



Epidemiology of Obesity

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Objectives

- ❑ To understand the magnitude of obesity worldwide and nationally
- ❑ To define obesity
- ❑ To list the risk factors for obesity
- ❑ To list complications of obesity
- ❑ To learn the different treatment modalities for obesity
- ❑ To apply prevention measures for obesity, starting with the level of your community

Definition of obesity

- “a condition of abnormal and excessive fat accumulation in adipose tissue to the extent that health may be adversely affected.”

Classification of obesity (Children)

- **In U.S.: Obesity** weight greater than or equal to the 95th percentile, based on the 2000 CDC growth charts*

- **International Obesity Taskforce**:**
 - **0-5:**
 - Overweight = 2 standard deviations (SD) above median BMI
 - Obese = 3 SD above median BMI

 - **5-19:**
 - Overweight = 1 SD above median BMI
 - Obese = 2 SD above median BMI

• Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC growth charts for the United States: Methods and development. Vital Health Stat. 2002;11(246)

** The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. Lancet 2014; 384(9945): 766-781. [Appendix]

Classification of obesity (Adults)

International Classification of adult underweight, overweight and obesity according to BMI

| Classification | BMI(kg/m ²) | |
|---------------------|--------------------------|---------------------------|
| | Principal cut-off points | Additional cut-off points |
| Underweight | <18.50 | <18.50 |
| Severe thinness | <16.00 | <16.00 |
| Moderate thinness | 16.00 – 16.99 | 16.00 – 16.99 |
| Mild thinness | 17.00 – 18.49 | 17.00 – 18.49 |
| Normal range | 18.50 – 24.99 | 18.50 – 22.99 |
| | | 23.00 – 24.99 |
| Overweight | ≥25.00 | ≥25.00 |
| Pre obese | 25.00 – 29.99 | 25.00 – 27.49 |
| | | 27.50 – 29.99 |
| Obese | ≥30.00 | ≥30.00 |
| Obese class I | 30.00 – 34.99 | 30.00 – 32.49 |
| | | 32.50 – 34.99 |
| Obese class II | 35.00 – 39.99 | 35.00 – 37.49 |
| | | 37.50 – 39.99 |
| Obese class III | ≥40.00 | ≥40.00 |

From World Health Organization. BMI Classification. 2016. Available at: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. Accessed July 26, 2016; with permission.

Is BMI an appropriate measure of weight-related health?

BMI indicators provide a measure of body mass/weight rather than providing a direct measure of body fat. Whilst physicians continue to use BMI as a general indicator of weight-related health risks, there are some cases where its use should be considered more carefully:

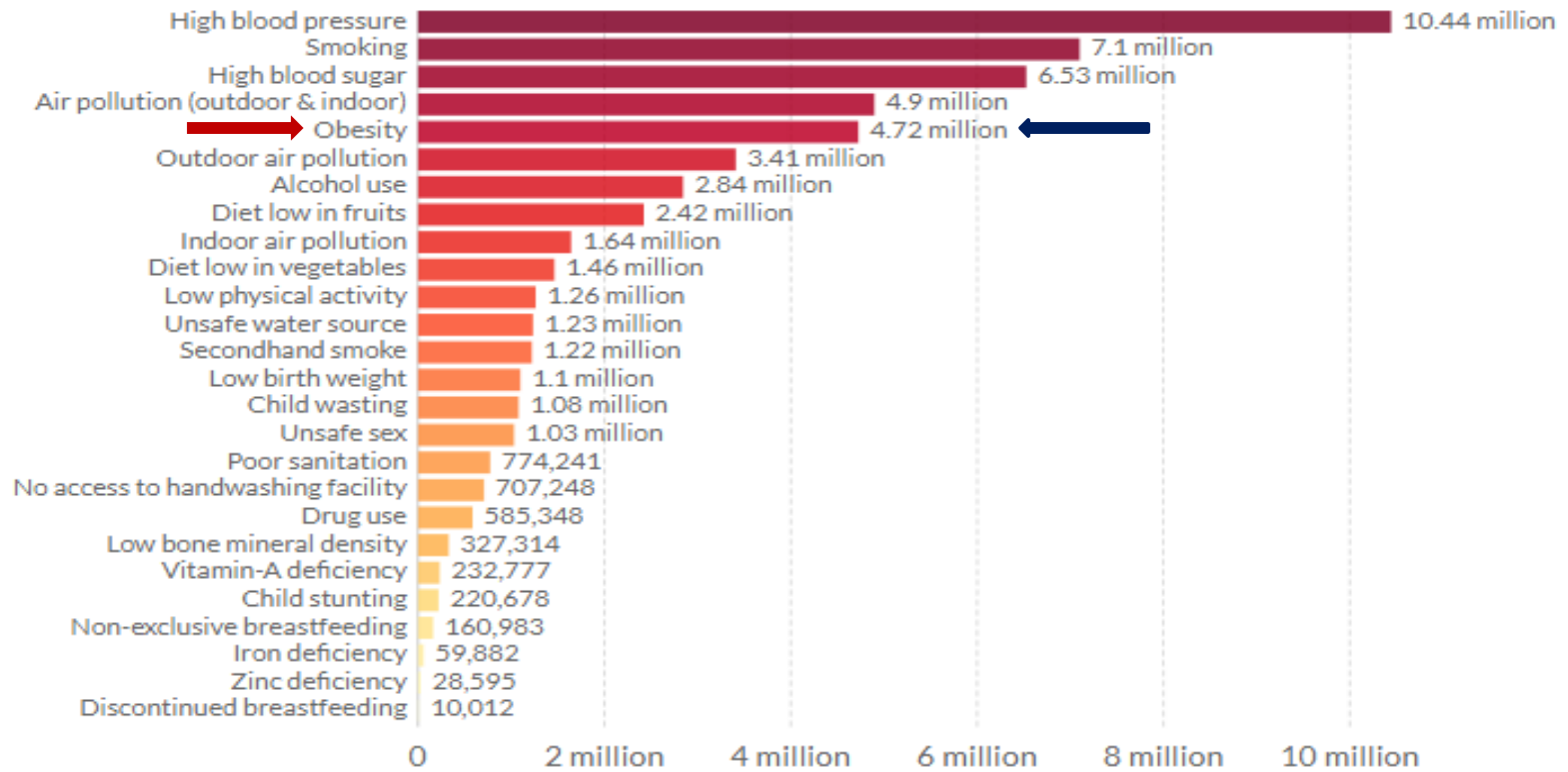
- Muscle mass can increase bodyweight; this means athletes or individuals with a high muscle mass percentage can be deemed overweight on the BMI scale, even if they have a low or healthy body fat percentage;
- Muscle and bone density tends to decline as we get older; this means that an older individual may have a higher percentage body fat than a younger individual with the same BMI;
- Women tend to have a higher body fat percentage than men for a given BMI.

Number of Deaths by Risk Factor Worldwide: 2017

Number of deaths by risk factor, World, 2017

Total annual number of deaths by risk factor, measured across all age groups and both sexes.

Our World
in Data



Source: IHME, Global Burden of Disease (GBD)

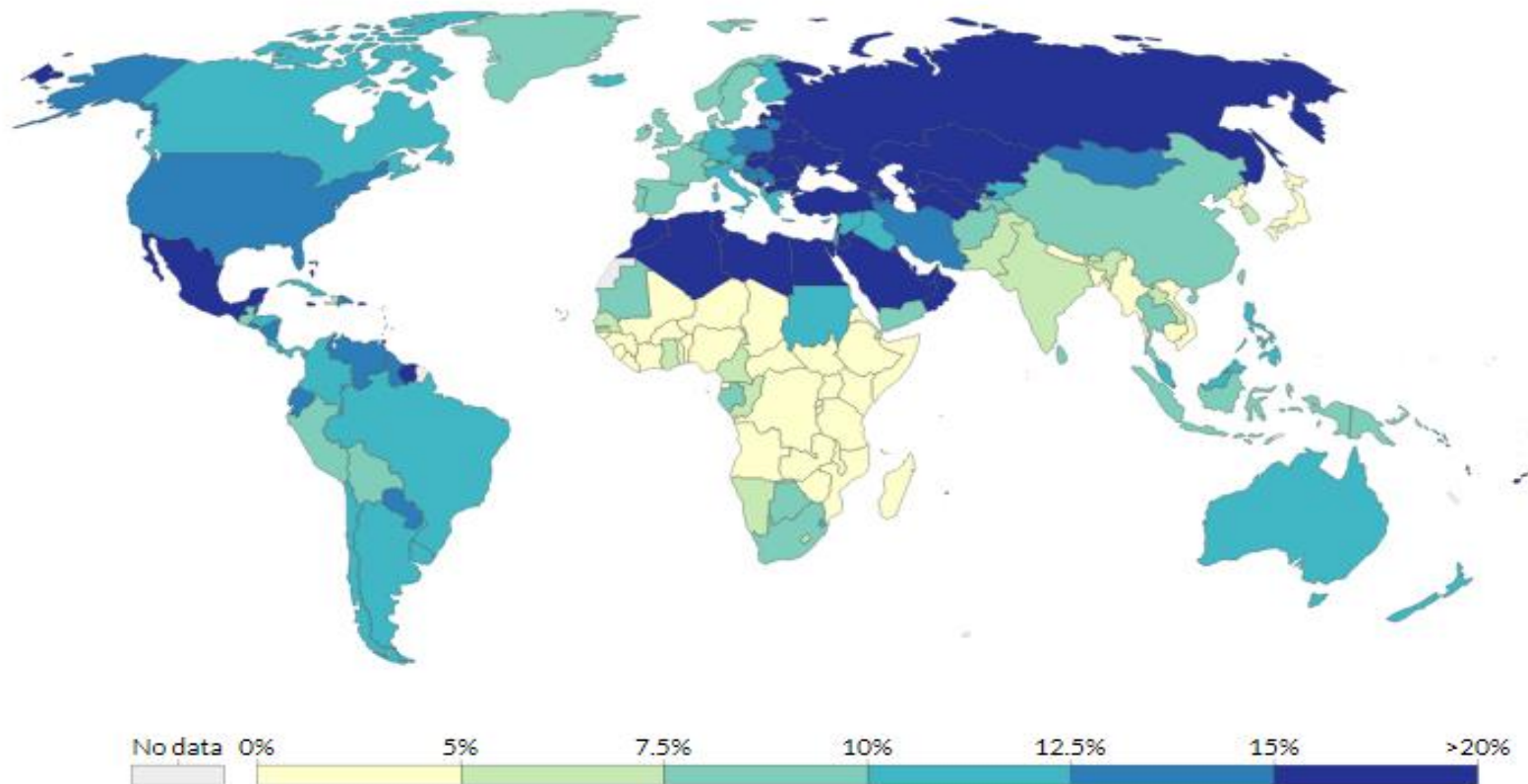
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Deaths Attributed to Obesity: 2017

Share of deaths attributed to obesity, 2017

Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World
in Data



Source: IHME, Global Burden of Disease

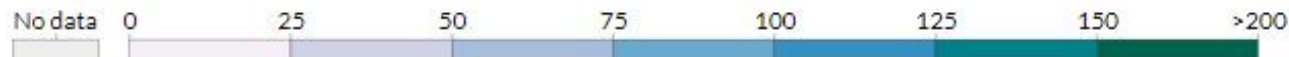
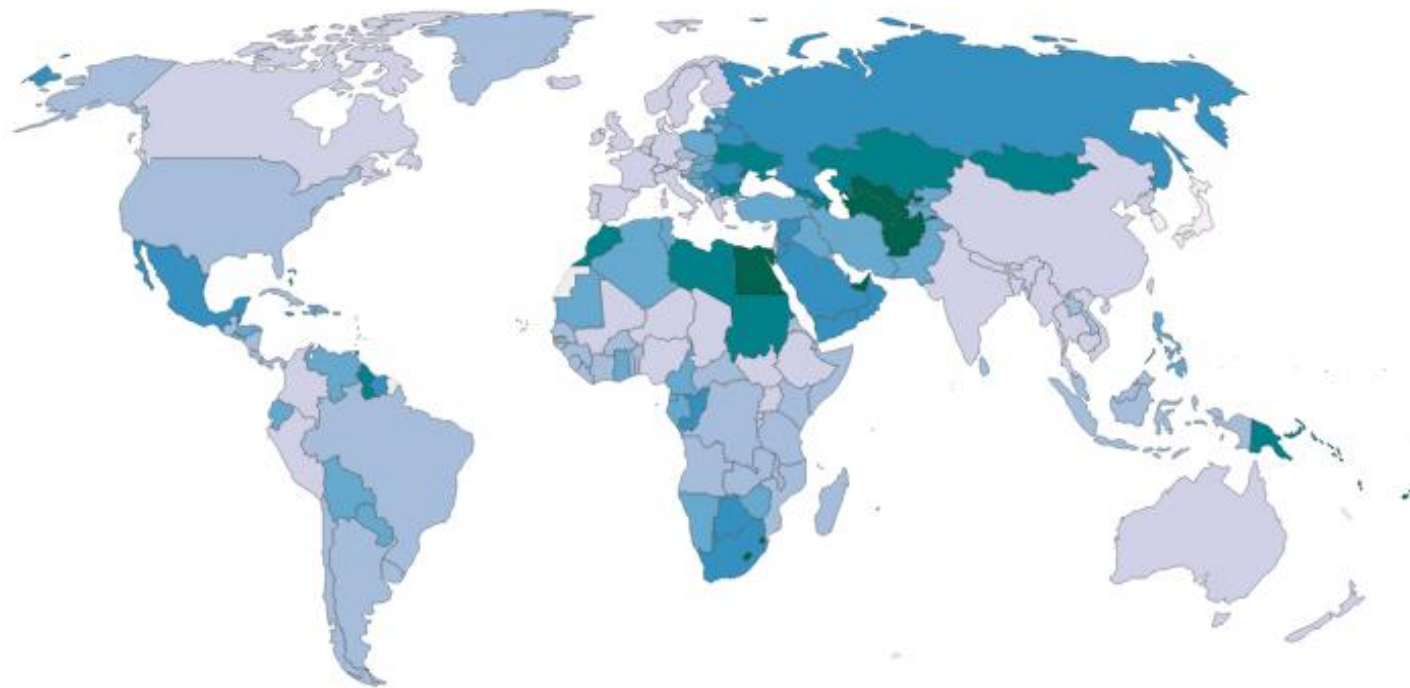
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Death Rate per 100.000 from Obesity: 2017

Death rate from obesity, 2017

Premature deaths attributed to obesity per 100,000 individuals. Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World
in Data



Source: IHME, Global Burden of Disease

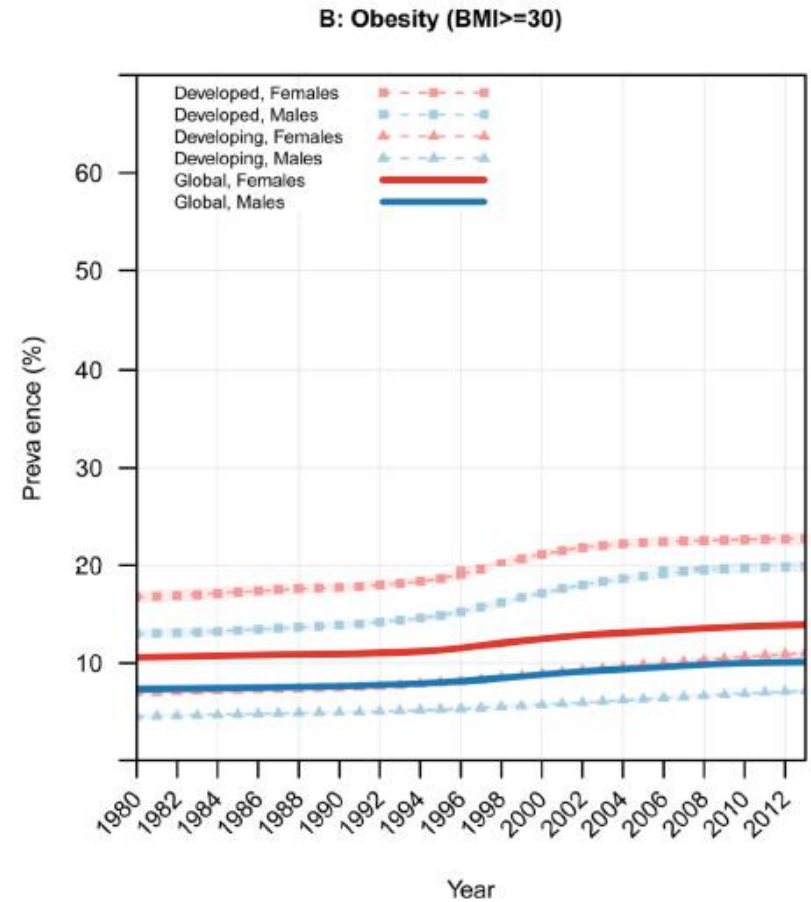
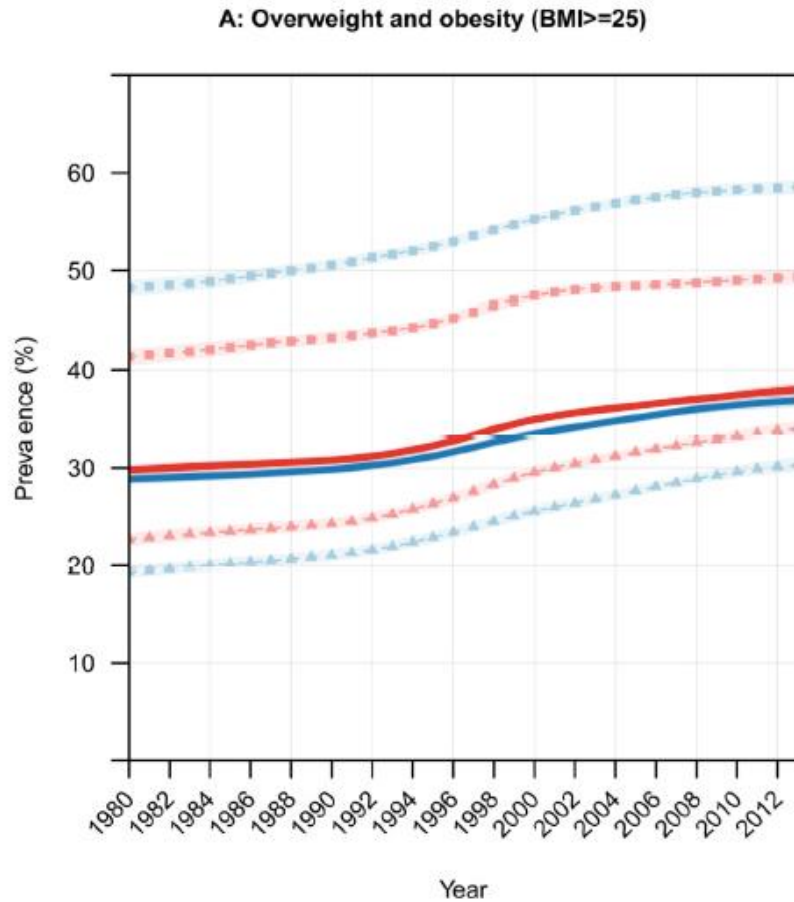
Note: To allow comparisons between countries and over time this metric is age-standardized.

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Global Burden

- Overweight + obesity were estimated to cause 3.4 million deaths worldwide in 2010
- Accounted for 3.9% of years of life lost
- Accounted for 3.8% of DALYs
- Associated with reduction of life expectancy by 5-10 years
- Obesity is associated with increase in:
 - ▣ All-cause mortality
 - ▣ Cancer related mortality
 - ▣ CVD-related mortality

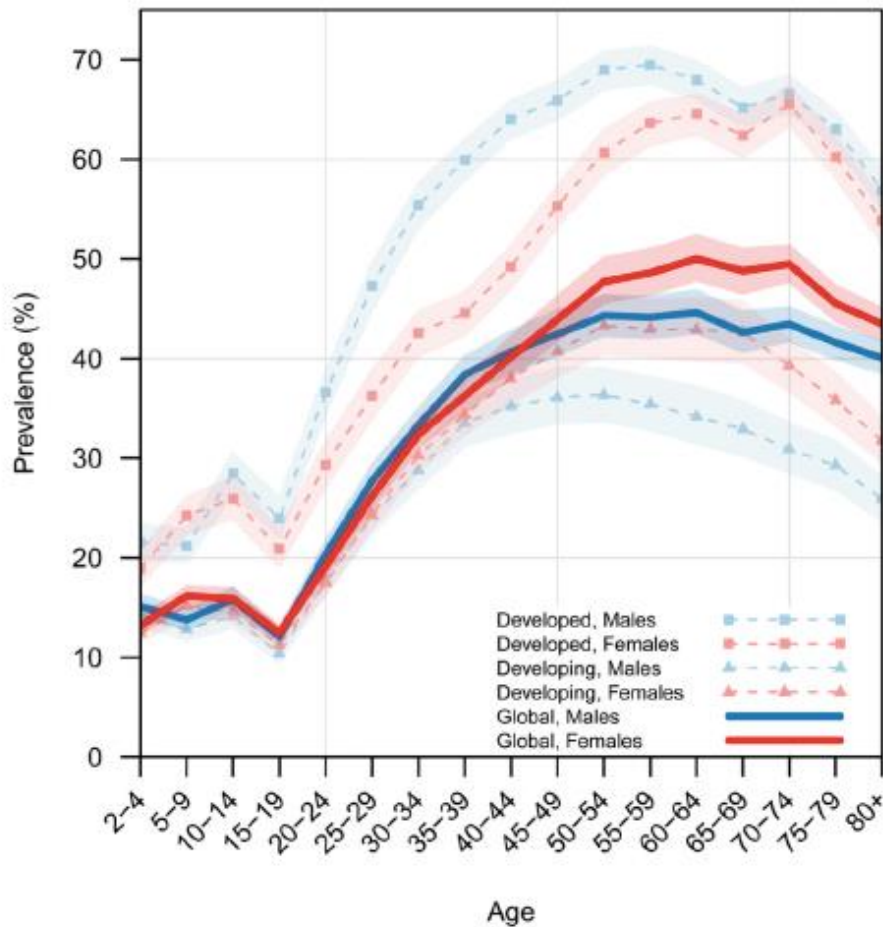
Overweight and Obesity in Adults Globally 2013



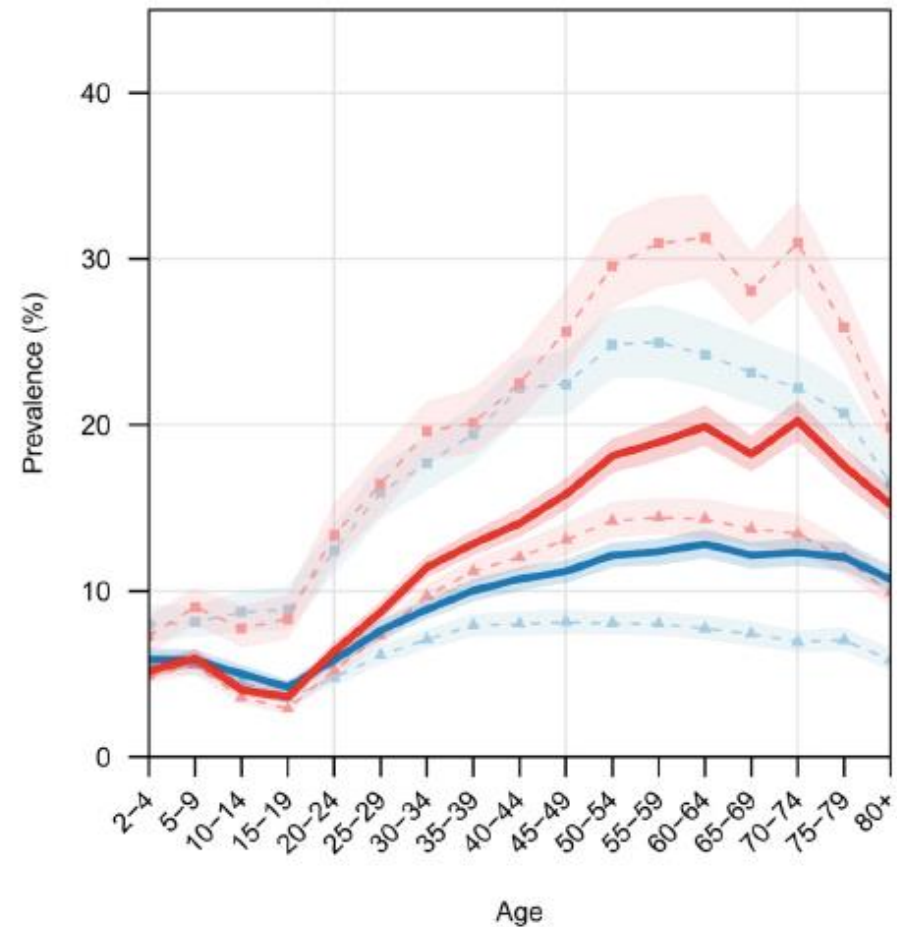
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Age-standardized Overweight/Obesity Globally 2013

A: Overweight and obesity (BMI \geq 25)



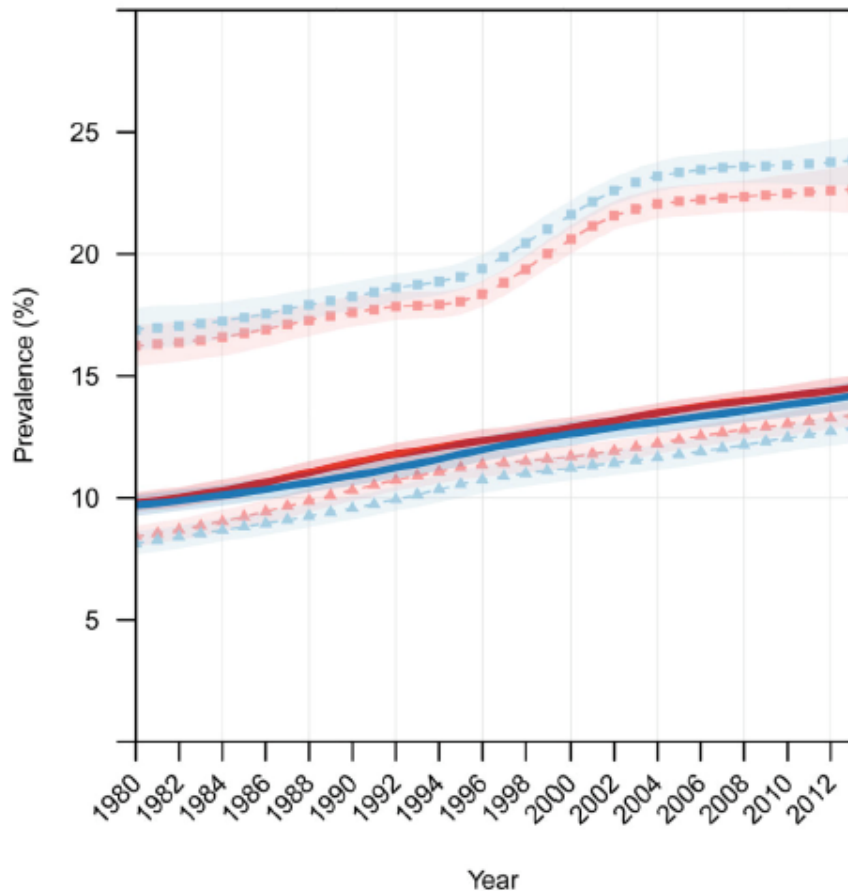
B: Obesity (BMI \geq 30)



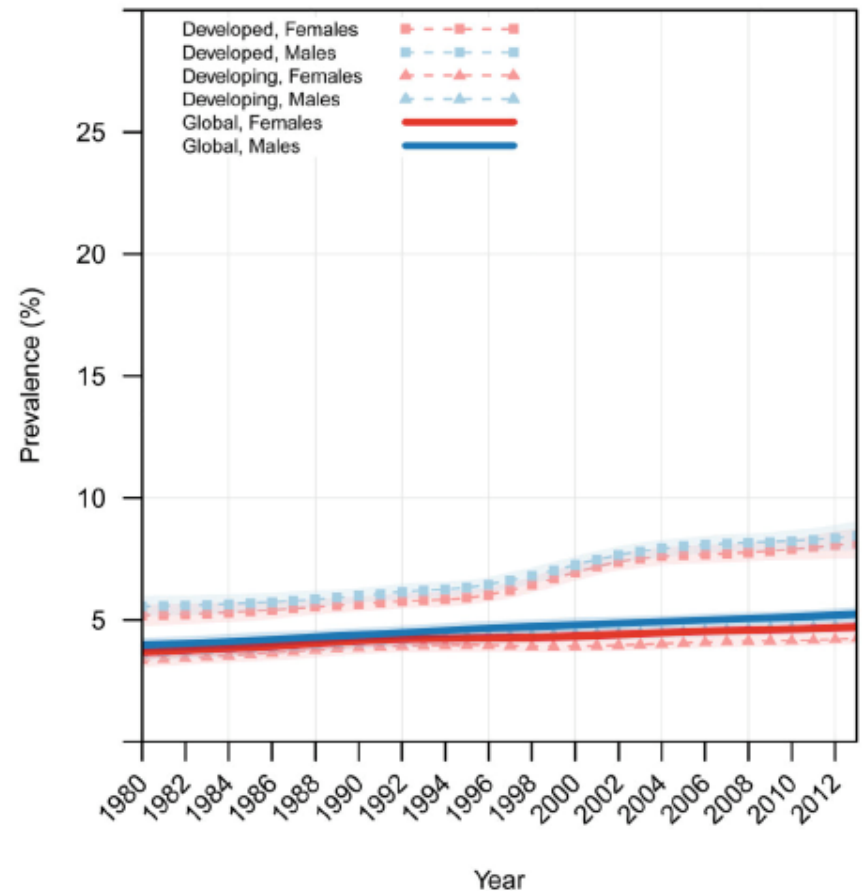
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Overweight/Obesity in Children Globally 2013

A: Overweight and obesity (based on IOTF cutoffs)



B: Obesity (based on IOTF cutoffs)



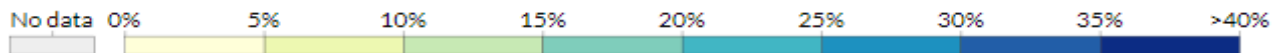
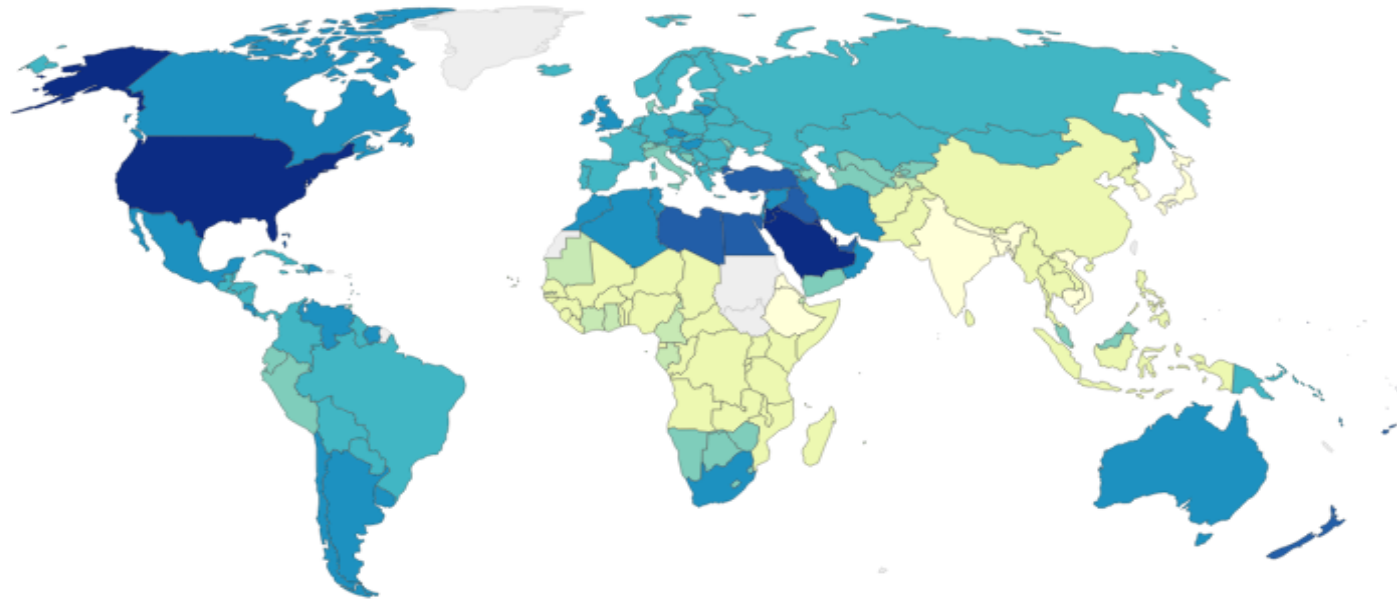
Source: *The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. Lancet 2014; 384(9945): 766-781.*

Obesity Worldwide-2016

Share of adults that are obese, 2016

Obesity is defined as having a body-mass index (BMI) equal to or greater than 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World
in Data



Source: WHO, Global Health Observatory

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■ 2016

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MAP

DATA

SOURCES

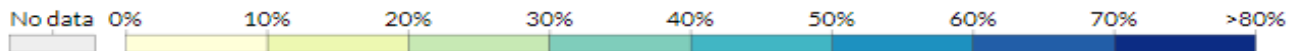
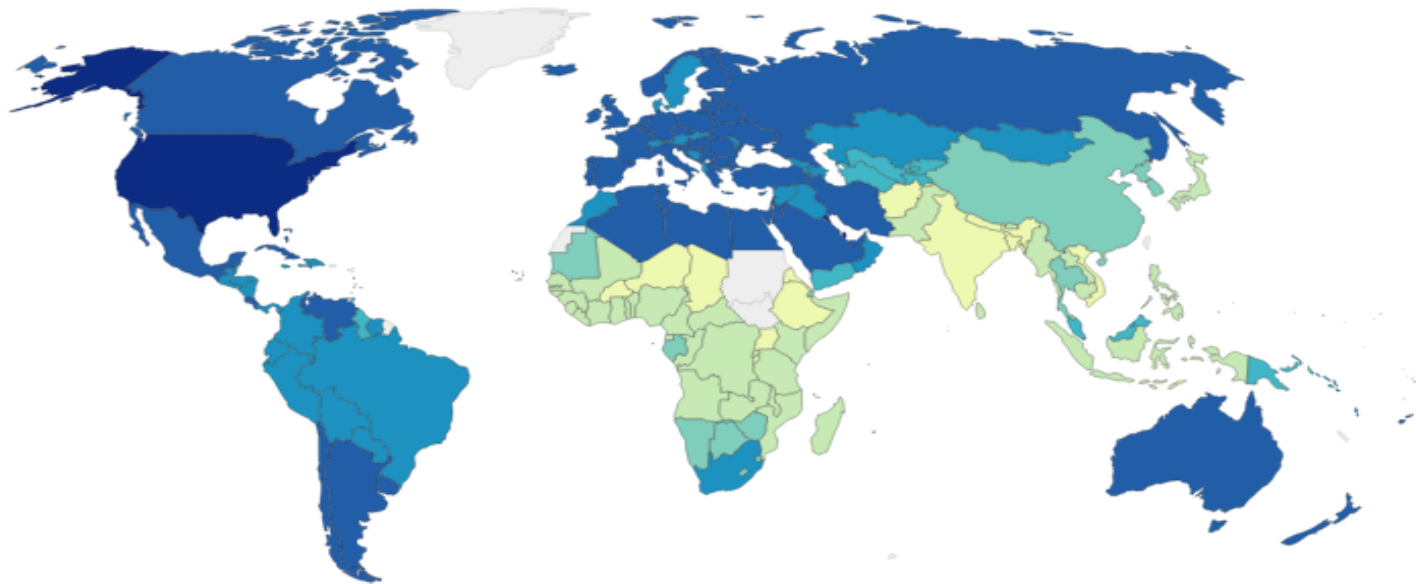


Overweight or Obesity Worldwide-2016

Share of adults that are overweight or obese, 2016

Being overweight is defined as having a body-mass index (BMI) greater than or equal to 25. Obesity is defined by a BMI greater than or equal to 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World
in Data



Source: WHO, Global Health Observatory

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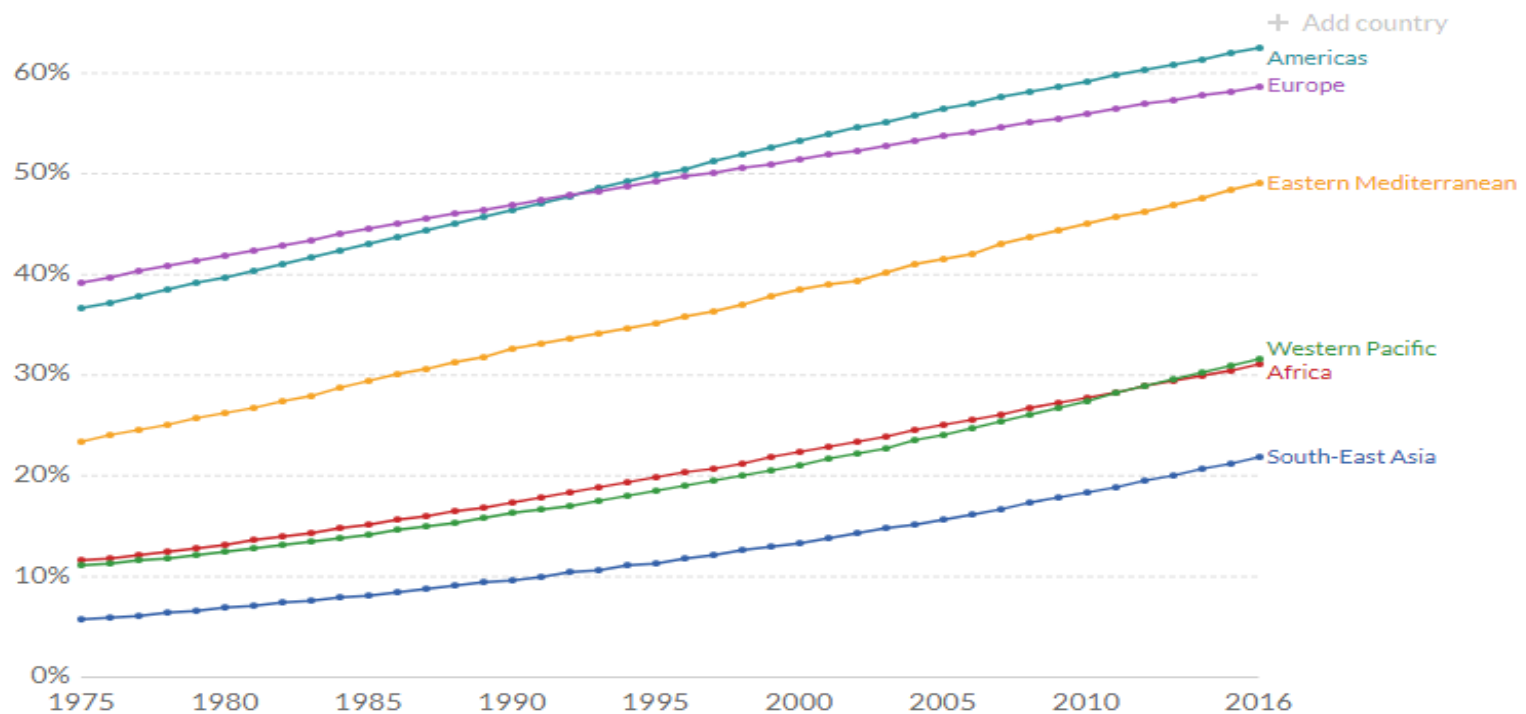


Trend of Overweight or Obesity -2016

Share of adults that are overweight or obese

Being overweight is defined as having a body-mass index (BMI) greater than or equal to 25. Obesity is defined by a BMI greater than or equal to 30. BMI is a person's weight in kilograms divided by his or her height in metres squared.

Our World
in Data



Source: WHO, Global Health Observatory

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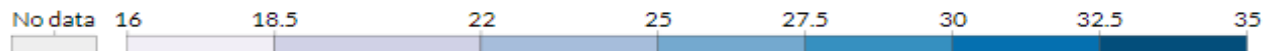
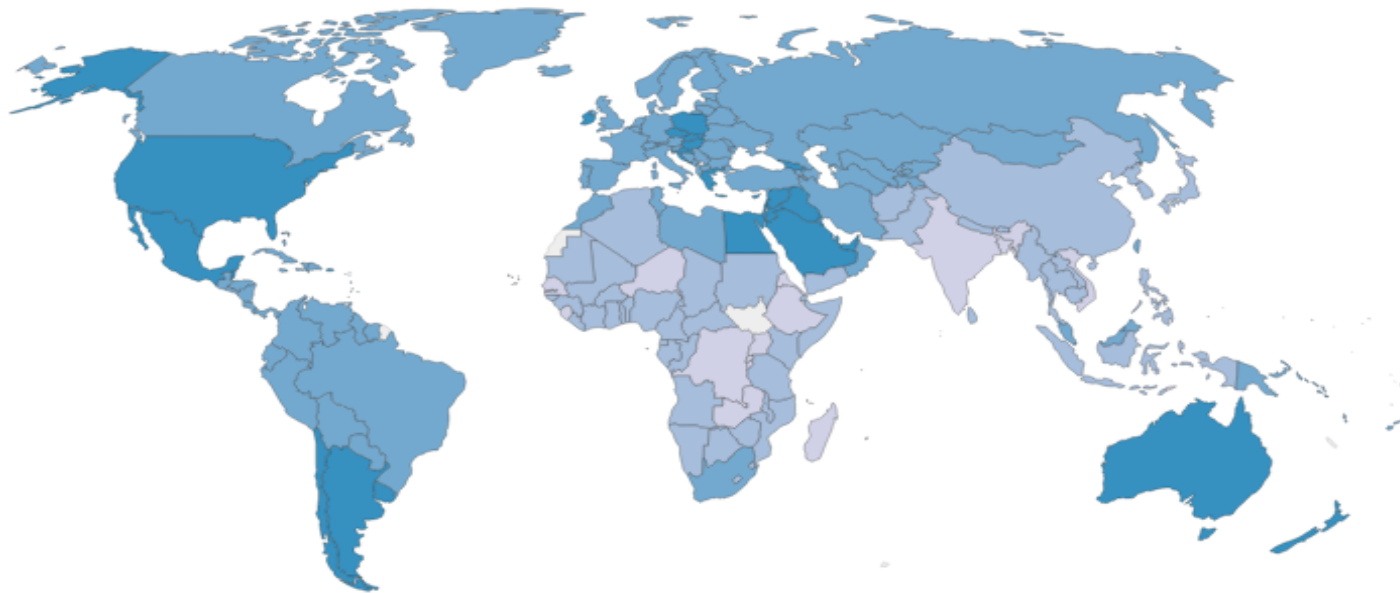


Mean BMI in Men Worldwide-2016

Mean body mass index (BMI) in men, 2016

Body mass index (BMI) is measured as a person's weight in kilograms (kg) divided by his height (in meters), squared. The WHO define a BMI ≤ 18.5 as 'underweight'; 18.5 to < 25 as 'normal/healthy'; 25.0 to < 30 as 'overweight'; and > 30.0 as 'obese'.

Our World
in Data



Source: NCD Risk Factor Collaboration (NCD-RisC)

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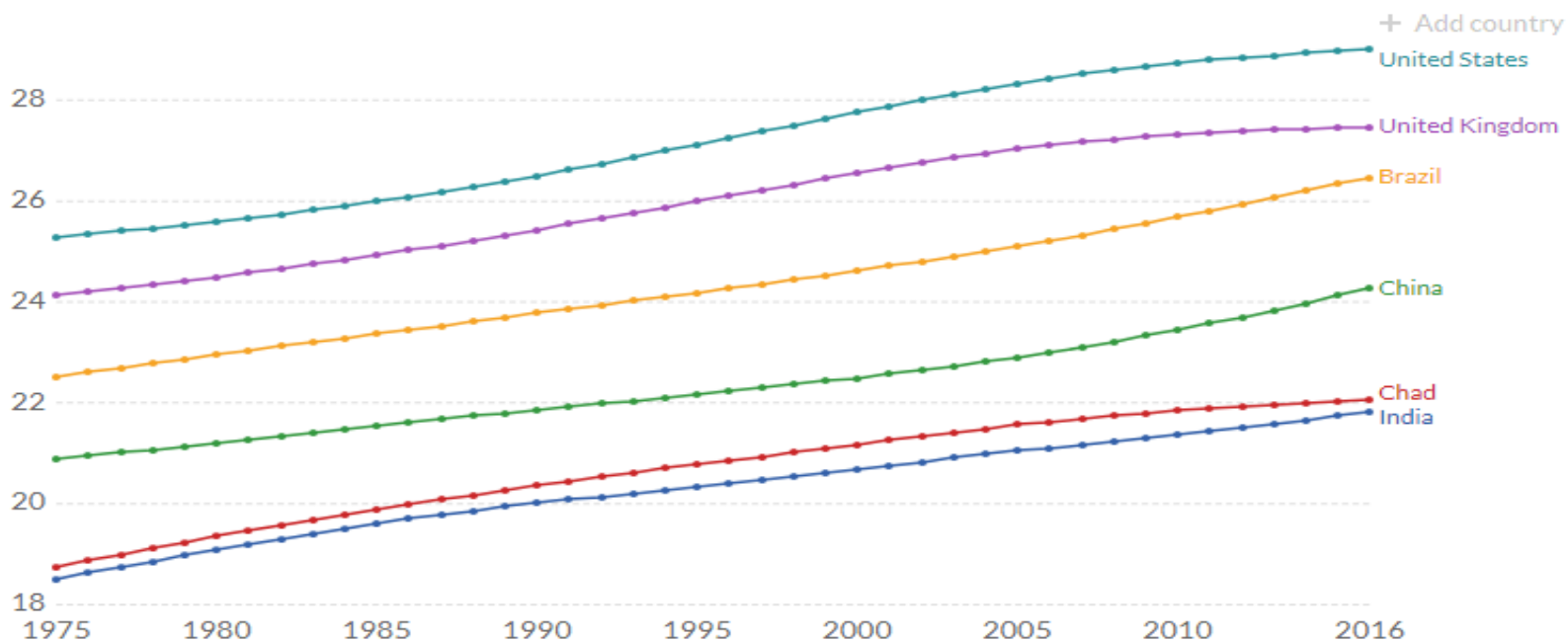


Mean and Trend of BMI in Men -2016

Mean body mass index (BMI) in men

Body mass index (BMI) is measured as a person's weight in kilograms (kg) divided by his height (in meters), squared. The WHO define a BMI ≤ 18.5 as 'underweight'; 18.5 to < 25 as 'normal/healthy'; 25.0 to < 30 as 'overweight'; and > 30.0 as 'obese'.

Our World
in Data



Source: NCD Risk Factor Collaboration (NCD-RisC)

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1975 2016

Relative change

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MAP

DATA

SOURCES

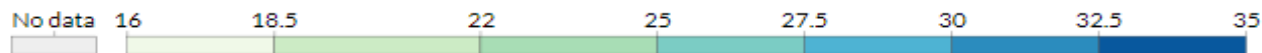
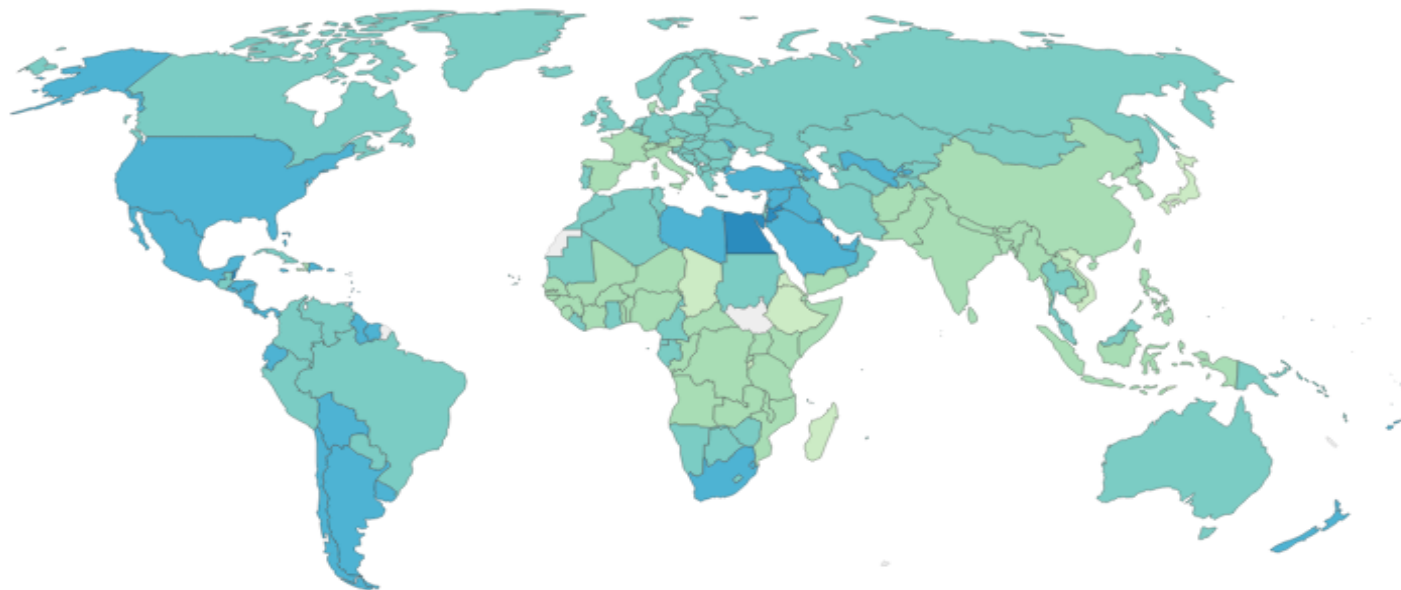


Mean BMI in Women Worldwide-2016

Mean body mass index (BMI) in women, 2016

Body mass index (BMI) is measured as a person's weight in kilograms (kg) divided by her height (in meters), squared. The WHO define a BMI ≤ 18.5 as 'underweight'; 18.5 to < 25 as 'normal/healthy'; 25.0 to < 30 as 'overweight'; and > 30.0 as 'obese'.

Our World
in Data



Source: NCD Risk Factor Collaboration (NCD-RisC)

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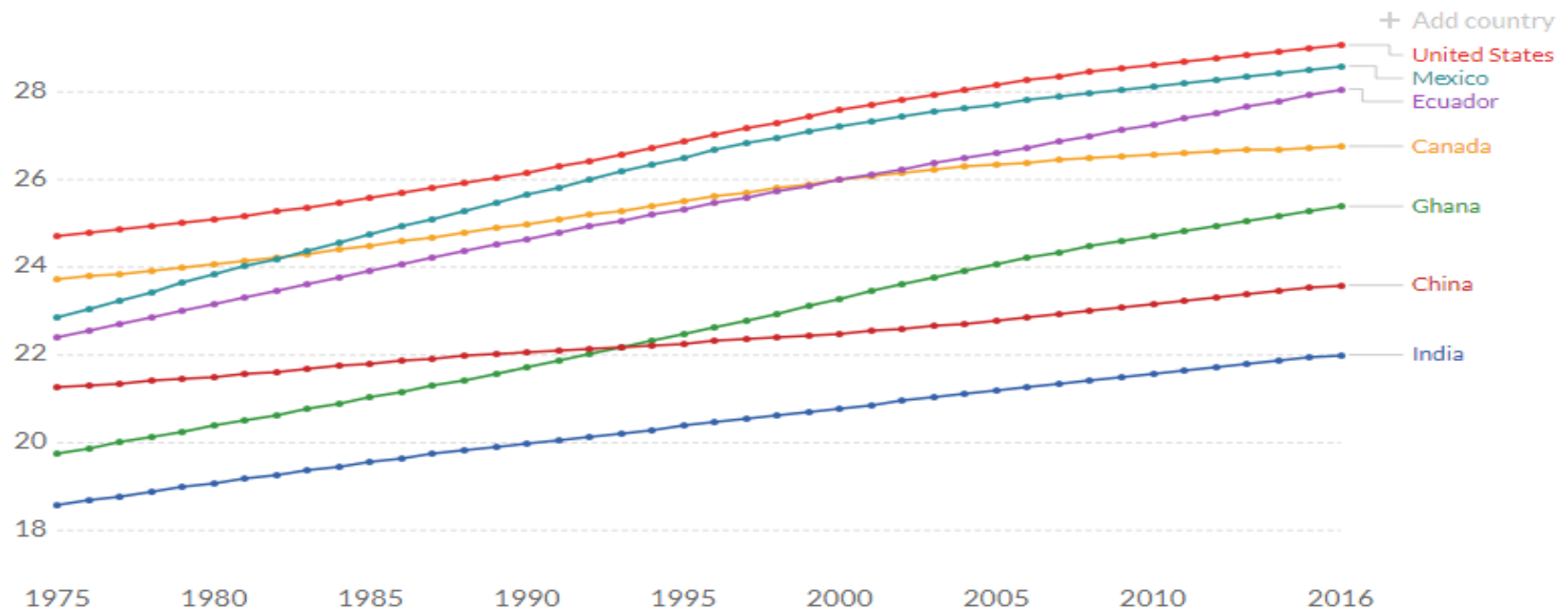


Trend of BMI in Women-2016

Mean body mass index (BMI) in women

Body mass index (BMI) is measured as a person's weight in kilograms (kg) divided by her height (in meters), squared. The WHO define a BMI ≤ 18.5 as 'underweight'; 18.5 to < 25 as 'normal/healthy'; 25.0 to < 30 as 'overweight'; and > 30.0 as 'obese'.

Our World
in Data



Source: NCD Risk Factor Collaboration (NCD-RisC)

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1975 2016

Relative change

CHART

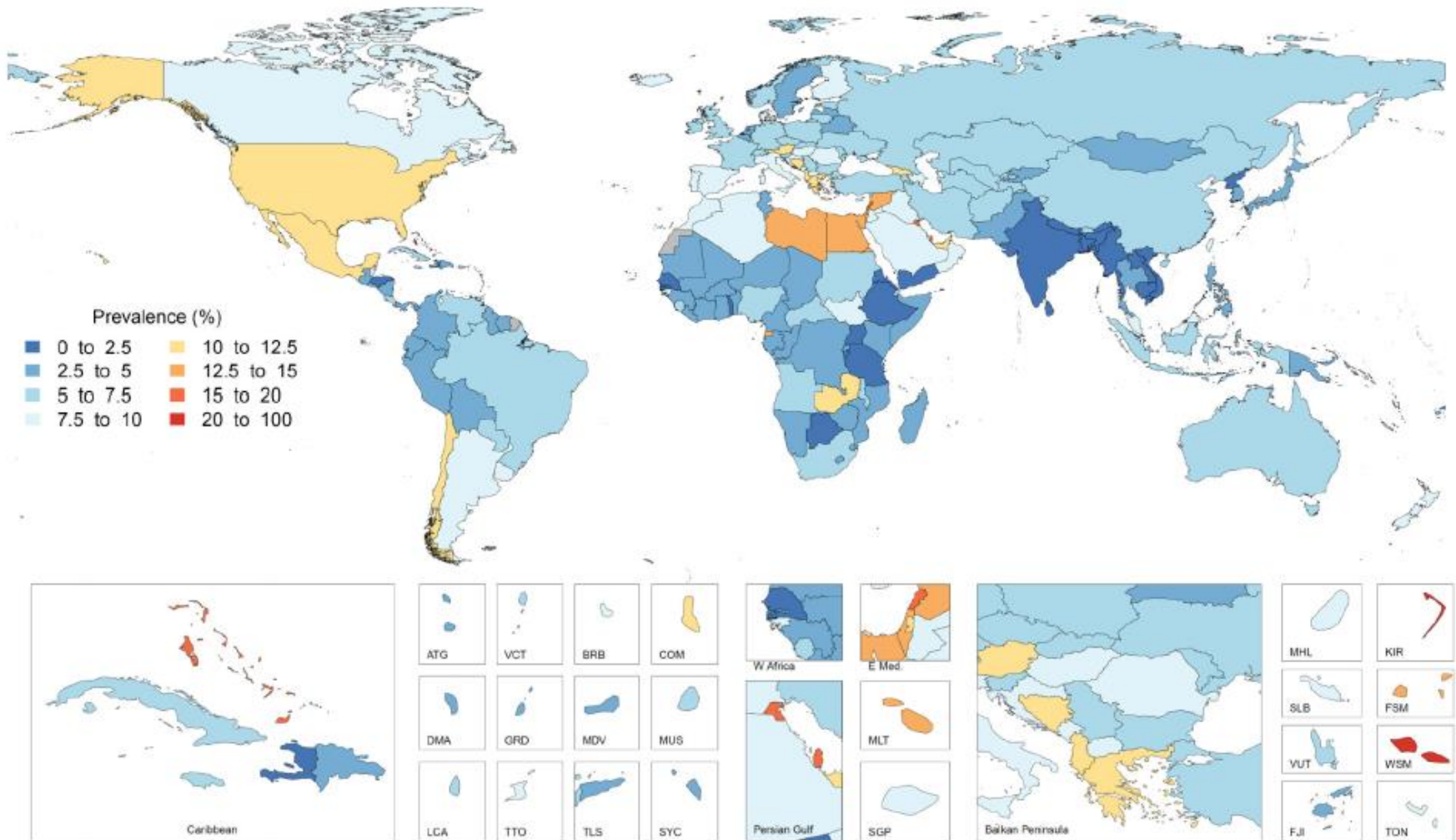
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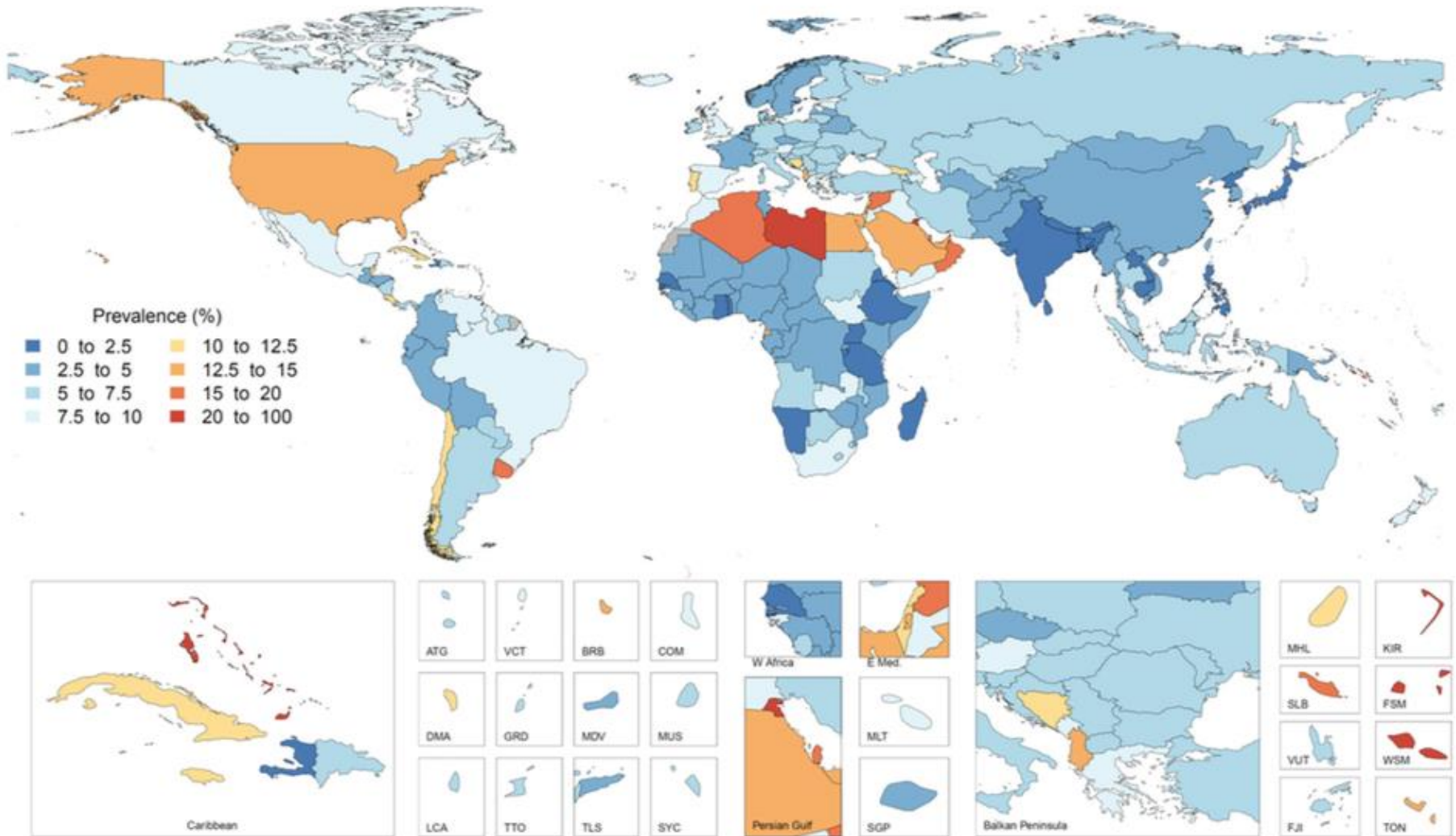


Childhood Obesity (Boys), 2013



Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Childhood Obesity (Girls), 2013



Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Comparing Estimates across countries

| Country/Region | Males <20 | | Males, >20 | | Females, <20 | | Females, >20 | |
|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Overweight | Obese | Overweight | Obese | Overweight | Obese | Overweight | Obese |
| Algeria | 21.7 (18.5-25.2) | 7.7 (6.2-9.4) | 42.0 (39.0-44.8) | 11.1 (9.8-12.3) | 30.0 (25.5-34.5) | 15.3 (12.5-18.6) | 57.8 (55.1-60.9) | 24.9 (22.6-27.4) |
| Bahrain | 22.4 (19.2-26.0) | 9.3 (7.3-11.4) | 67.7 (65.3-70.2) | 31.0 (28.4-33.7) | 26.7 (22.5-30.8) | 10.7 (8.5-13.4) | 75.2 (72.8-77.5) | 42.9 (40.0-45.9) |
| Egypt | 31.5 (27.5-35.7) | 12.7 (10.7-15.2) | 71.2 (68.9-73.7) | 26.4 (25.0-27.8) | 39.5 (34.7-44.3) | 14.4 (11.9-17.6) | 79.4 (77.6-81.3) | 48.4 (46.1-50.9) |
| Iran | 21.6 (18.6-25.4) | 5.9 (4.8-7.2) | 49.4 (47.2-51.6) | 13.6 (12.5-14.8) | 26.2 (22.3-30.4) | 7.2 (5.7-8.9) | 63.3 (61.0-65.4) | 29.3 (27.2-31.6) |
| Iraq | 19.5 (16.5-22.8) | 8.2 (6.8-9.8) | 62.4 (59.7-65.3) | 25.7 (23.3-28.1) | 25.0 (21.3-28.9) | 8.2 (6.6-10.0) | 68.1 (65.1-70.9) | 37.5 (34.4-40.6) |
| Jordan | 24.1 (20.6-28.0) | 8.0 (6.4-9.9) | 71.6 (69.3-74.1) | 27.5 (25.3-29.7) | 25.4 (21.8-29.3) | 8.0 (6.2-10.0) | 75.6 (74.0-77.3) | 45.6 (43.4-47.9) |
| Kuwait | 24.6 (21.1-28.5) | 16.7 (13.9-20.1) | 74.5 (72.4-76.6) | 43.4 (40.9-46.1) | 45.5 (40.1-50.9) | 23.3 (19.5-27.8) | 84.3 (82.6-86.1) | 58.6 (55.7-61.4) |
| Lebanon | 33.1 (28.9-37.9) | 15.9 (13.0-19.1) | 71.1 (68.9-73.4) | 26.3 (24.2-28.4) | 29.8 (25.6-34.0) | 12.5 (10.2-15.4) | 62.3 (59.9-64.8) | 29.3 (27.0-31.7) |
| Libya | 32.5 (28.5-36.9) | 14.5 (12.0-17.0) | 70.6 (68.1-73.1) | 30.2 (27.6-32.9) | 41.7 (36.3-46.8) | 22.1 (18.1-26.4) | 77.0 (74.6-79.3) | 57.2 (54.0-60.4) |
| Morocco | 22.5 (19.3-26.1) | 7.9 (6.4-9.6) | 54.7 (51.7-57.5) | 18.1 (16.3-20.0) | 25.9 (22.1-30.2) | 9.1 (7.3-11.3) | 52.8 (50.0-55.5) | 20.9 (18.8-23.1) |
| Oman | 24.5 (20.5-28.5) | 8.4 (6.7-10.2) | 53.7 (50.9-56.7) | 20.6 (18.5-22.7) | 42.3 (37.4-47.5) | 15.4 (12.4-18.5) | 73.4 (71.0-75.7) | 36.9 (33.9-40.1) |
| Palestine | 27.9 (23.8-31.9) | 11.9 (9.8-14.3) | 70.0 (67.4-72.4) | 29.8 (28.0-31.5) | 30.6 (26.4-35.5) | 12.5 (10.1-15.2) | 77.0 (74.8-79.2) | 42.4 (40.5-44.4) |
| Qatar | 33.5 (29.3-38.0) | 18.8 (15.8-21.9) | 75.7 (73.8-77.4) | 44.0 (41.8-46.4) | 22.1 (18.6-25.7) | 15.5 (12.6-18.6) | 78.5 (77.0-80.1) | 54.7 (52.1-57.0) |
| Saudi Arabia | 23.5 (20.2-26.8) | 9.4 (7.8-11.2) | 69.0 (67.1-70.7) | 30.0 (28.4-31.8) | 37.4 (32.8-42.5) | 14.8 (12.2-17.7) | 74.2 (72.3-76.0) | 44.4 (42.4-46.5) |
| Sudan | 11.2 (9.2-13.4) | 5.7 (4.6-6.9) | 35.8 (33.2-38.4) | 12.7 (11.3-14.2) | 14.4 (12.0-17.6) | 5.8 (4.5-7.1) | 39.9 (37.3-42.7) | 18.3 (16.4-20.4) |
| Syria | 32.9 (28.6-37.5) | 13.9 (11.5-16.5) | 72.0 (69.5-74.2) | 24.2 (21.8-26.6) | 33.3 (28.8-38.3) | 15.4 (12.5-18.6) | 72.7 (69.9-75.1) | 39.9 (36.8-43.0) |
| Tunisia | 17.7 (15.0-20.8) | 4.2 (3.4-5.2) | 51.7 (48.8-54.4) | 15.3 (13.7-16.9) | 23.4 (19.6-27.5) | 4.2 (3.3-5.2) | 57.5 (54.4-60.3) | 12.8 (11.3-14.3) |
| Turkey | 20.4 (17.5-23.6) | 7.1 (5.7-8.7) | 63.8 (62.1-65.5) | 20.1 (18.7-21.3) | 19.8 (16.6-23.0) | 5.7 (4.5-7.0) | 65.8 (64.2-67.5) | 34.1 (32.4-35.8) |
| United Arab Emirates | 30.8 (26.5-35.1) | 12.2 (9.8-14.7) | 66.1 (63.6-68.8) | 27.1 (24.5-30.0) | 31.6 (27.1-36.2) | 12.6 (10.0-15.7) | 60.6 (57.4-63.4) | 33.2 (30.2-36.3) |
| Yemen | 8.4 (6.9-10.0) | 1.7 (1.4-2.1) | 29.0 (26.8-31.2) | 4.1 (3.7-4.7) | 26.9 (22.9-31.4) | 8.3 (6.5-10.3) | 57.9 (55.1-60.8) | 24.7 (22.2-27.2) |
| Philippines | 5.5 (4.5-6.6) | 2.6 (2.1-3.2) | 22.9 (21.0-24.8) | 4.1 (3.6-4.7) | 5.4 (4.4-6.6) | 2.1 (1.6-2.7) | 25.9 (23.8-28.2) | 6.2 (5.5-7.0) |

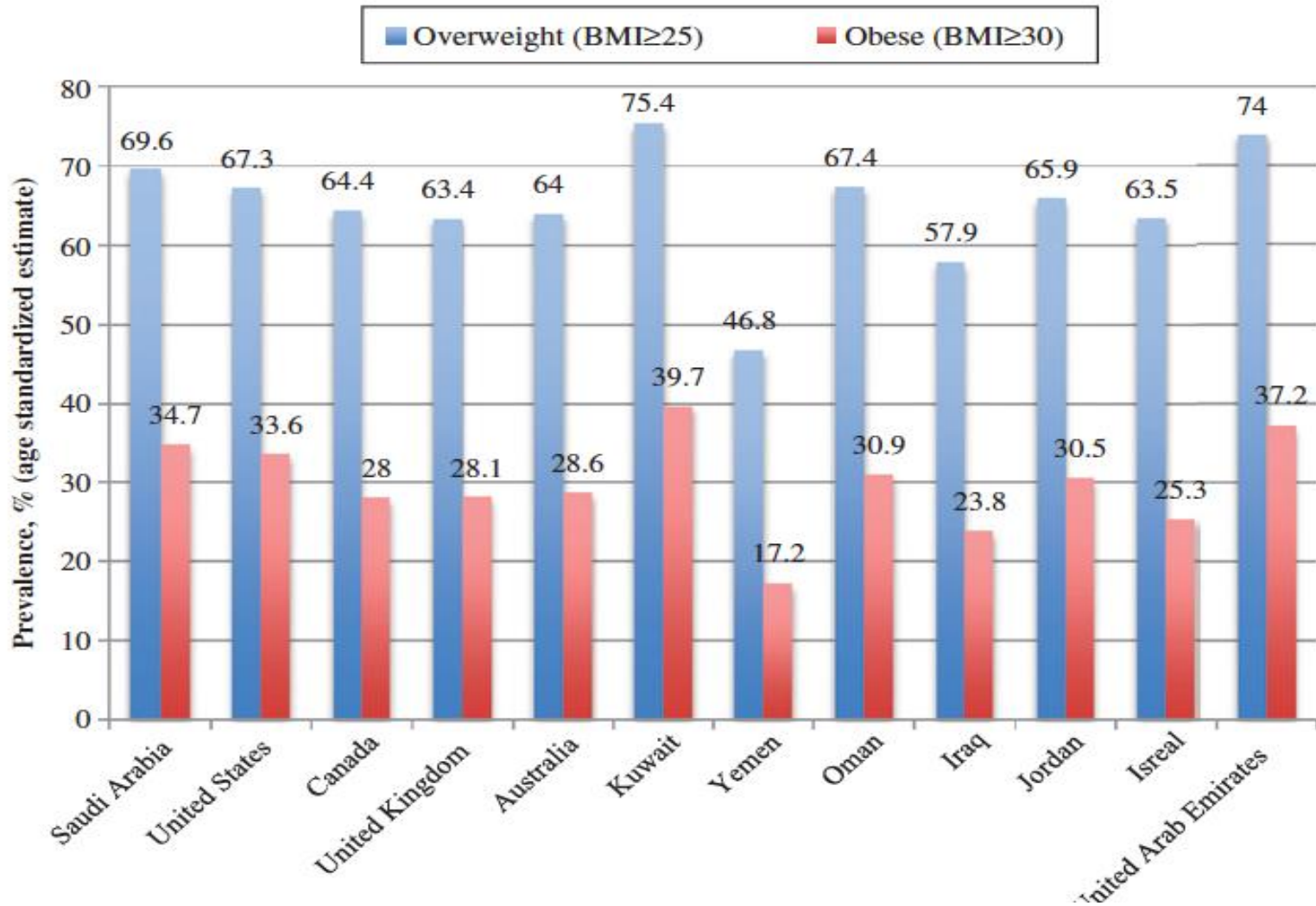
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Comparing Estimates across countries 2013

| Country/Region | Males <20 | | Males, >20 | | Females, <20 | | Females, >20 | |
|----------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Overweight | Obese | Overweight | Obese | Overweight | Obese | Overweight | Obese |
| Morocco | 22.5 (19.3-26.1) | 7.9 (6.4-9.6) | 54.7 (51.7-57.5) | 18.1 (16.3-20.0) | 25.9 (22.1-30.2) | 9.1 (7.3-11.3) | 52.8 (50.0-55.5) | 20.9 (18.8-23.1) |
| Oman | 24.5 (20.5-28.5) | 8.4 (6.7-10.2) | 53.7 (50.9-56.7) | 20.6 (18.5-22.7) | 42.3 (37.4-47.5) | 15.4 (12.4-18.5) | 73.4 (71.0-75.7) | 36.9 (33.9-40.1) |
| Palestine | 27.9 (23.8-31.9) | 11.9 (9.8-14.3) | 70.0 (67.4-72.4) | 29.8 (28.0-31.5) | 30.6 (26.4-35.5) | 12.5 (10.1-15.2) | 77.0 (74.8-79.2) | 42.4 (40.5-44.4) |
| Qatar | 33.5 (29.3-38.0) | 18.8 (15.8-21.9) | 75.7 (73.8-77.4) | 44.0 (41.8-46.4) | 22.1 (18.6-25.7) | 15.5 (12.6-18.6) | 78.5 (77.0-80.1) | 54.7 (52.1-57.0) |
| Saudi Arabia | 23.5 (20.2-26.8) | 9.4 (7.8-11.2) | 69.0 (67.1-70.7) | 30.0 (28.4-31.8) | 37.4 (32.8-42.5) | 14.8 (12.2-17.7) | 74.2 (72.3-76.0) | 44.4 (42.4-46.5) |
| Sudan | 11.2 (9.2-13.4) | 5.7 (4.6-6.9) | 35.8 (33.2-38.4) | 12.7 (11.3-14.2) | 14.4 (12.0-17.6) | 5.8 (4.5-7.1) | 39.9 (37.3-42.7) | 18.3 (16.4-20.4) |
| Syria | 32.9 (28.6-37.5) | 13.9 (11.5-16.5) | 72.0 (69.5-74.2) | 24.2 (21.8-26.6) | 33.3 (28.8-38.3) | 15.4 (12.5-18.6) | 72.7 (69.9-75.1) | 39.9 (36.8-43.0) |
| Tunisia | 17.7 (15.0-20.8) | 4.2 (3.4-5.2) | 51.7 (48.8-54.4) | 15.3 (13.7-16.9) | 23.4 (19.6-27.5) | 4.2 (3.3-5.2) | 57.5 (54.4-60.3) | 12.8 (11.3-14.3) |
| Turkey | 20.4 (17.5-23.6) | 7.1 (5.7-8.7) | 63.8 (62.1-65.5) | 20.1 (18.7-21.3) | 19.8 (16.6-23.0) | 5.7 (4.5-7.0) | 65.8 (64.2-67.5) | 34.1 (32.4-35.8) |
| United Arab Emirates | 30.8 (26.5-35.1) | 12.2 (9.8-14.7) | 66.1 (63.6-68.8) | 27.1 (24.5-30.0) | 31.6 (27.1-36.2) | 12.6 (10.0-15.7) | 60.6 (57.4-63.4) | 33.2 (30.2-36.3) |
| Yemen | 8.4 (6.9-10.0) | 1.7 (1.4-2.1) | 29.0 (26.8-31.2) | 4.1 (3.7-4.7) | 26.9 (22.9-31.4) | 8.3 (6.5-10.3) | 57.9 (55.1-60.8) | 24.7 (22.2-27.2) |
| Spain | 27.6 (23.9-31.2) | 8.4 (6.7-10.2) | 62.3 (60.0-64.9) | 20.2 (18.5-22.1) | 23.8 (20.2-27.4) | 7.6 (6.0-9.3) | 46.5 (43.7-48.9) | 20.9 (19.0-23.1) |
| Sweden | 20.4 (17.5-23.4) | 4.3 (3.6-5.3) | 58.2 (55.6-61.0) | 18.9 (17.0-21.0) | 19.3 (16.5-22.5) | 4.0 (3.2-5.0) | 45.8 (43.2-48.5) | 19.8 (17.7-21.9) |
| Switzerland | 20.7 (17.4-24.4) | 6.6 (5.4-7.9) | 56.6 (53.7-59.4) | 18.4 (16.5-20.1) | 16.2 (13.4-19.4) | 5.5 (4.3-6.8) | 39.9 (37.0-42.9) | 17.0 (15.3-18.8) |
| United Kingdom | 26.1 (23.8-28.5) | 7.4 (6.5-8.5) | 66.6 (65.3-68.0) | 24.5 (23.4-25.7) | 29.2 (26.8-31.9) | 8.1 (7.0-9.3) | 57.2 (55.7-58.6) | 25.4 (24.2-26.6) |
| Denmark | 19.7 (16.8-23.1) | 8.7 (7.1-10.7) | 59.2 (56.5-61.9) | 19.6 (17.7-21.9) | 19.4 (15.8-23.2) | 5.9 (4.7-7.5) | 44.7 (41.7-47.7) | 19.9 (17.7-22.0) |
| Finland | 26.0 (22.3-29.8) | 9.2 (7.5-11.2) | 62.2 (59.5-64.9) | 20.9 (18.9-23.2) | 21.1 (17.7-25.0) | 6.6 (5.2-8.1) | 50.4 (47.5-53.2) | 22.3 (20.3-24.6) |
| France | 19.9 (16.8-23.3) | 5.8 (4.7-7.0) | 55.9 (53.2-58.7) | 19.3 (17.4-21.4) | 16.0 (13.3-18.7) | 4.7 (3.8-5.9) | 42.8 (40.0-45.7) | 19.7 (17.7-21.7) |
| Germany | 20.5 (17.4-23.8) | 5.5 (4.5-6.7) | 64.3 (61.9-66.8) | 21.9 (20.2-23.8) | 19.4 (16.3-22.5) | 5.3 (4.2-6.5) | 49.0 (46.5-51.4) | 22.5 (20.5-24.7) |

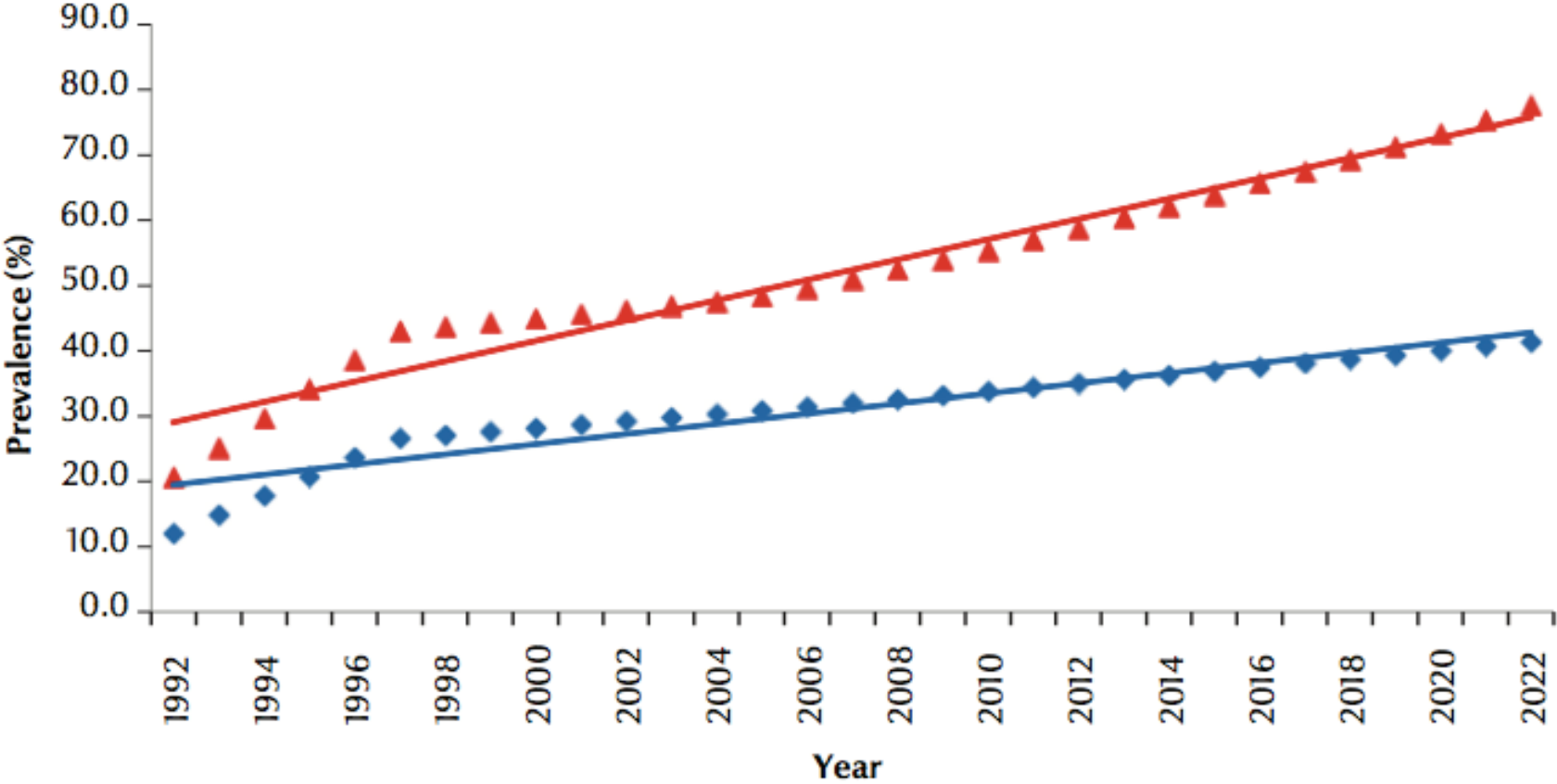
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Comparing obesity and overweight in Arab world



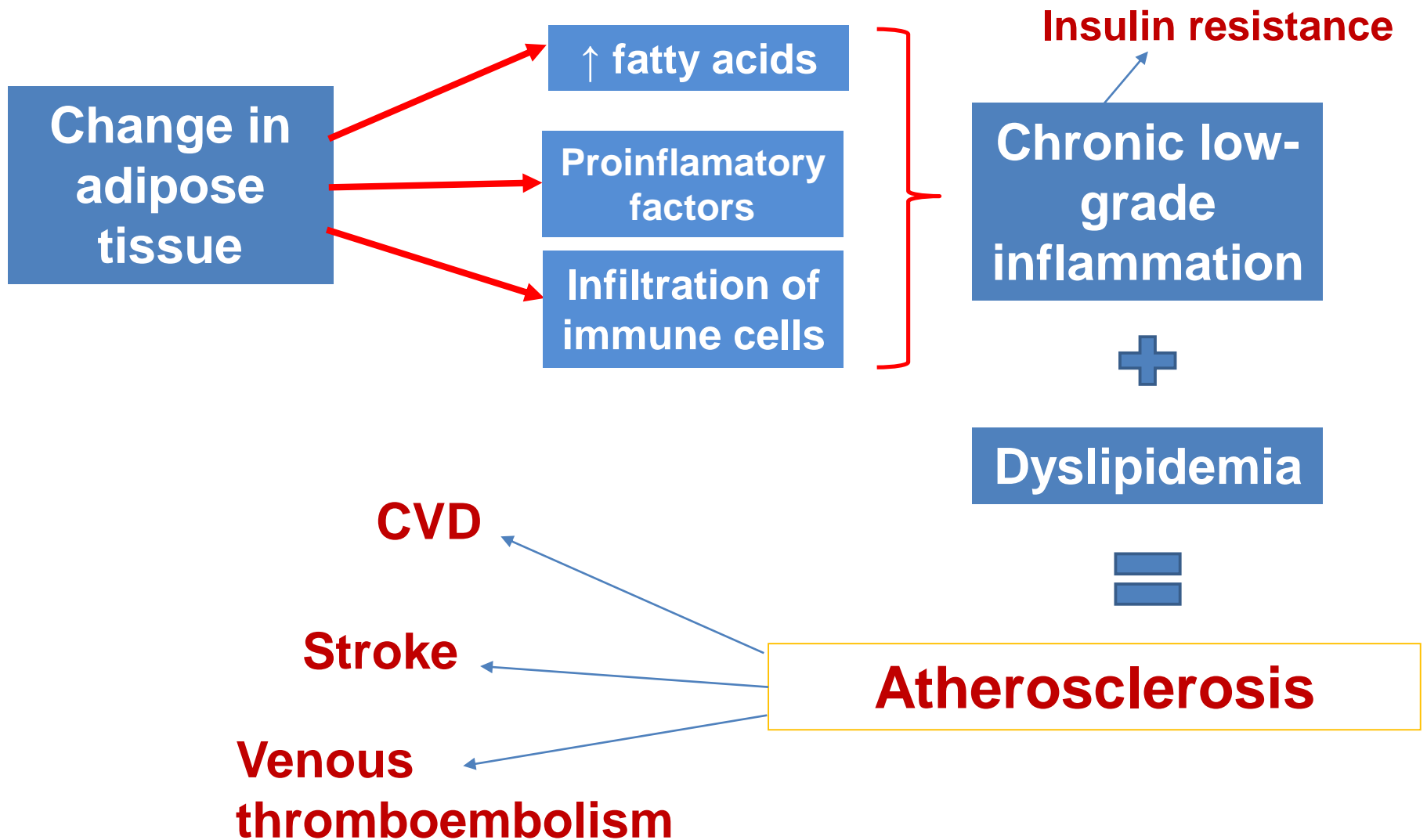
Source: DeNicola E, Aburizaiza OS, Siddique A, Khawaja H, Carpenter DO. Obesity and public health in the Kingdom of Saudi Arabia. Rev Environ Health 2015; 30(3): 191-205.

Projections of obesity in Saudi Adults



Source: Al-Quwaidhi AJ, Pearce MS, Critchley JA, Sobngwi E, O’Flaherty M. Trends and future projections of the prevalence of adult obesity in Saudi Arabia, 1992-2022.

Pathophysiology of Obesity



Risk Factors for Obesity

- Genetic factors
- Hormonal factors
- Environmental factors
- Behavioral factors

Genetic risk factors for Obesity

- Parents who are obese
- Genetic disorders:
 - ▣ Trisomy 21 (Down's Syndrome)
 - ▣ Prader-Willi Syndrome
 - ▣ Albright's hereditary osteodystrophy
 - ▣ Leptin deficiency
 - ▣ Leptin receptor mutations
 - ▣ Melanocortin 4 receptor disorders

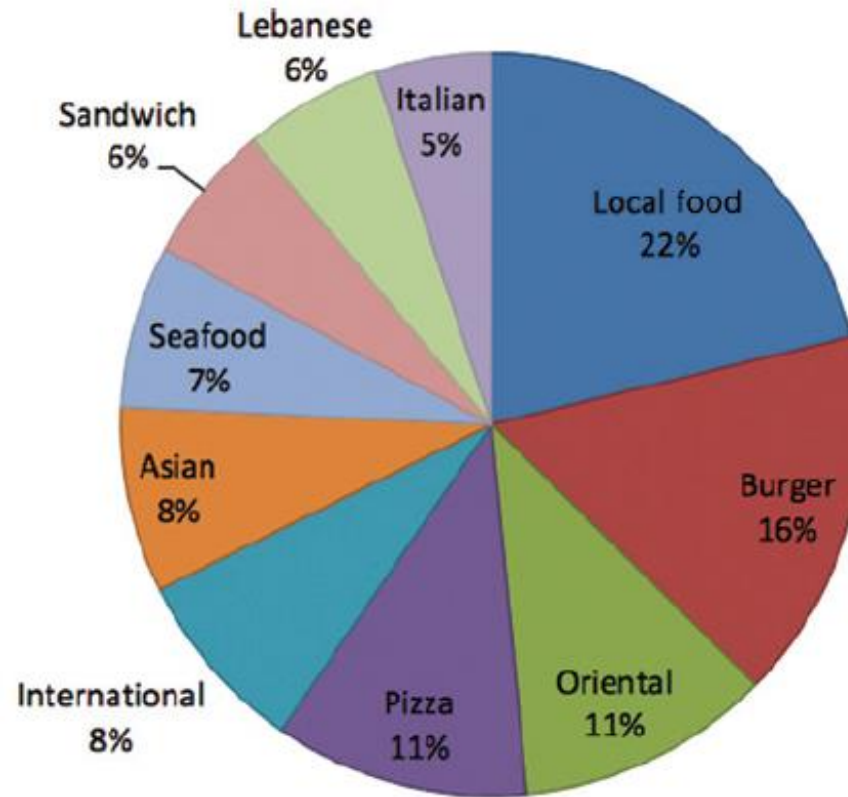
Hormonal risk factors for Obesity

- Hypothyroidism
- Growth hormone deficiency
- Cushing syndrome
- Hypothalamic obesity
- Polycystic ovary syndrome (PCO)
- Hyperprolactinemia

Environmental/societal risk factors for Obesity

- Low income
- Parents' bad habits for food and physical activity
- Difficulty accessing places with healthy food options (food desert)
- Living far away from parks
- Dangerous neighborhoods
- Food insecurity (no sufficient quantity of affordable healthy food)

Top Ten restaurant types searched on phone-apps in 2013



Source: DeNicola E, Aburizaiza OS, Siddique A, Khawaja H, Carpenter DO. Obesity and public health in the Kingdom of Saudi Arabia. Rev Environ Health 2015; 30(3): 191-205.

Behavioral Risk Factors for Obesity

- Nutrition and diet
- Physical activity
- Sleep
- Stress

Consequences of Obesity in adults

Table 1 Morbidities associated with obesity (Hamdy, 2016; Petry, Barry, Pietrzak, & Wagner, 2008; Pi-Sunyer, 2009; Sakai et al., 2005; Smith, Hulseay, & Goodnight, 2008; Yosipovitch, DeVore, & Dawn, 2007)

| Class of event | Comorbidities associated with obesity |
|---|---|
| Cancer/malignancy | Postmenopausal breast, endometrial, colon and rectal, gallbladder, prostate, ovarian, endometrial renal cell, esophageal adenocarcinoma, pancreatic, and kidney cancer |
| Cardiovascular | Coronary artery disease, obesity-associated cardiomyopathy, essential hypertension, left ventricular hypertrophy, cor pulmonale, accelerated atherosclerosis, pulmonary hypertension of obesity, dyslipidemia, chronic heart failure (CHD), left ventricular hypertrophy (LVH), cardiomyopathy, pulmonary hypertension, lymphedema (legs) |
| Gastrointestinal (GI) | Gall bladder disease (cholecystitis, cholelithiasis), gastroesophageal reflux disease (GERD), reflux esophagitis, nonalcoholic steatohepatitis (NASH), nonalcoholic fatty liver disease (NAFLD), fatty liver infiltration, acute pancreatitis |
| Genitourinary | Stress incontinence |
| Metabolic/endocrine | Type 2 diabetes mellitus, prediabetes, metabolic syndrome, insulin resistance, and dyslipidemia |
| Musculoskeletal/orthopedic | Pain in back, hips, ankles, feet and knees; osteoarthritis (especially in the knees and hips), plantar fasciitis, back pain, coxavera, slipped capital femoral epiphyses, Blount disease and Legg-Calvé-Perthes disease, and chronic lumbago |
| Neurological and central nervous system (CNS) | Stroke, dementia idiopathic intracranial hypertension, and meralgia paresthesia |
| Obstetric and perinatal | Pregnancy-related hypertension, fetal macrosomia, very low birthweight, neural tube defects, preterm birth, increased cesarean delivery, increased postpartum infection and pelvic dystocia, preeclampsia, hyperglycemia, gestational diabetes (GDM) |
| Skin | Keratosis pilaris, hirsutism, acanthosis nigricans, and acrochondons, psoriasis, intertrigo (bacterial and/or fungal), and increased risk for cellulitis, venous stasis ulcers, necrotizing fasciitis, and carbuncles |
| Psychological | Depression, anxiety, personality disorder, and obesity stigmatization |
| Respiratory/pulmonary | Obstructive sleep apnea (OSA), Pickwickian syndrome (obesity hypoventilation syndrome), higher rates of respiratory infections, asthma, hypoventilation, pulmonary emboli risk |
| Surgical | Increased surgical risk and postoperative complications, deep venous thrombosis, including wound infection, pulmonary embolism, and postoperative pneumonia |
| Reproductive (Women) | Anovulation, early puberty, polycystic ovaries, infertility, hyperandrogenism, and sexual dysfunction |
| Reproductive (Men) | Hypogonadotropic hypogonadism, polycystic ovary syndrome (PCOS), decreased libido, and sexual dysfunction |
| Extremities | Venous varicosities, lower extremity venous and/or lymphatic edema |

Consequences of Obesity in Children

- ❑ T2 Diabetes Mellitus
- ❑ Early onset metabolic syndrome
- ❑ Asthma
- ❑ Poor dental health
- ❑ Non-alcoholic fatty liver disease
- ❑ Gastro Esophageal Reflux Disease (GERD)
- ❑ Puberty (delay in boys, advance in girls)
- ❑ Hyperandrogenism, PCOS
- ❑ Poor self-esteem
- ❑ Attention Deficit Hyperactivity Disorder (ADHD)
- ❑ Sleep problems

Benefits of Weight Reduction

- Reduction of 5% to 10% of weight is associated with significant reduction in risk for:
 - CVD
 - T2DM
 - GERD
 - PCOS
 - Dyslipidemia
 - HTN
 - Osteoarthritis
 - Sleep apnea

Important Strategies For maintaining Weight Reduction

1. ***Changing lifestyle***

- ▣ Modify food intake
- ▣ Increase physical activity
- ▣ Exercise 1 hour daily
- ▣ Weigh weekly
- ▣ Watch less than 10 hours TV per week
- ▣ Use a weight-loss program

Important Strategies for Maintaining Weight Reduction cont.

2. ***Set realistic goals***

- ▣ 5% - 15% of initial weight

3. ***Maintaining a food diary***

4. ***Continuous support***

5. ***Prepare the suitable environment***

- ▣ Availability of healthy food items
- ▣ Organized family meal times
- ▣ Meal prepping (plan what you eat ahead of time)

Treatment of Obesity

- Behavioral modification
- Bariatric surgery
- Treatment of underlying cause (if hormonal causes)

Prevention of Obesity

- In children
- In adults

Preventing Obesity in Children

□ Early stage prevention:

- ▣ Maternal gestational weight control

□ During infancy:

- ▣ Dietary intake (self-regulation of breastfeeding ↓ risk, early introduction of solid food ↑ risk)
- ▣ Broad spectrum antibiotics (↑ risk)

□ During pre-school:

- ▣ Response to child temperament
- ▣ Dietary habits
- ▣ Reducing screen time

□ School and adolescents:

- ▣ Physical activity
- ▣ Peer habits

Secondary Prevention Measures

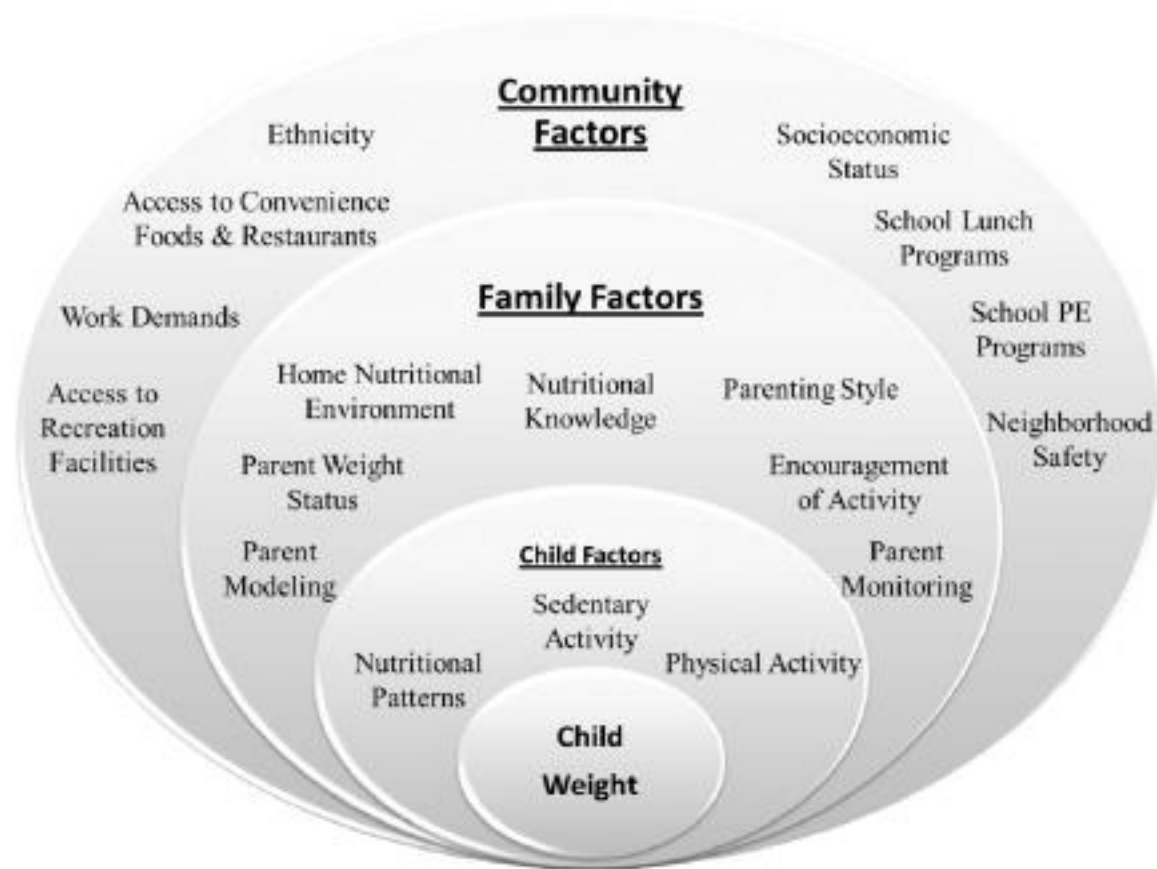
Obesity in Children

- Screening for obesity by primary care provider -> Provide counseling
- Provide guidance on nutrition and physical activity

Prevention of Childhood Obesity at Community Level

- ❑ Provide services for obesity prevention and treatment (BMI screening, well-visits)
- ❑ Promote healthy food and beverages and physical activity at schools
- ❑ Maintain safe neighborhoods
- ❑ Encourage going to parks and physical activity (especially summer vacation)
- ❑ Availability of healthy food resources in all communities
- ❑ Funding research for childhood obesity

Tackling factors affecting childhood obesity



(Adapted from Davison KK, Birch LL. Childhood overweight: a contextual model and

Preventing obesity in adults

- Educate and promote healthy lifestyle
- Promote social and environmental situation that prevents weight gain
- Involve different stakeholders in combating this epidemic
- Develop population-based policies that target:
 - ▣ barriers for healthy food and physical activity
 - ▣ Influence positive eating and physical activity behavior
 - ▣ Provide weight screening services, weight control services

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Thank you

Questions?