



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:

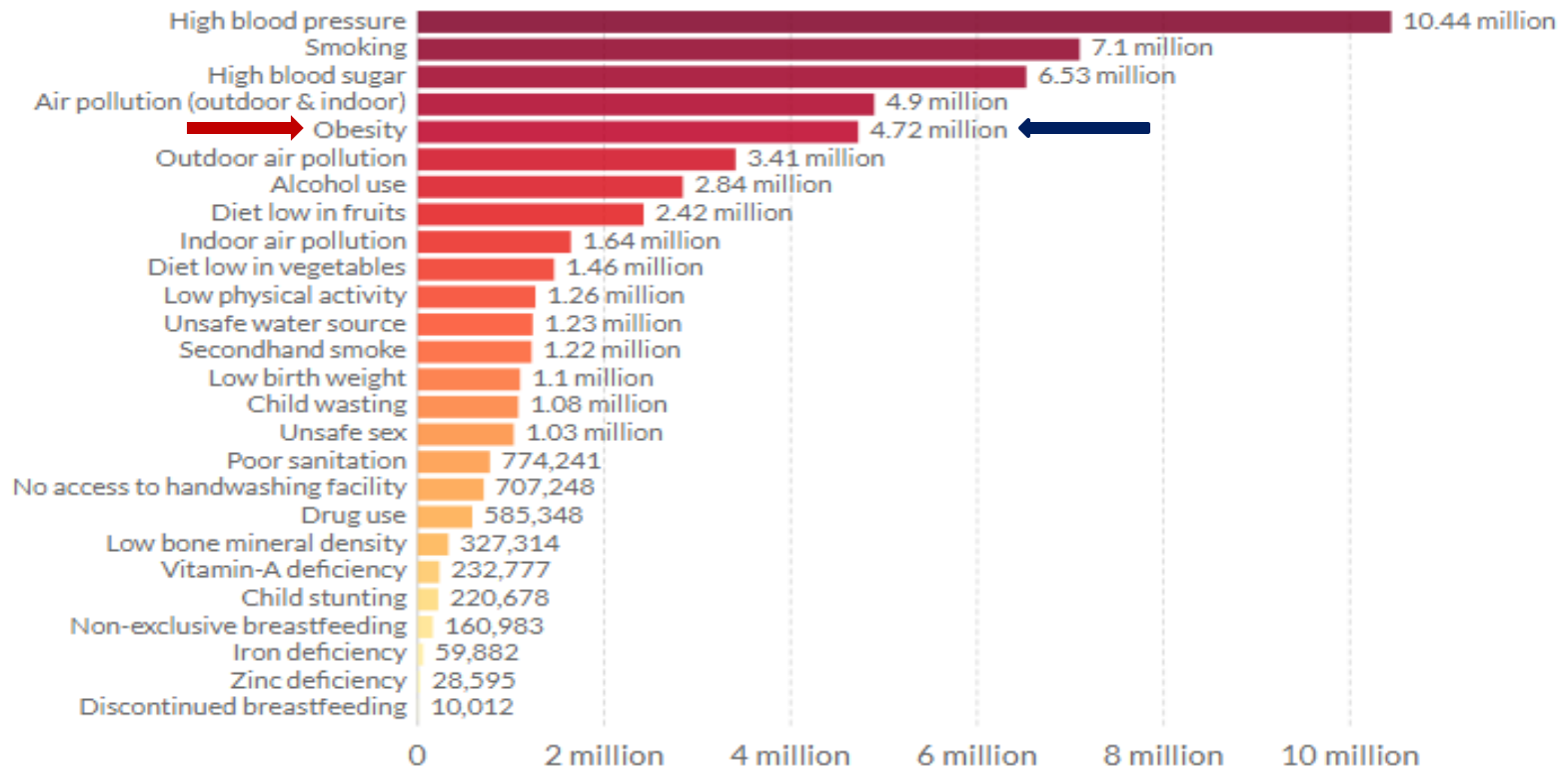
- Muscle mass can increase bodyweight; this means athletes or individuals with a high muscle mass percentage can be deemed overweight on the BMI scale, even if they have a low or healthy body fat percentage;
- Muscle and bone density tends to decline as we get older; this means that an older individual 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)

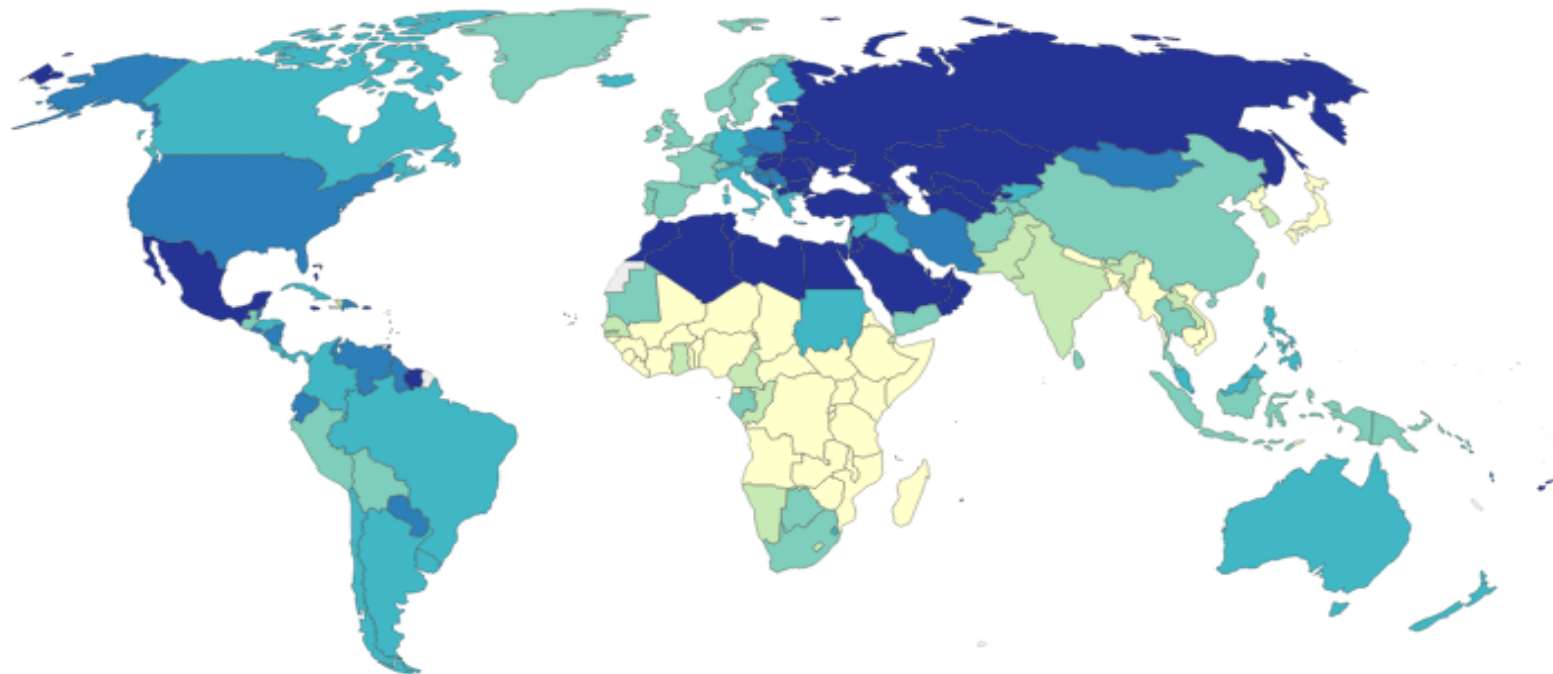
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Deaths Attributed to Obesity: 2017

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

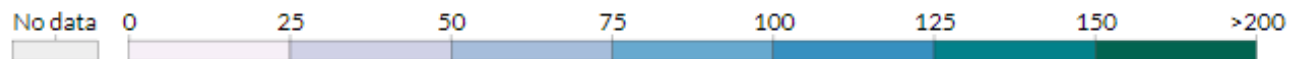
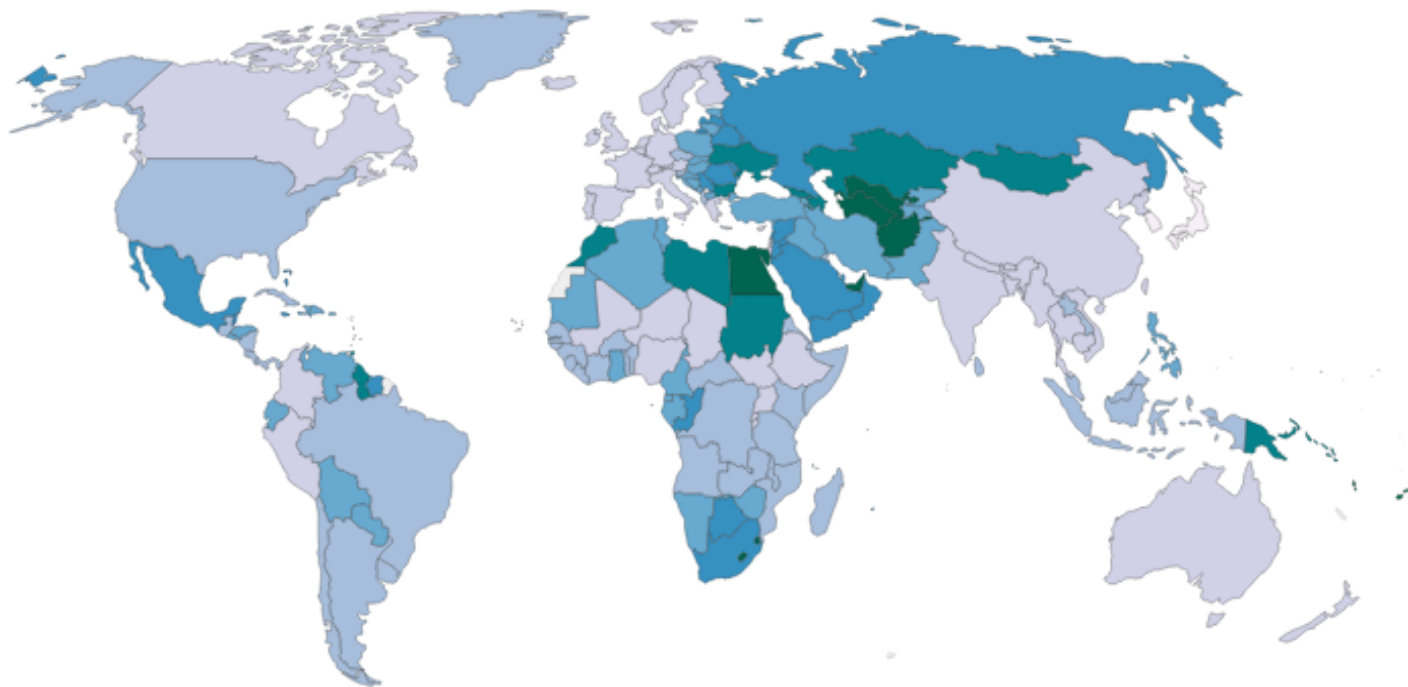
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Death Rate per 100.000 from Obesity: 2017

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

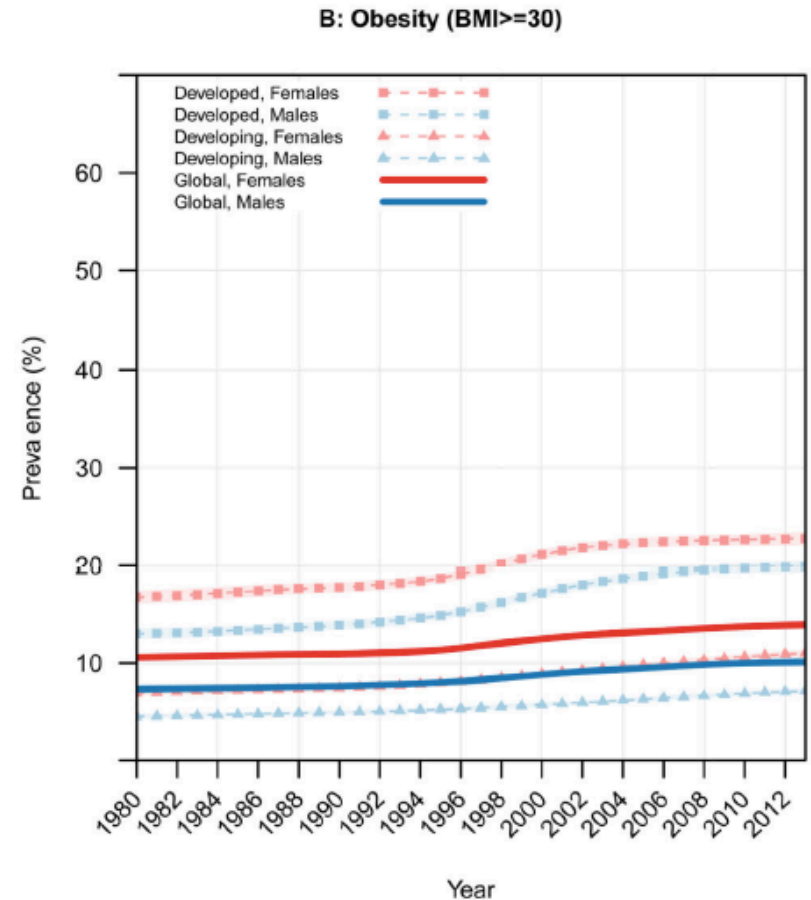
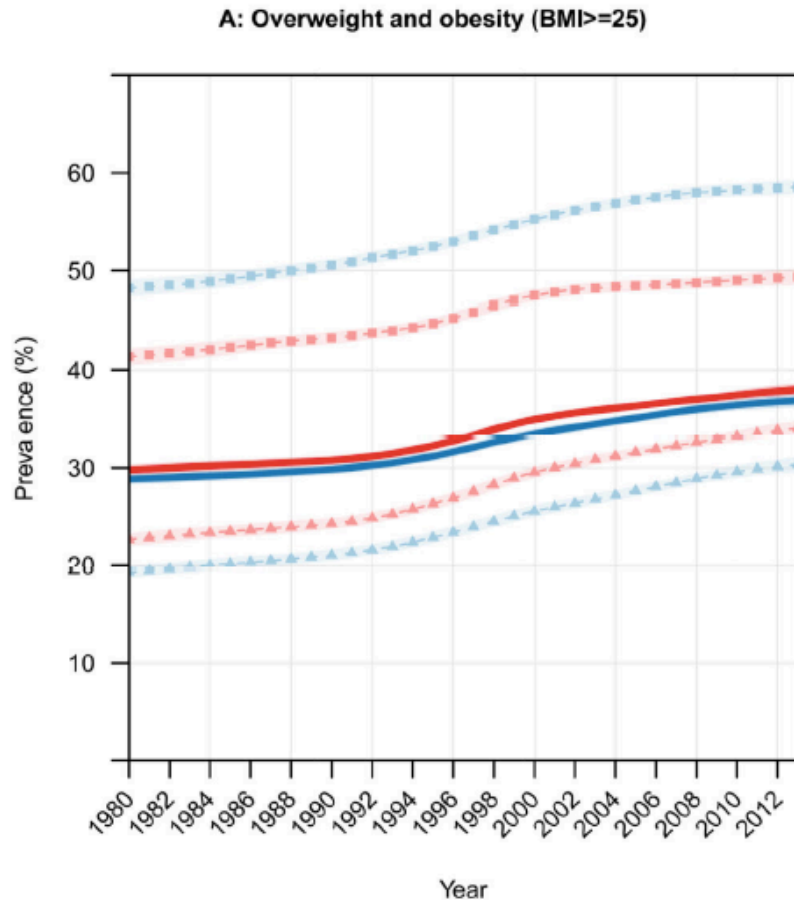
Note: To allow comparisons between countries and over time this metric is age-standardized.

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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

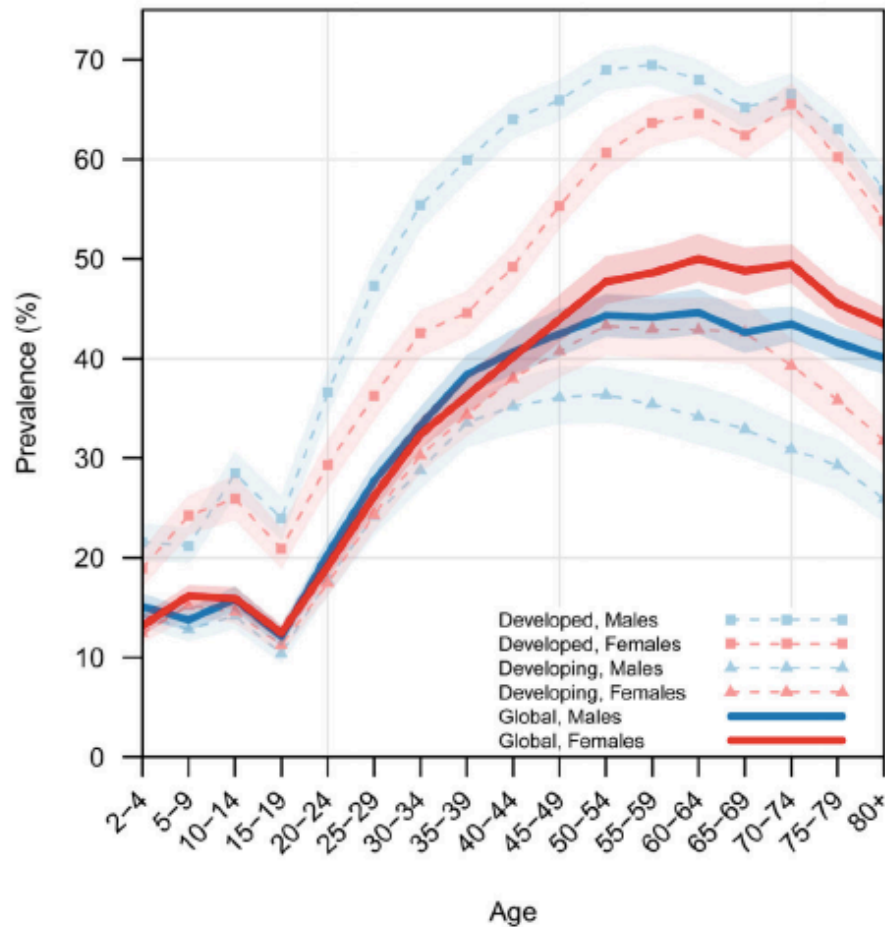
Overweight and Obesity in Adults Globally 2013



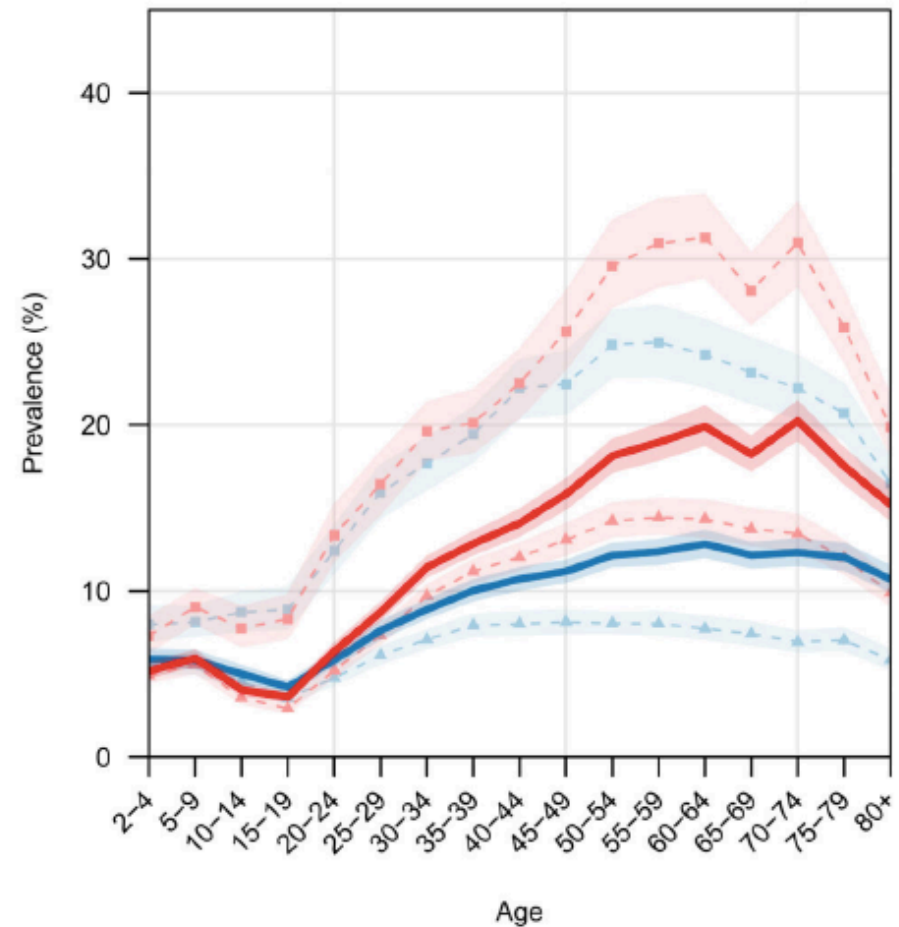
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Age-standardized Overweight/Obesity Globally 2013

A: Overweight and obesity (BMI \geq 25)



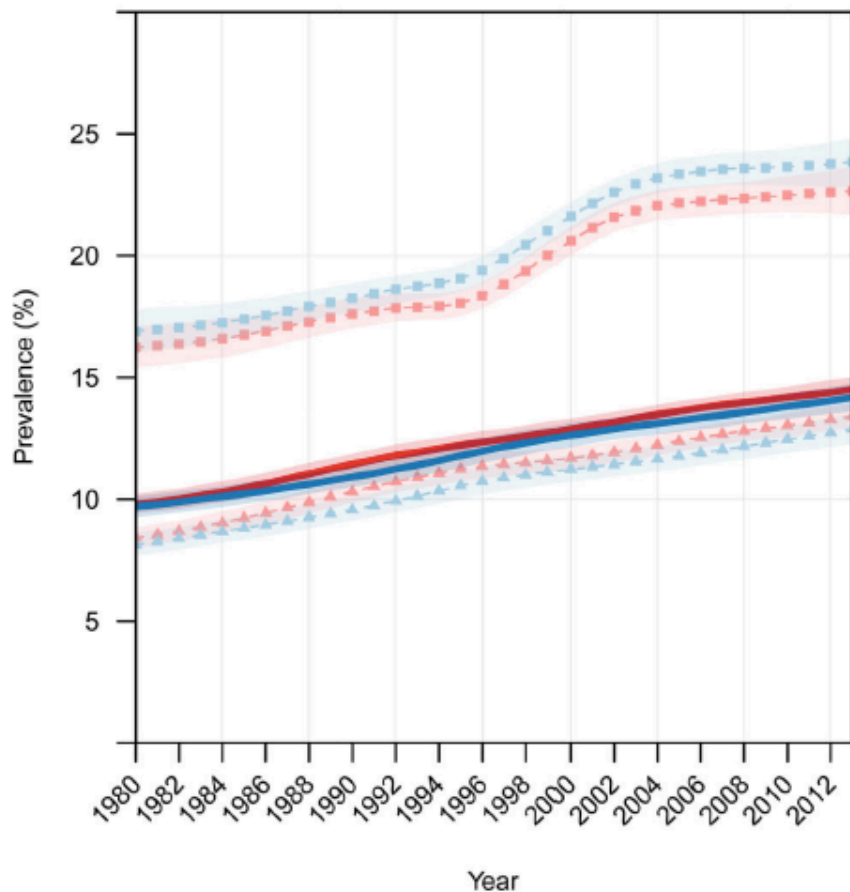
B: Obesity (BMI \geq 30)



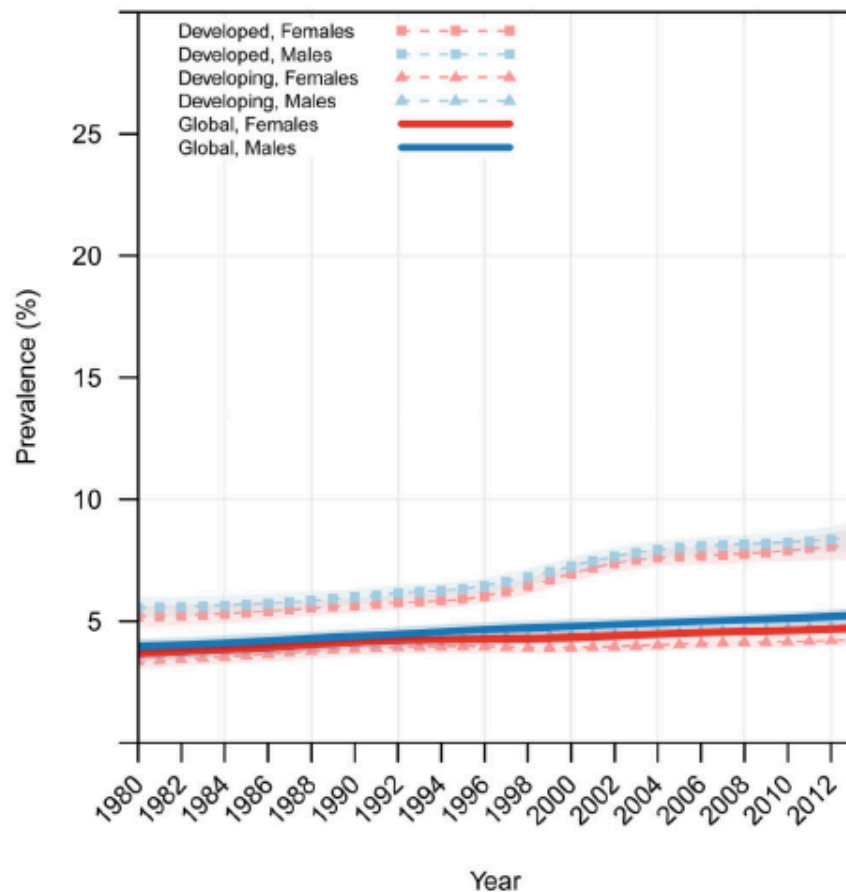
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Overweight/Obesity in Children Globally 2013

A: Overweight and obesity (based on IOTF cutoffs)



B: Obesity (based on IOTF cutoffs)



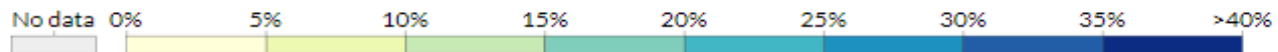
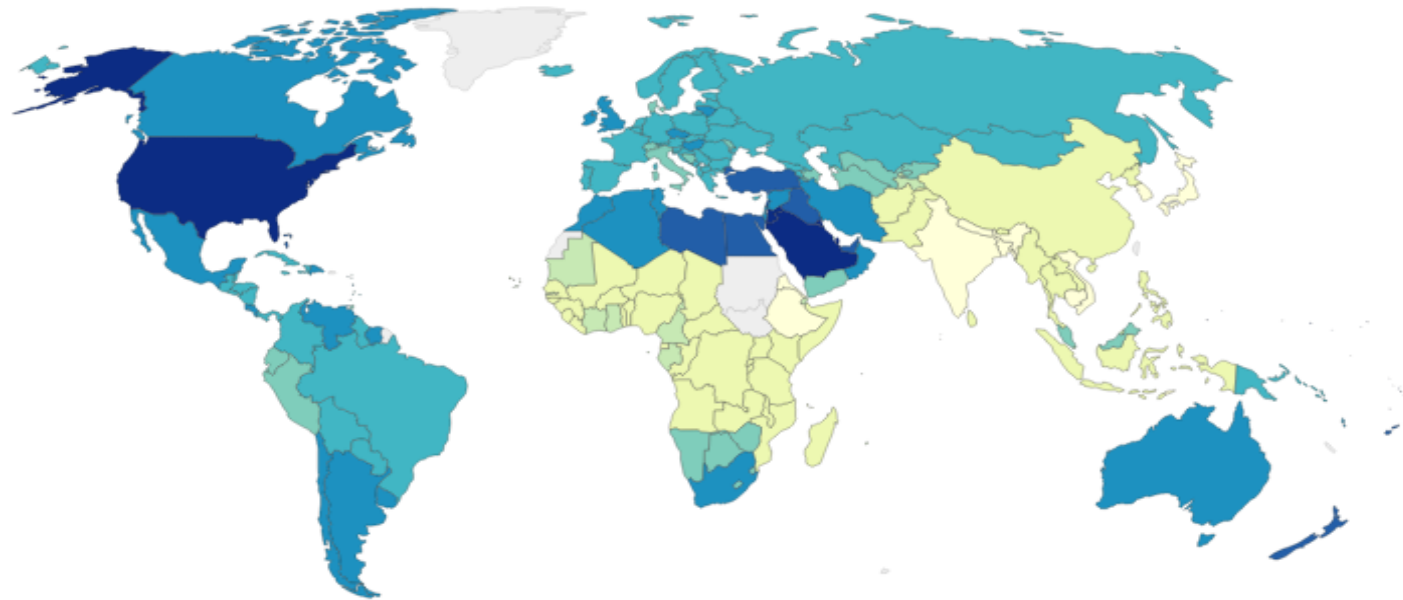
Source: *The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. Lancet 2014; 384(9945): 766-781.*

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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1975 2016

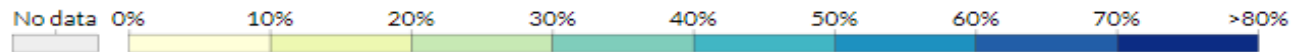
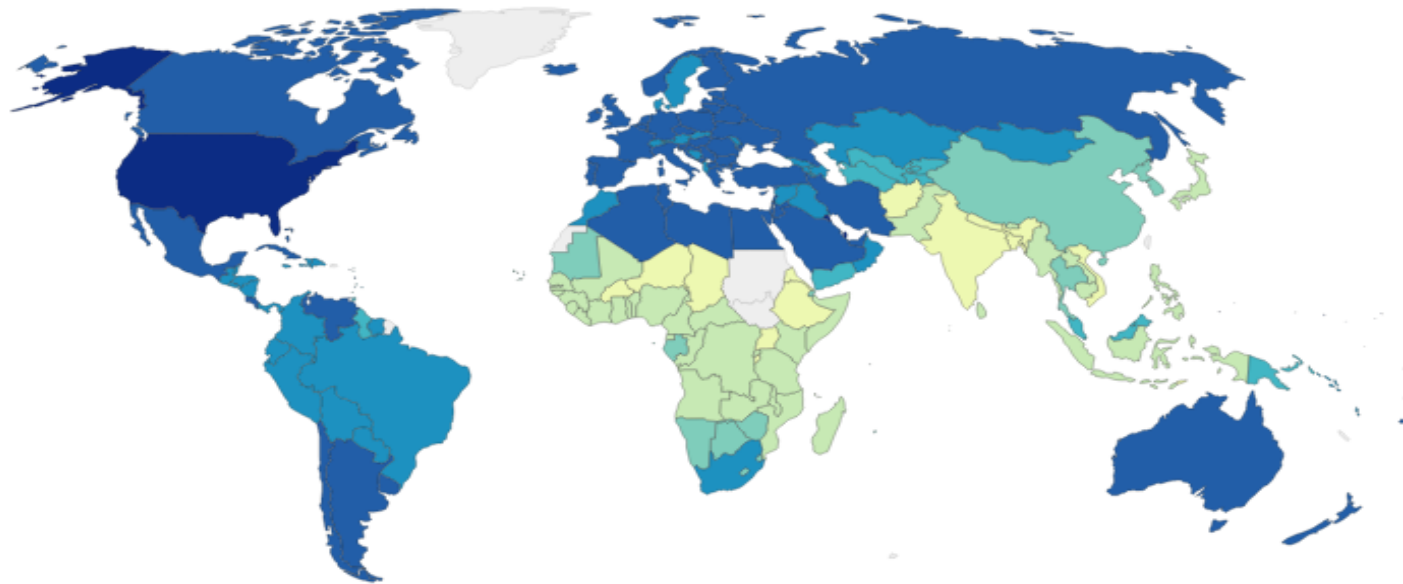
CHART MAP DATA SOURCES

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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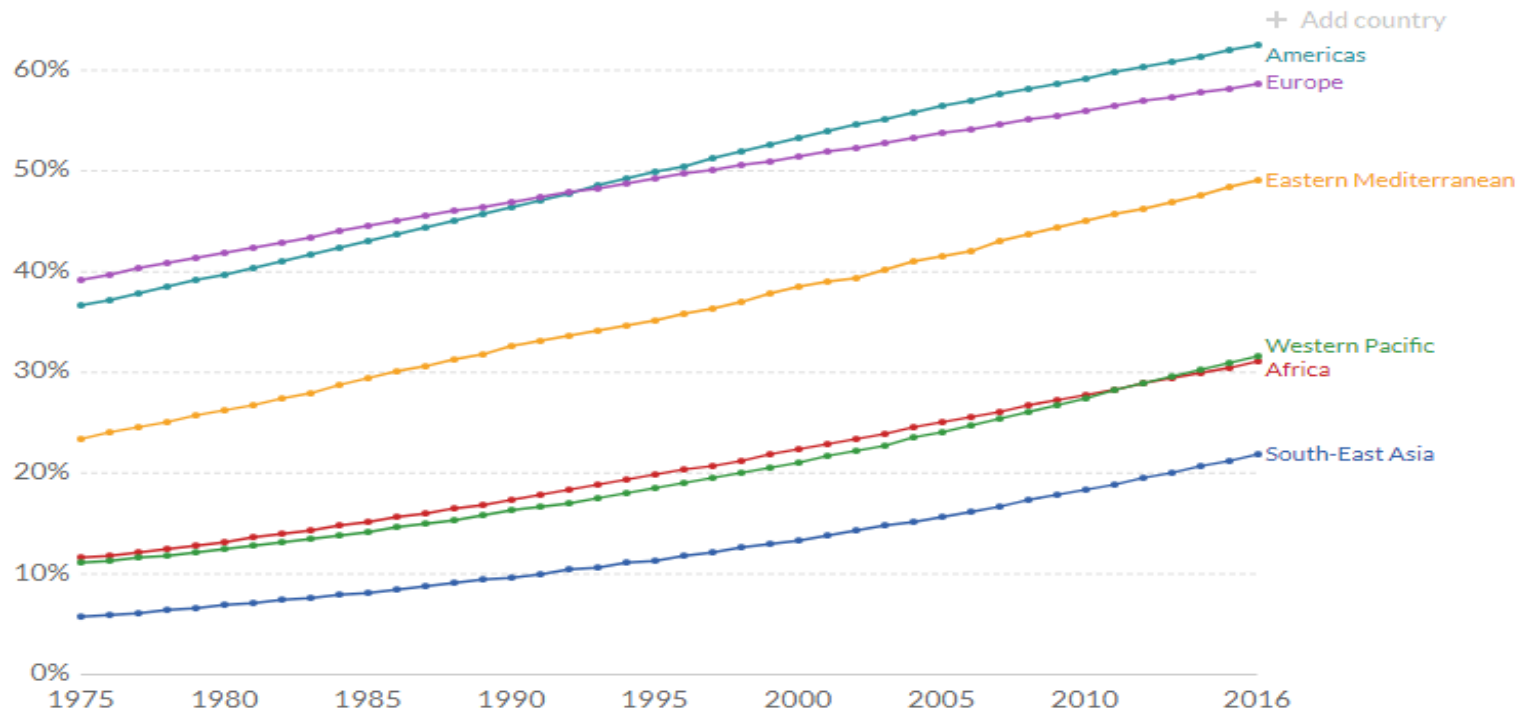
1975 2016 CHART MAP DATA SOURCES [Download] [Share] [Settings] [Full Screen]

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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1975 2016

CHART

MAP

DATA

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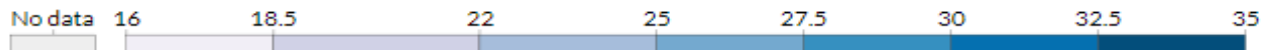
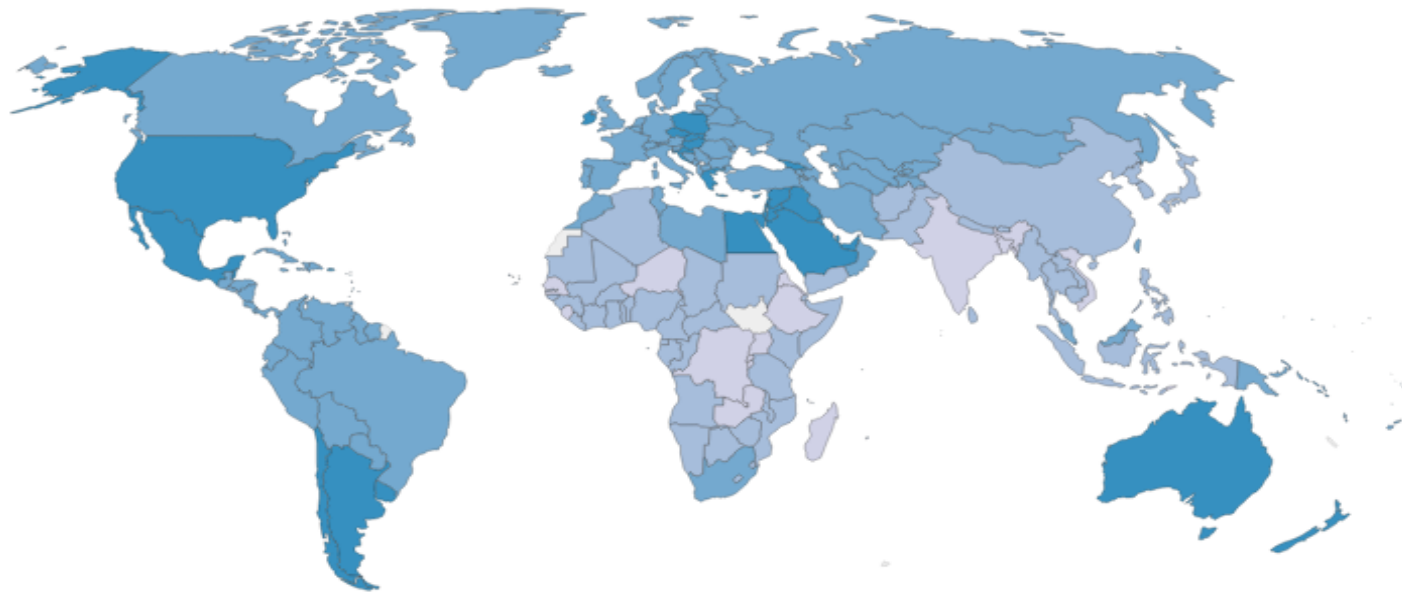


Mean BMI in Men Worldwide-2016

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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MAP

DATA

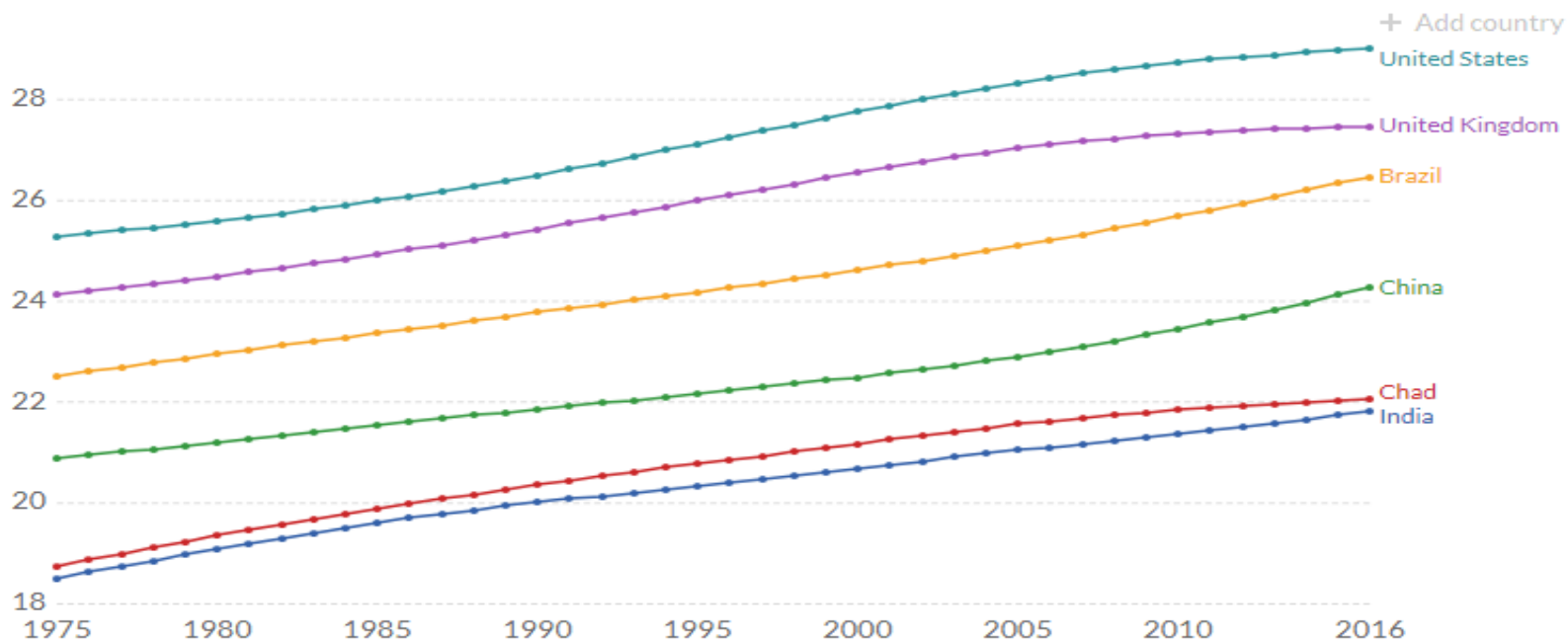
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Mean and Trend of BMI in Men -2016

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'.



Source: NCD Risk Factor Collaboration (NCD-RisC)

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Relative change

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MAP

DATA

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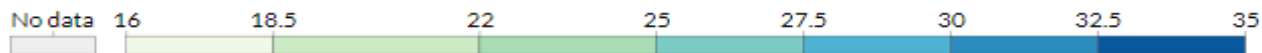
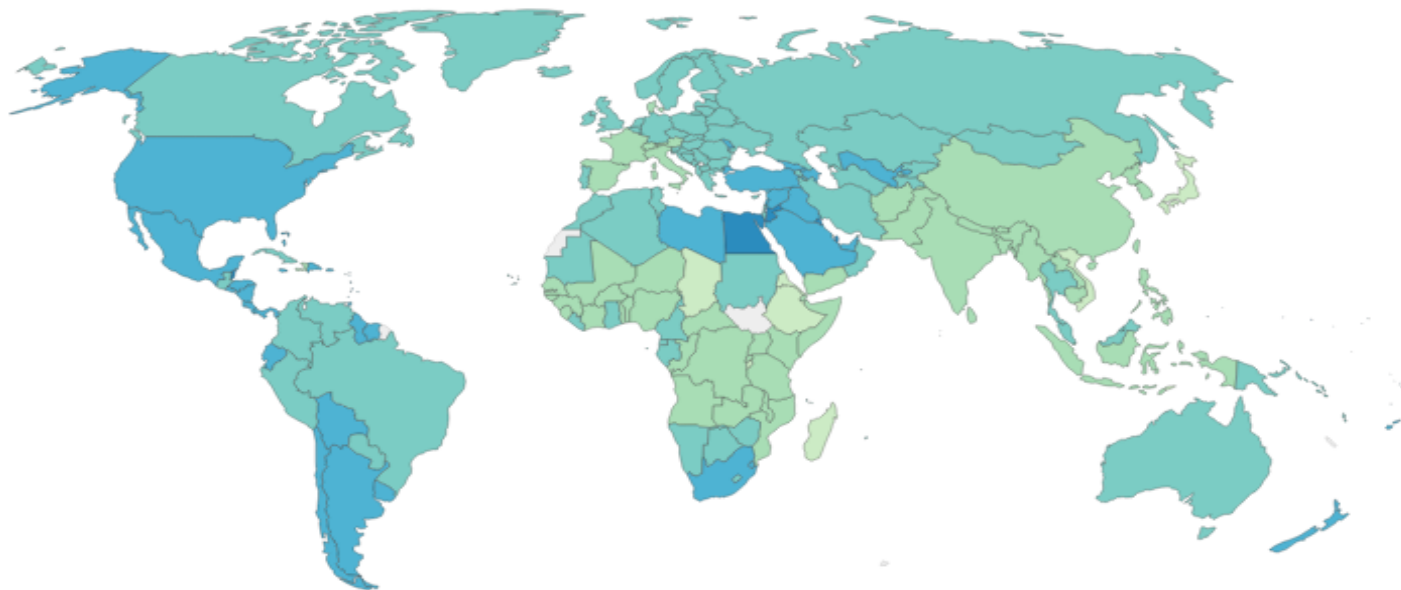


Mean BMI in Women Worldwide-2016

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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CHART

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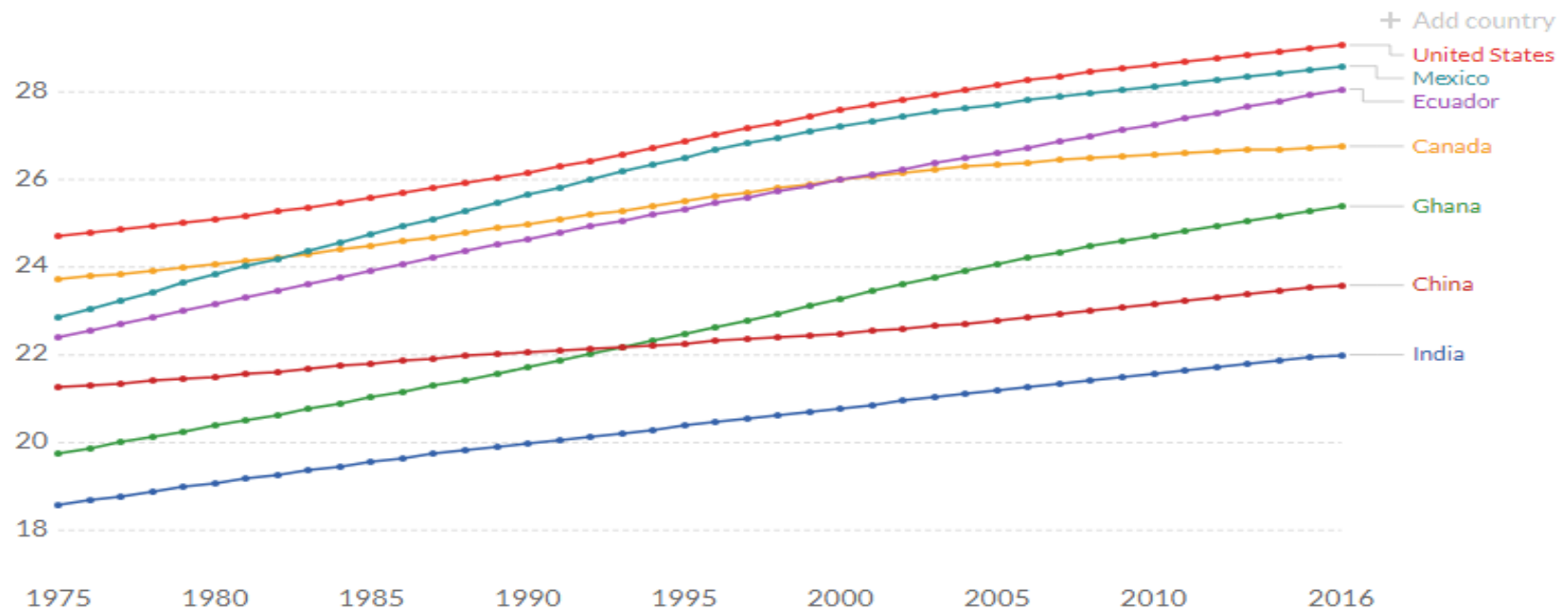


Trend of BMI in Women-2016

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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Relative change

CHART

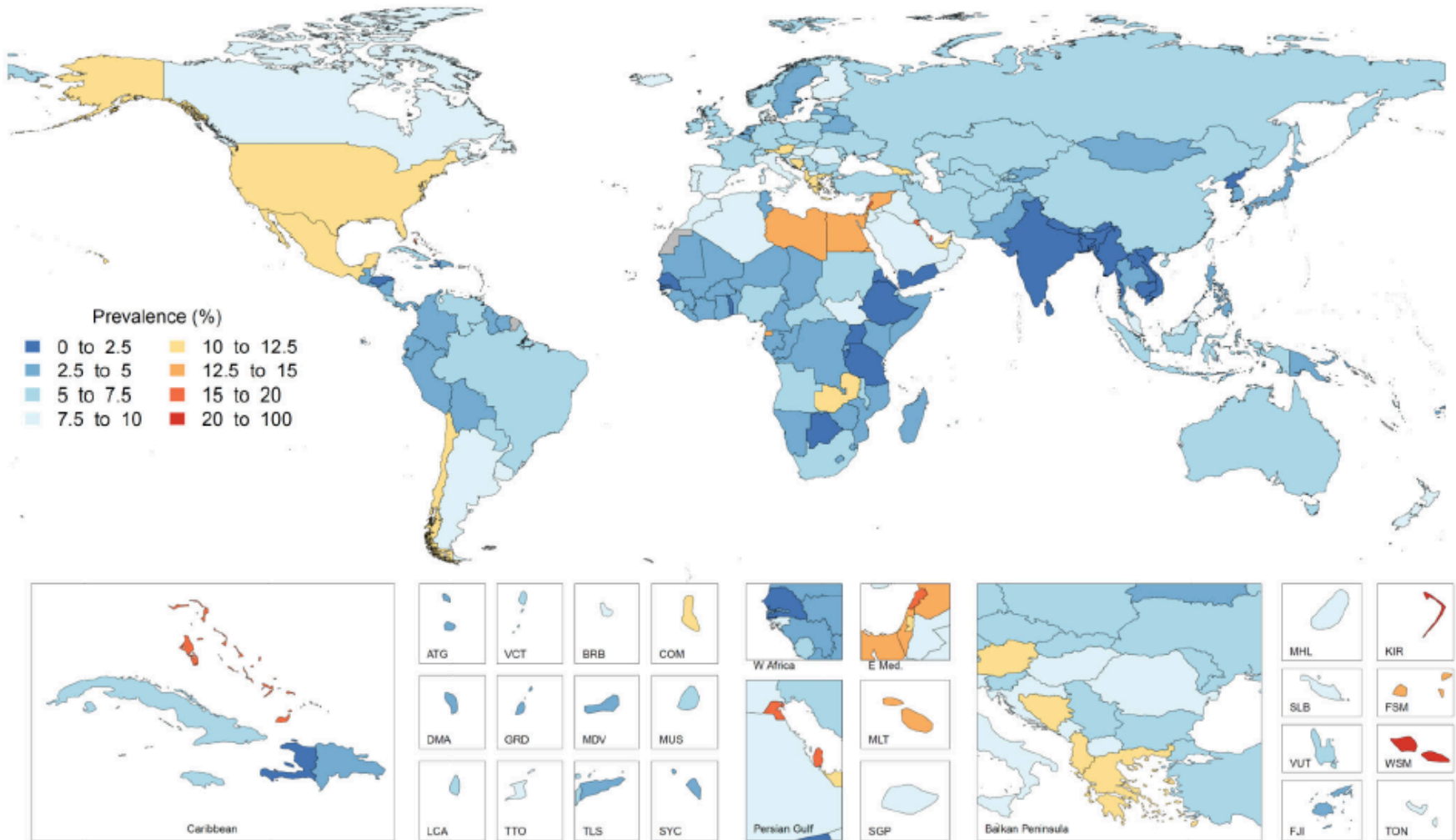
MAP

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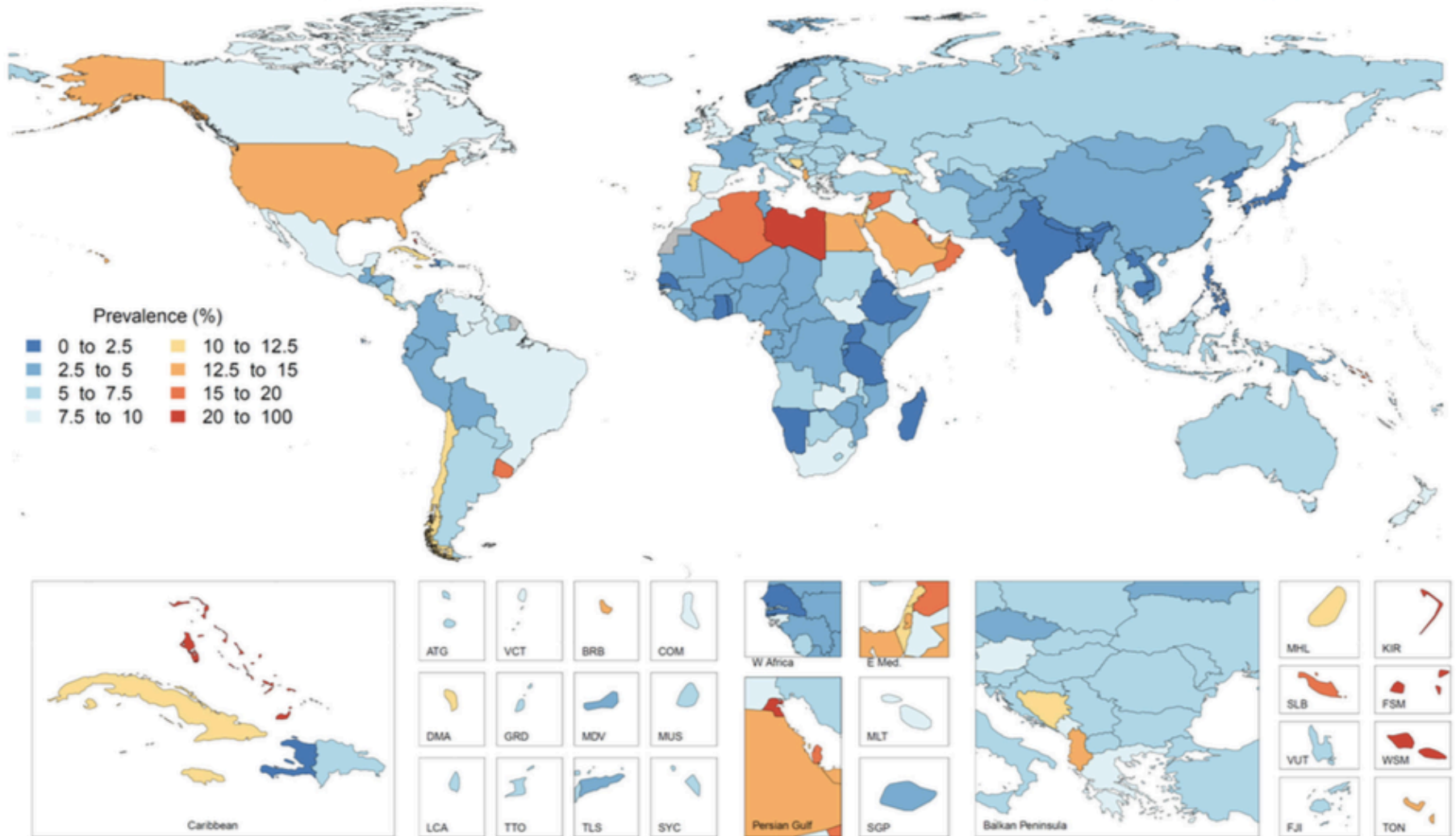


Childhood Obesity (Boys), 2013



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)

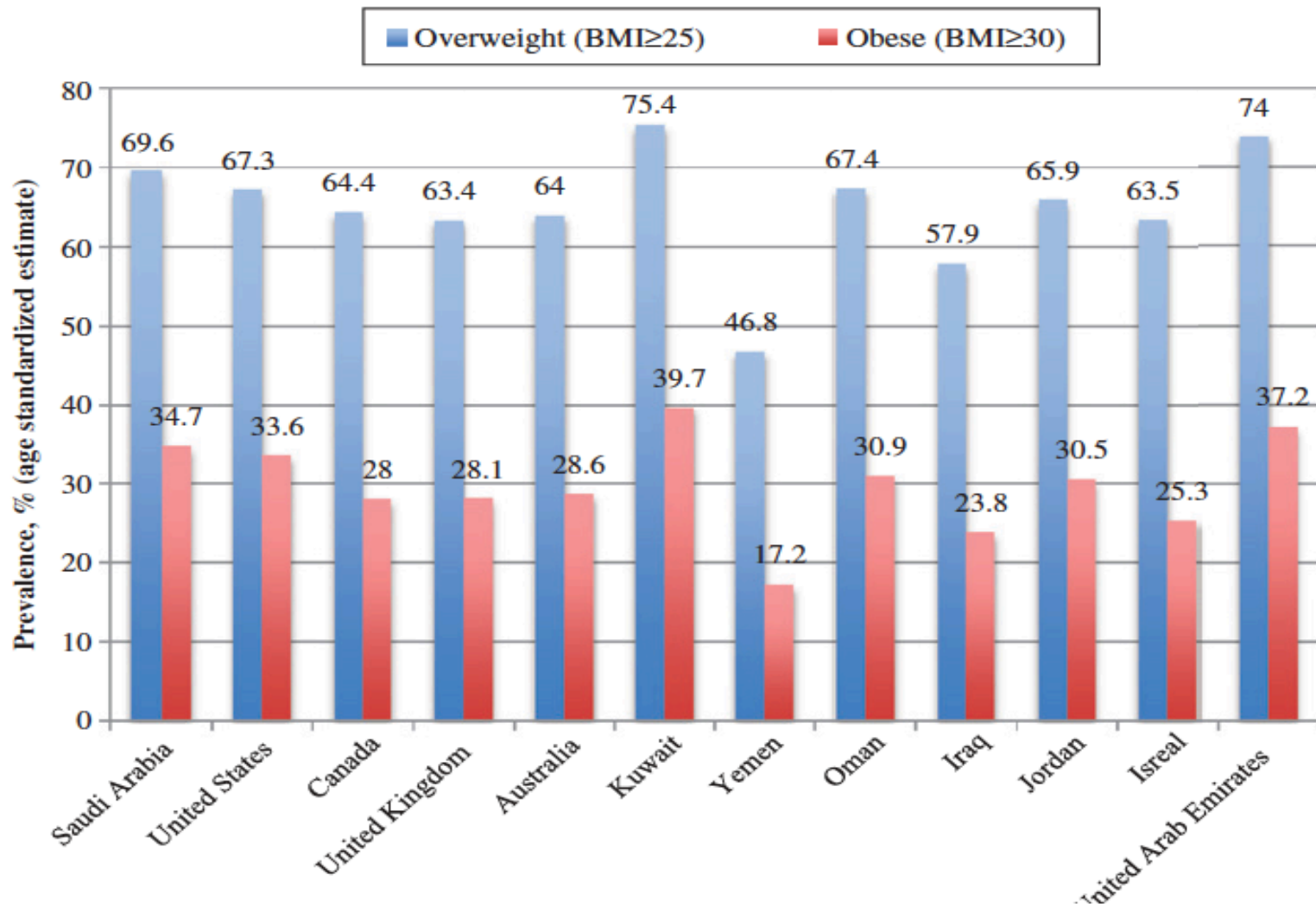
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Comparing Estimates across countries 2013

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	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)

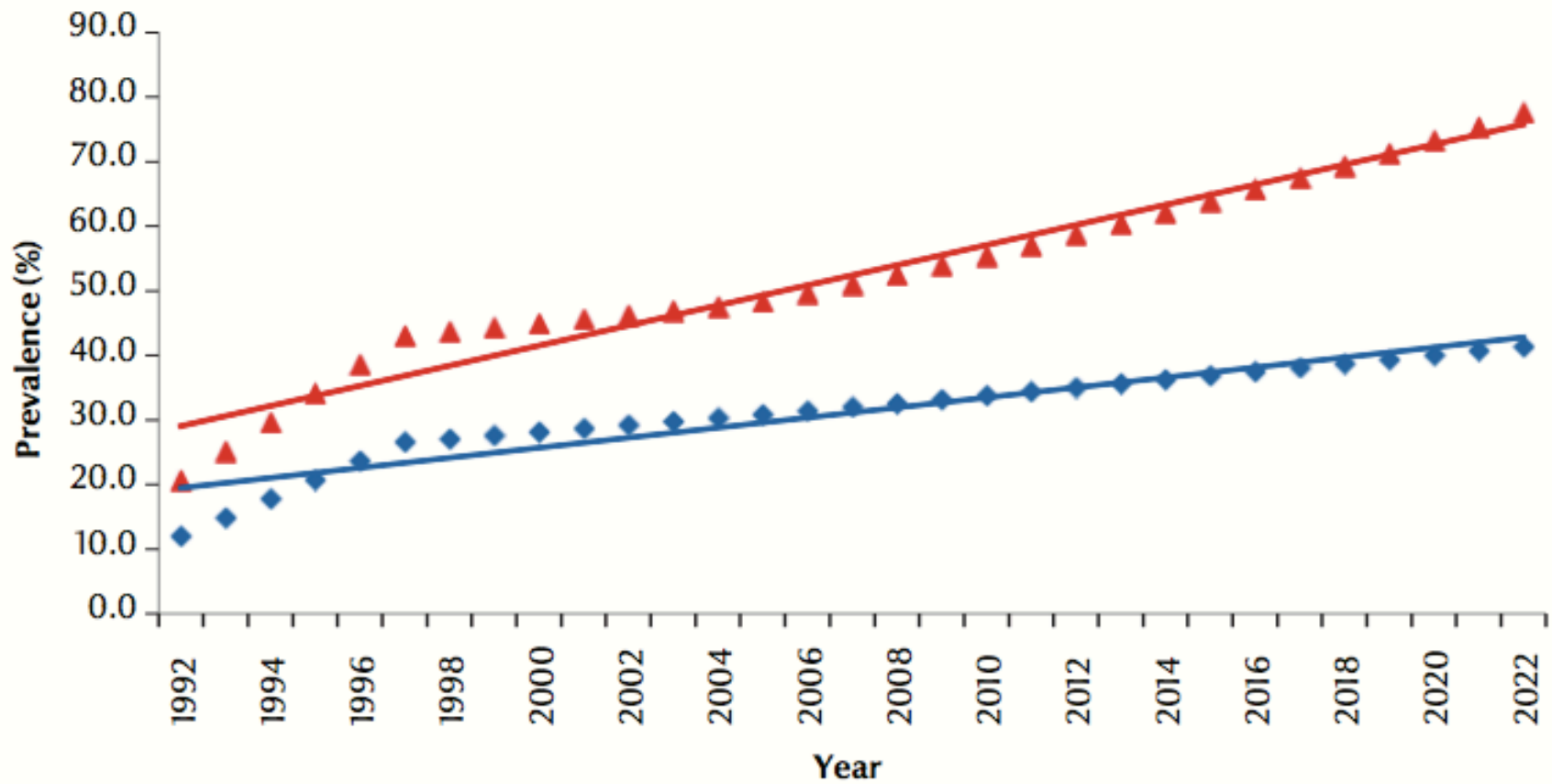
Source: The GBD 2013 Obesity Collaboration. Global regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. *Lancet* 2014; 384(9945): 766-781.

Comparing obesity and overweight in Arab world



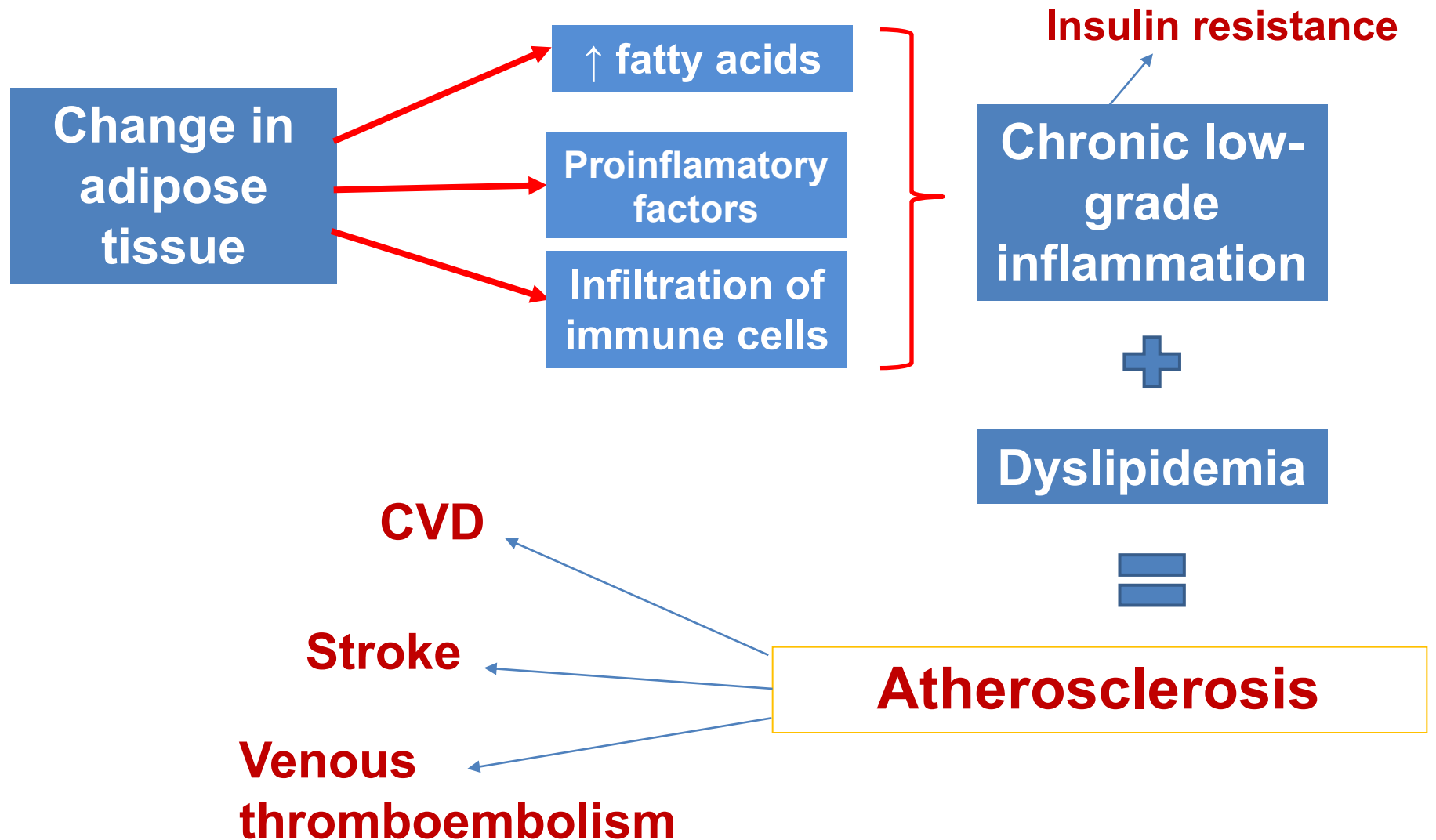
Source: DeNicola E, Aburizaiza OS, Siddique A, Khawaja H, Carpenter DO. Obesity and public health in the Kingdom of Saudi Arabia. Rev Environ Health 2015; 30(3): 191-205.

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

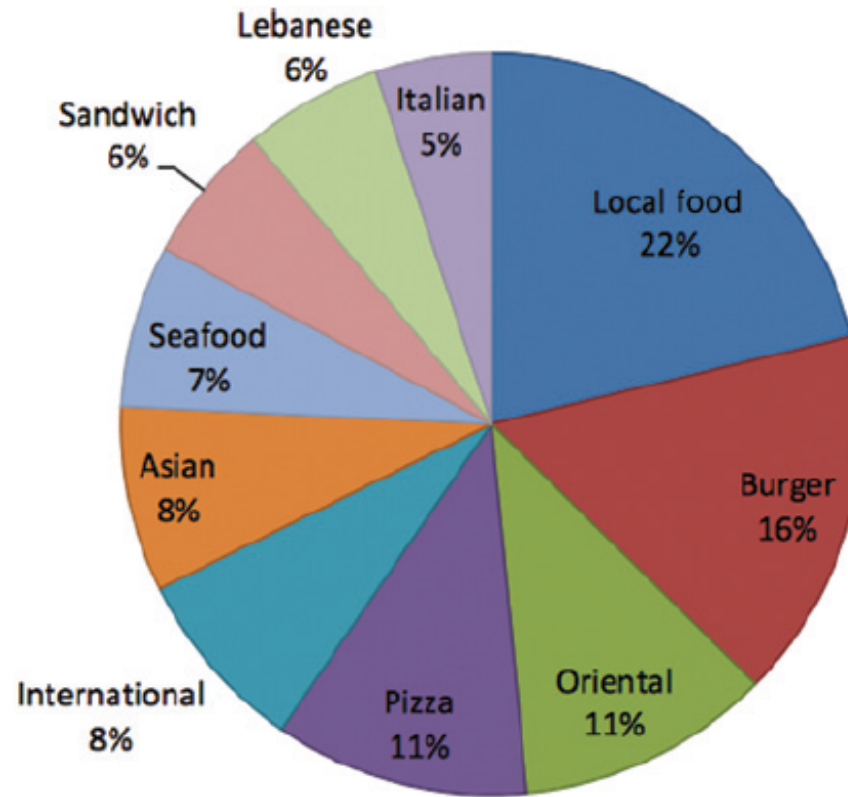
Hormonal risk factors for Obesity

- 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

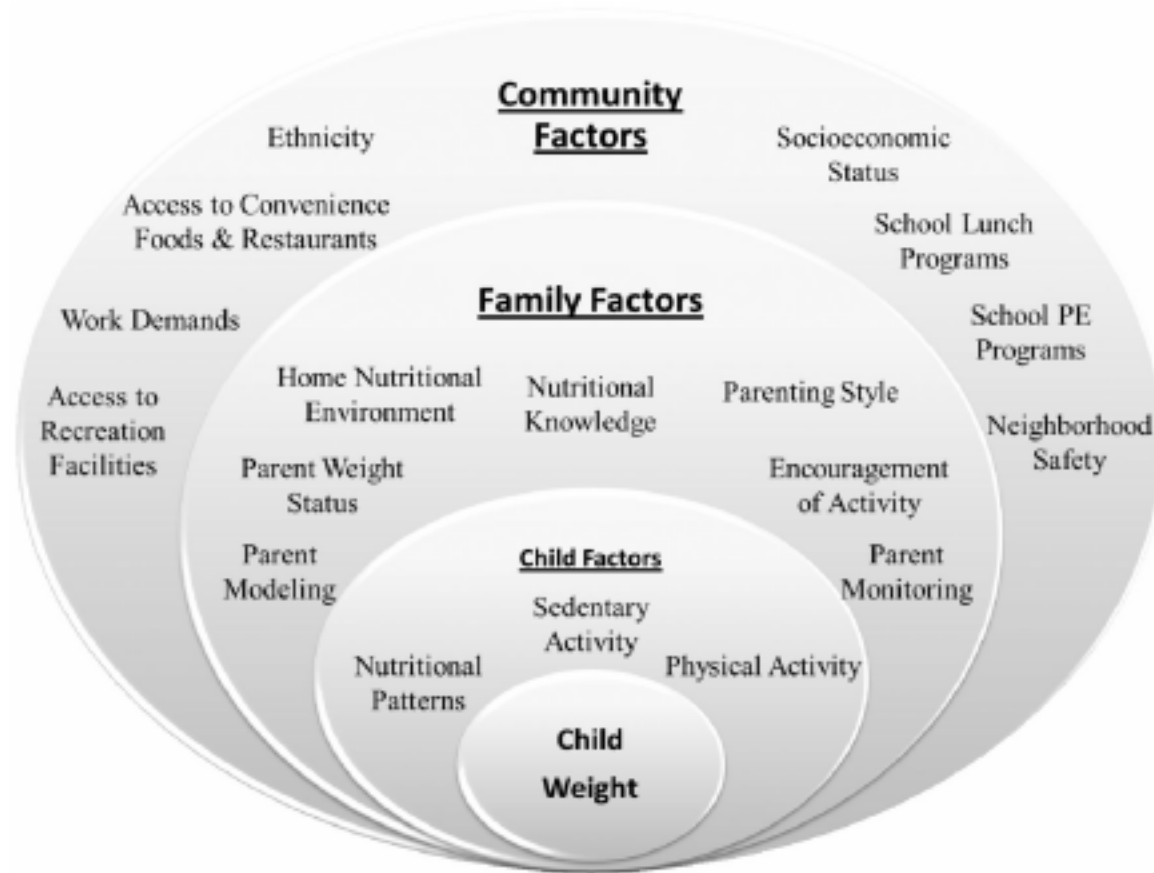
Obesity in Children

- 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?