Fat distribution matters!
Findings from the first 6,000 UKBB participants

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# Overweight and Obesity Definitions Today

## BMI* (Body Mass Index)

\[ \text{BMI} = \frac{\text{Weight}}{\text{Height}^2} \]

- **Male**: (82 kg/1,82² m = 24,8)
- **Female**: (68 kg/1,65² m = 24,5)

| <18,5 | Underweight |
| 18,5 – 24,9 | Normal |
| 25,0 – 29,9 | Overweight |
| >30 | Obese |
| >40 | Morbidly obese |

*WHO

## Waist Circumference

<table>
<thead>
<tr>
<th>Risk</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>37” (94 cm)</td>
<td>31,5” (80 cm)</td>
</tr>
<tr>
<td>High Risk</td>
<td>40” (102 cm)</td>
<td>34,5” (88 cm)</td>
</tr>
</tbody>
</table>
Prevalence of Obesity Among U.S Adults Aged 20-74

BMI > 30

Derived from NHANES data (http://www.cdc.gov/nchs/data/hestat/obesity_adult_09_10/obesity_adult_09_10.html#table1)
Overweight BMI >25

Past and projected future overweight rates in selected OECD countries

Proportion overweight

USA  England  Canada  Spain  Austria  Australia  France  Korea

Years

Body Composition Profiling in UKBB

- Liver fat (%)
- Visceral Fat (volume)
- Abdominal Subcutaneous Fat (volume)
- Lean Thigh Muscle (volume)
- Muscle Fat Infiltration (%)

Rapid 6-Minute MRI
BCP – Body Composition Profile

**Muscle Fat Infiltration**
- Sarcopenia and Muscle Degeneration
- Predictor of CV Events\textsuperscript{15}
- Predictor of High Mortality\textsuperscript{15}

**Liver Fat**
- Insulin Resistance\textsuperscript{10,11,12}
- Predictor of CV Events\textsuperscript{13,14}
- Transition into NASH

**Total Abdominal Fat Index**
- Highly correlated to BMI
- Fat-tissue Specific

**Visceral Fat**
- Insulin Resistance\textsuperscript{1,2,3}
- Predictor of CV Events\textsuperscript{4,5,6}
- Adverse Outcomes in Several Diseases\textsuperscript{7,8,9}

**Lean Muscle Tissue**
- Sarcopenia and Cachexia
- Predictor in Most End-Stage Diseases\textsuperscript{16}

**Fat Ratio**

*Metabolic disease free population as reference star*

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\textsuperscript{1,2,3} Insulin Resistance
\textsuperscript{4,5,6} Predictor of CV Events
\textsuperscript{7,8,9} Adverse Outcomes in Several Diseases
\textsuperscript{10,11,12} Insulin Resistance
\textsuperscript{13,14} Predictor of CV Events
\textsuperscript{15} Sarcopenia and Muscle Degeneration
\textsuperscript{16} Sarcopenia and Cachexia

(extracted from AMRA reference database)
7 UKBB participants: Identical BMI = 27 (+/-0,5) & Waist circumference = 91 cm
Methods Description

UKBB Data

6021 subjects

Disease History

T2D  CHD  MDF

Statistical Modeling

Disease Probability

VAT 9.3 L

Vastly different with direct body composition biomarkers

Individualized disease association profiles

Coronary Heart Disease
Type 2 Diabetes
Metabolic Disease Free

Sex-and-age normalized disease predicted probability

7 UK Biobankers: Identical BMI = 27 (+/-0.5) & Waist circumference = 91 cm

Fat Distribution Matters!

Sex and age normalized disease predicted probability

Coronary Heart Disease  |  Type 2 Diabetes  |  Metabolic Disease Free

Summary: Clinical Associations

- **Low Visceral fat** and **Muscle fat** infiltration are associated with metabolic health.
- **High Visceral fat** and **Muscle fat** infiltration are associated with CHD and T2D.
- Associations with **Liver fat** ambiguous:
  - Positive with T2D
  - Negative with CHD
  - Non-significant with metabolic health
- Associations could not be described by
  - Sex
  - Age
  - Lifestyle
  - BMI
  - Single fat compartment alone

Next Step

1. Increased # participants
   - Rare diseases
   - Ethnical groups
   - Sociodemographics

2. Outcomes/Prospective data
   - Disease risk prediction
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This research has been conducted using the UK Biobank Resource. (Access application 6569)
Redefining Obesity, From BMI to BCP

www.amramedical.com