and age categories.

## Methods

64,046 western European participants aged 18-80 years from the Dutch LifeLines Cohort study (2) were categorized into three body mass index (BMI) classes (BMI <25, normal weight; BMI 25-30, overweight; BMI ≥30 kg/m<sup>2</sup>, obese), and six age decades. MetS was defined according to the revised NCEP ATP III criteria (3): SBP ≥ 130 mmHg or DBP ≥ 85 mmHg or use of BP-lowering medication, fasting blood glucose (BG) ≥ 5.6 mmol/L or use of BG-lowering medication or diagnosis of type 2 diabetes, HDL-cholesterol < 1.03 mmol/L in men or < 1.30 mmol/L in women or drug treatment for reduced HDL-C, triglycerides (TG) ≥ 1.70 mmol/L or medication for elevated TG, waist circumference ≥ 102 cm in men or ≥ 88 cm in women. MetS was present if at least three criteria were met. Within each BMI and age class, we determined the prevalence of all five MetS components.

## Results

Prevalence of elevated blood pressure in the entire cohort increased from 22% in the youngest age group (18-30 yrs) to 84% in the oldest age group (70-80 yrs). In these age groups, the prevalence of excess waist circumference increased from 40 to 80%. The prevalence of increased serum TG and fasting BG was also the highest in the oldest age group (both 30%), while HDL-cholesterol remained strikingly constant with increasing age. Overall prevalence of MetS in subjects with BMI <25 was 3.6% in men and 2.4% in women, while in the overweight this was 21.6% in men and 16.0% in women, rising to 64.3% of obese men and 41.5% of obese women. In normal weight (Fig.1) and overweight (Fig. 2) individuals, elevated blood pressure was the most common contributor to the presence of MetS. In obese individuals (Fig.3), elevated waist circumference, blood pressure and reduced HDL-cholesterol were the largest contributors.

## Major finding

We conclude that the increase in prevalence of MetS with age in Western European individuals is mainly driven by elevated blood pressure, and -to a lesser extent- by waist and HDL-cholesterol. As it is known that blood pressure increases with age, using a fixed 130/85 mmHg cut-off results in a disproportionate contribution of elevated blood pressure to the prevalence of MetS.

## References

1. Grundy SM, et al. Circulation 2005; 2. Stolk RP, et al. Eur J Epidemiol 2008; 3. Alberti KG, et al. Circulation 2009.

Figure 1. Percentage of normal weight individuals per age group fulfilling a specific metabolic syndrome criterium

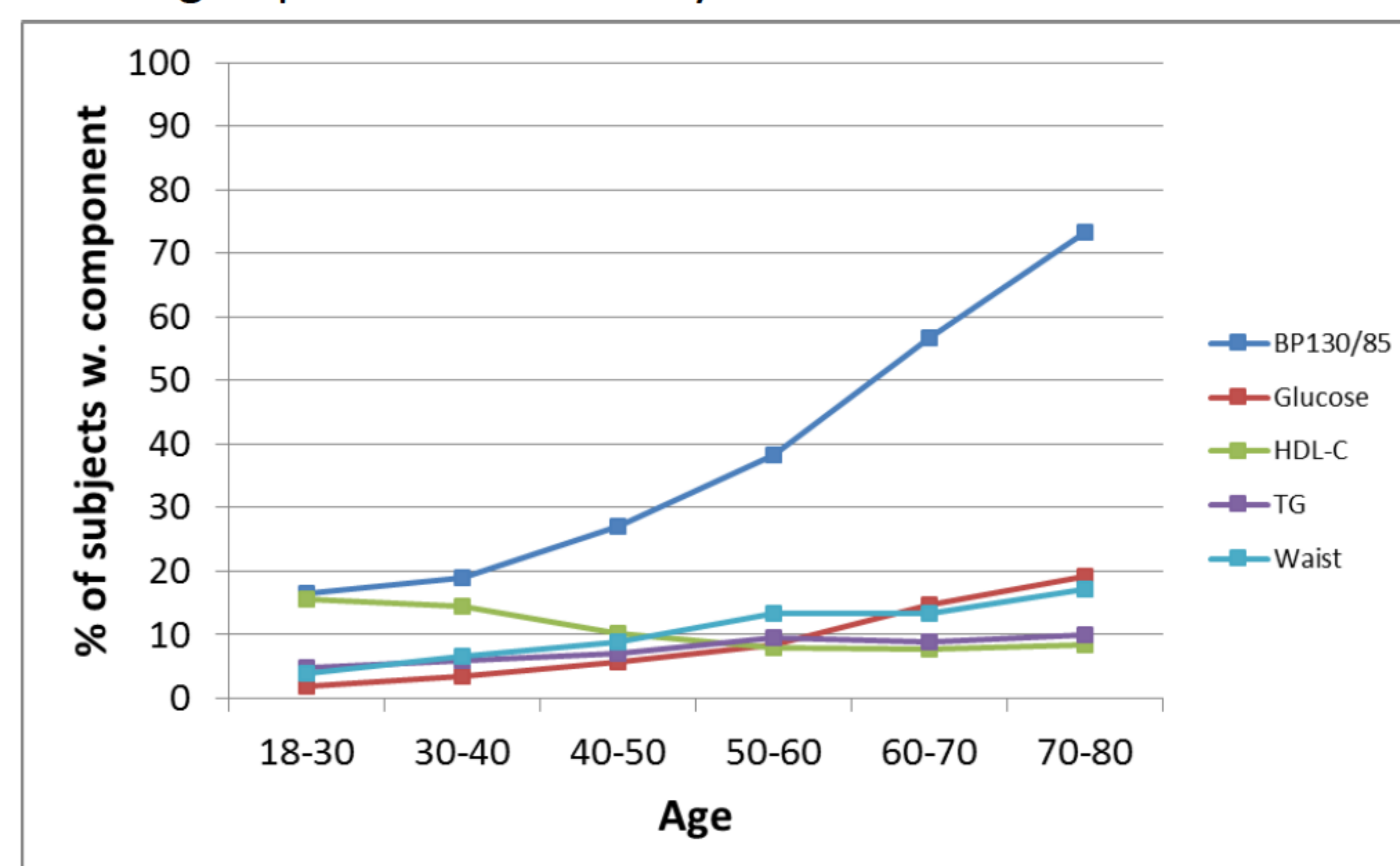


Figure 2. Percentage of overweight individuals per age group fulfilling a specific metabolic syndrome criterium

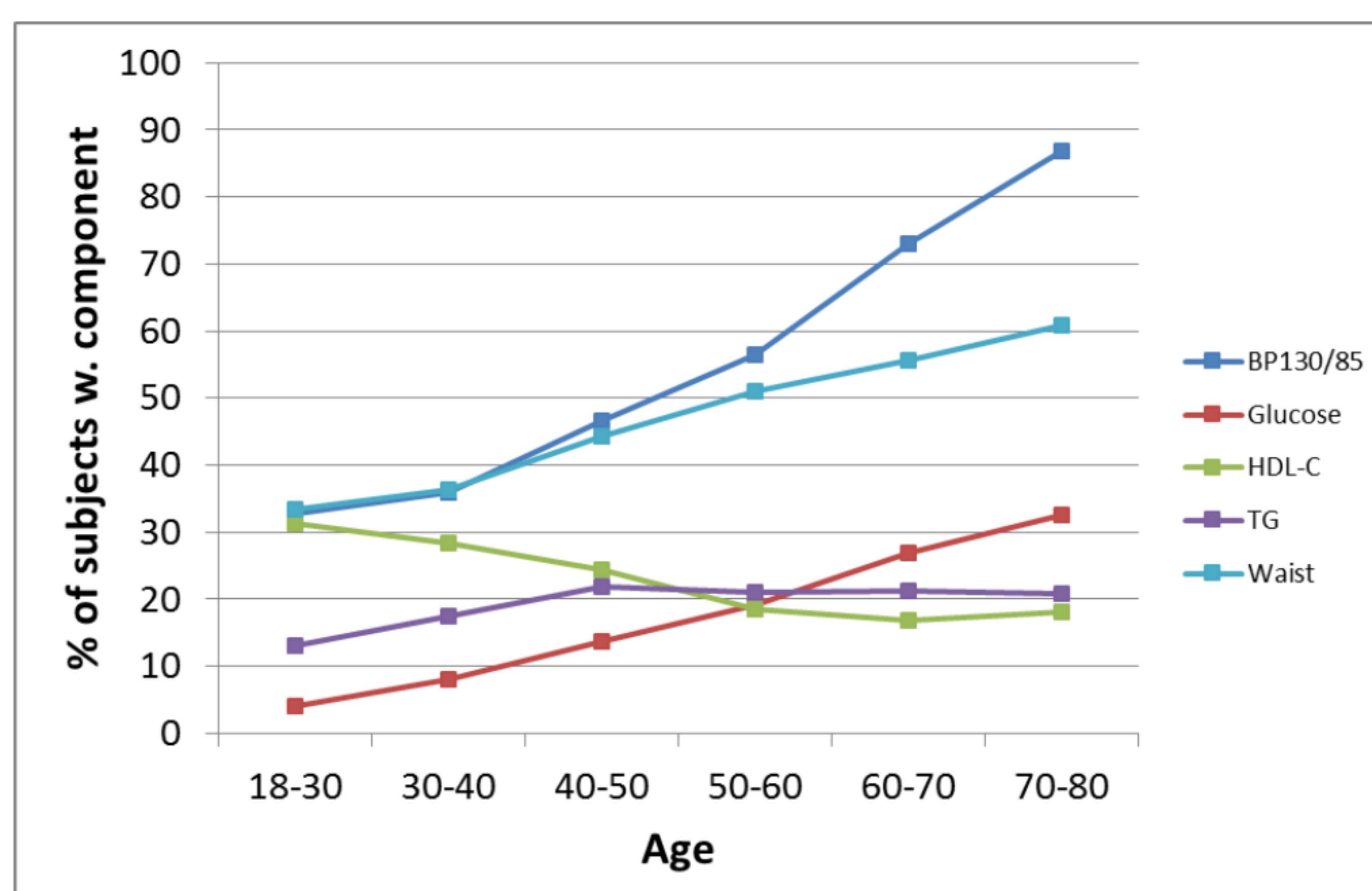
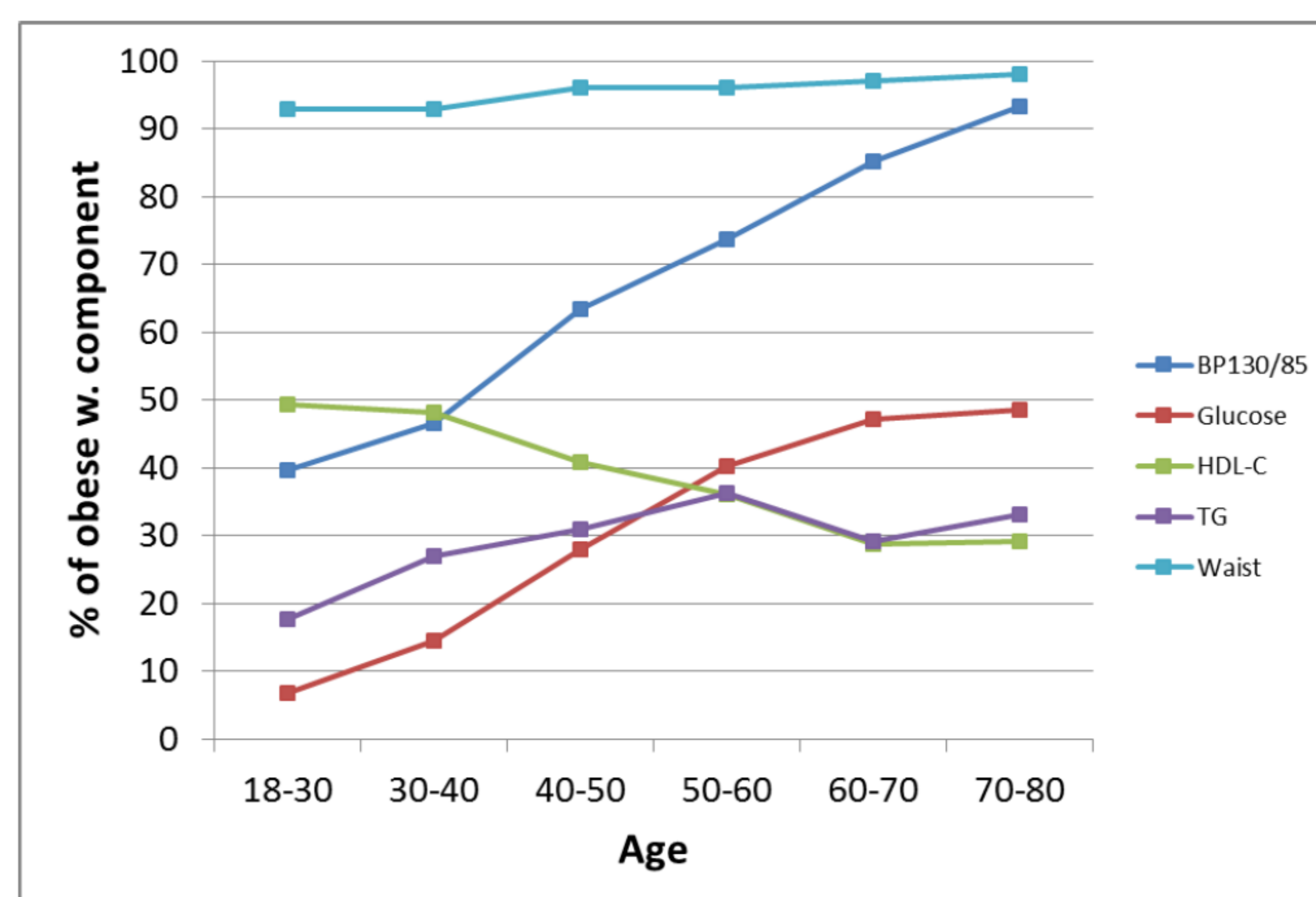


Figure 3. Percentage of obese individuals per age group fulfilling a specific metabolic syndrome criterium



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Diabetes (to include obesity, pathophysiology & epidemiology)

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