Obesity in Asian Populations

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Prevalence of obesity (BMI >30) in adults (18 years+) by region
Prevalence of underweight and overweight or obesity by age and sex in urban and rural settings in India, 2004-2006 (n=236,039)

Vertical axis = prevalence
Horizontal axis = age group (years), point estimates

Age-adjusted prevalence of overweight but not obesity among Asian subgroups, 18 years of age +, 2004–2006

<table>
<thead>
<tr>
<th>Population</th>
<th>Overweight</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Whites</td>
<td>34.6</td>
</tr>
<tr>
<td>All Asians</td>
<td>27.5</td>
</tr>
<tr>
<td>Chinese</td>
<td>21.8</td>
</tr>
<tr>
<td>Filipino</td>
<td>33.0</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>34.4</td>
</tr>
<tr>
<td>Japanese</td>
<td>25.9</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>19.1</td>
</tr>
<tr>
<td>Korean</td>
<td>27.3</td>
</tr>
<tr>
<td>Other Asian &amp; NHOPI</td>
<td>29.2</td>
</tr>
</tbody>
</table>

Percent distribution of race and ethnicity in US
- Non-Hispanic white: 70.4%
- Non-Hispanic Asian: 4.0%
- Non-Hispanic black: 11.2%
- Hispanic: 12.9%
- Non-Hispanic AIAN: 0.6%

Percent distribution of Asian subgroups in US
- Korean: 21.2%
- Japanese: 18.8%
- Vietnamese: 12.1%
- Other Asian and NHOPI: 10.4%

Medical Complications of Obesity

- Sleep apneas and snoring
- Stroke
- Lung disease
  - Asthma
  - Pulmonary blood clots
- Heart disease
  - Diabetes
  - Abnormal lipid profile
  - High blood pressure
- Liver disease
  - Fatty liver
  - Cirrhosis
- Pancreatitis
- Female disorders
  - Abnormal periods
  - Infertility
- Gallstones
- Cancer
  - Breast
  - Uterus
  - Colon
  - Esophagus
  - Pancreas
  - Kidney
  - Prostate
- Arthritis
- Inflamed veins, often with blood clots
- Gout

CDC: https://www.cdc.gov/healthreport/publications/compendium.pdf
Global trends in type 2 diabetes prevalence
International comparison of prevalence of obesity and diabetes

Prevalence of obesity in India is lowest but prevalence of diabetes highest

Proportion of adults with overweight and obesity

Prevalence of diabetes

Lancet 2006; 368: 1681–88
Comparison of diabetes prevalence between 30 and 40 year-olds

Prevalence of diabetes in Asian populations is higher among 30-year-olds in comparison to US population

A

30-39
14
12
10
8
6
4
2
0

40-49

Prevalence (%)

USA
Taiwan
China
Hong Kong
Vietnam
India
Korea
Thailand

B

10
9
8
7
6
5
4
3
2
1
0

Prevalence (%)
Estimated age-adjusted prevalence of diabetes in adults (20-79 years), 2017
Number of Adults with Diabetes Worldwide in 2017 and 2045
Asian populations and diabetes/cardiometabolic risk

- High prevalence of diabetes and cardiovascular risk factors in parts of Asia where average BMI is below 25 kg/m2
  - In some Asian populations a specific BMI reflects a higher percentage of body fat compared to white/European populations
  - Some Asian populations (especially South Asians) tend to have less muscle and more abdominal fat compared to white/European populations

The two authors share a near identical BMI, but differ in percent body fat.

Reminder of the limitations of BMI as a measure of adiposity across populations.
Asian-specific BMI cut-off points

<table>
<thead>
<tr>
<th>Classification</th>
<th>Asian-specific BMI cut-off points</th>
<th>Traditional WHO cut-off points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5 kg/m²</td>
<td>&lt;18.5 kg/m²</td>
</tr>
<tr>
<td>Healthy weight</td>
<td>18.5 - 22.9 kg/m²</td>
<td>18.5 - 24.9 kg/m²</td>
</tr>
<tr>
<td>Overweight</td>
<td>23 - 27.4 kg/m²</td>
<td>25 - 29.9 kg/m²</td>
</tr>
<tr>
<td>Obesity</td>
<td>≥ 27.5 kg/m²</td>
<td>≥ 30 kg/m²</td>
</tr>
</tbody>
</table>

The paradox of low BMI and high body fat percentage among Chinese, Malays and Indians in Singapore (n=291)

Indians had the highest body fat % and Chinese the lowest for the same BMI.

For the same amount of body fat as Caucasians with a BMI of 30, the BMI cut-off points for obesity would be ~ 27 for Chinese and Malays and 26 for Indians.
Prevalence of MAN (metabolic abnormality but normal weight) was higher among South Asians and Hispanics, followed African and Chinese Americans compared with whites.
Race/ethnicity-specific BMI values associated with MAN (metabolic abnormality but normal weight) compared with whites with a BMI of 25

- For a MAN prevalence equivalent to that in whites with a BMI of 25, the corresponding BMI values were lower in all racial/ethnic minority groups,
- BMI alone is a poor indicator of cardiometabolic risk in most of these populations.

Ann Intern Med. 2017 May 2;166(9):628-636.
For a given BMI, elevated glucose- and lipid- factors were more likely to be present in South Asian, Chinese, and Aboriginal populations compared with Europeans.

The cut point to define obesity, is lower by ~6 kg/m2 among non-European groups compared with Europeans.
Significant ethnic differences in type 2 diabetes prevalence without excess weight

Diabetes Research and Clinical Practice (2018)
https://doi.org/10.1016/j.diabres.2018.09.011
Increased risk for diabetes observed at lower levels of BMI in migrant south Asian groups than white individuals or Europeans

Cross-sectional study of 490,288 UK biobank participants
South Asians develop diabetes ~ 5–10 years earlier than Europeans and have more rapid progression from impaired glucose tolerance (IGT) to diabetes.
Ethnic-specific cut-offs for waist circumference

### World Health Organization cut-off points and risk of metabolic complications

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Cut-off points</th>
<th>Risk of metabolic complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist circumference</td>
<td>&gt;94 cm (M); &gt;80 cm (W)</td>
<td>Increased</td>
</tr>
<tr>
<td>Waist circumference</td>
<td>&gt;102 cm (M); &gt;88 cm (W)</td>
<td>Substantially increased</td>
</tr>
<tr>
<td>Waist–hip ratio</td>
<td>≥0.90 cm (M); ≥0.85 cm (W)</td>
<td>Substantially increased</td>
</tr>
</tbody>
</table>

M, men; W, women

### International Diabetes Federation cut-off points for different ethnic groups

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europids</td>
<td>&gt;94 cm</td>
<td>&gt;80 cm</td>
</tr>
<tr>
<td>South Asians, Chinese and Japanese</td>
<td>&gt;90 cm</td>
<td>&gt;80 cm</td>
</tr>
</tbody>
</table>

Differences in body composition and metabolic status between white UK and Asian Indian children

(EarlyBird 24 (n=262), and the Pune Maternal Nutrition Study (n=626))

Indian children have greater adiposity than white UK children despite lower BMIs

Indian children are also more insulin resistant, even after adjustment for adiposity

Total healthcare expenditure on diabetes (20-79 years) (ID)

IDF Diabetes Atlas - 8th Edition
Summary

- Obesity has increased in Asia over recent decades but rates are among the lowest globally
  - Regional differences- higher in Central Asia and high income Asia-Pacific, higher in urban vs. rural
  - Similar trends in migrant Asian populations
  - Underweight a co-existing problem in some regions
- Asians develop diabetes at a younger age, more rapidly and at a lower BMI compared to Western populations
  - Asian specific lower cut-points for BMI and WC
  - Evidence suggests that similar trends may be apparent among children but further studies are needed
- Incorporating Asian BMI and WC cut-points into screening programs could help reduce diabetes burden in Asian populations in Asia and globally
Trends in age-standardized mean BMI by sex and region

Women

Men

Dashed line: children and adolescents, 5–19 years
Solid line: adults, 20 years and older

Lancet. 2017 Dec 16;390(10113):2627-2642
Prevalence of obesity (BMI >30) in adults (18 years+) by country

UN Food and Agriculture Organization/WHO
Trends in age-standardized prevalence of BMI categories for adults (aged 20 years and older) by region: **Double burden**

Women

Men

Lancet. 2017 Dec 16;390(10113):2627-2642
### Age-adjusted percent distributions of selected health behaviors for adults 18 years of age and over, 2004–2006, obese

<table>
<thead>
<tr>
<th>Population</th>
<th>Obese</th>
<th>Ratio Obese/All Asian Population</th>
<th>Ratio Obese/Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Whites</td>
<td>23.6</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>All Asians</td>
<td>8.1</td>
<td>--</td>
<td>0.3</td>
</tr>
<tr>
<td>Chinese</td>
<td>4.2</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Filipino</td>
<td>14.1</td>
<td>1.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Asian Indian</td>
<td>6.0</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Japanese</td>
<td>8.7</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>5.3</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Korean</td>
<td>2.8</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Other Asian &amp; NHAPI</td>
<td>12.5</td>
<td>1.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnic group</th>
<th>Waist circumference (as measure of central obesity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europids*</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>≥ 94 cm</td>
</tr>
<tr>
<td>Women</td>
<td>≥ 80 cm</td>
</tr>
<tr>
<td>South Asians</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>≥ 90 cm</td>
</tr>
<tr>
<td>Women</td>
<td>≥ 80 cm</td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>≥ 90 cm</td>
</tr>
<tr>
<td>Women</td>
<td>≥ 80 cm</td>
</tr>
<tr>
<td>Japanese</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>≥ 85 cm</td>
</tr>
<tr>
<td>Women</td>
<td>≥ 90 cm</td>
</tr>
<tr>
<td>Ethnic south and central Americans</td>
<td>Use south Asian recommendations until more specific data are available</td>
</tr>
<tr>
<td>Sub-Saharan Africans</td>
<td>Use European data until more specific data are available</td>
</tr>
<tr>
<td>Eastern Mediterranean and middle east (Arab) populations</td>
<td>Use European data until more specific data are available</td>
</tr>
</tbody>
</table>

Data are pragmatic cutoffs and better data are required to link them to risk. Ethnicity should be basis for classification, not country of residence. *In USA, Adult Treatment Panel III values (102 cm male, 88 cm female) are likely to continue to be used for clinical purposes. In future epidemiological studies of populations of Europid origin (white people of European origin, regardless of where they live in the world), prevalence should be given, with both European and North American cutoffs to allow better comparisons.

_Table: Ethnic-specific values for waist circumference_
Figure 3: Hypothesised mechanisms for increased type 2 diabetes risk in south Asian people
A combination of innate and environmental factors interact to accelerate diabetes risk in south Asian people compared with individuals of white European descent, through the potential mechanisms outlined. Intensity of colour in the boxes suggests the amount of supporting evidence for each factor. *Such as urbanisation, diet, physical activity.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Countries</th>
<th>Total healthcare expenditure*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United States of America</td>
<td>348</td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>110</td>
</tr>
<tr>
<td>3</td>
<td>Germany</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>India</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Japan</td>
<td>28</td>
</tr>
<tr>
<td>6</td>
<td>Brazil</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Russian Federation</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Mexico</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>France</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>Canada</td>
<td>15</td>
</tr>
</tbody>
</table>

*Billion ID