# Epidemiology of Obesity

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# OBJECTIVES OF THE LECTURE

At the end of the session you should be able to:

- 1-describe the magnitude of the problem of obesity.
- 2- Recognize the consequences of obesity.
- 3- List the factors leading to obesity.
- 4- Discuss the prevention of obesity


No body is exempted from obesity . It can be you.


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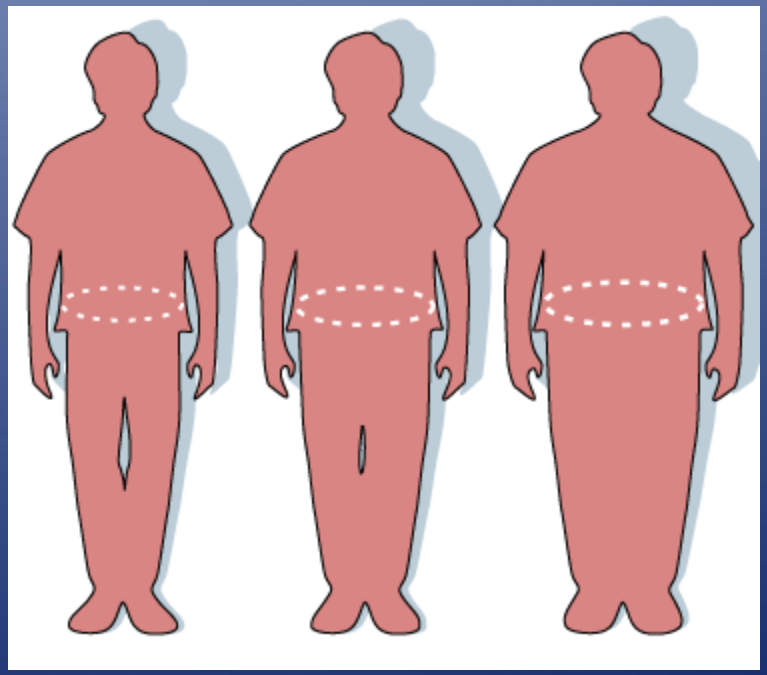
# Today's obese child - tomorrow's diabetic patient?

# Terms Obesity and Overweight

- Obesity is excessive fat accumulation in adipose tissue to the extent that it can affect health
- When a person is "overweight", it means that they have more body fat than they need for their body to function.
- Weight ranges are greater than what is generally considered healthy for a given height
- Such ranges of weight increase the likelihood of certain diseases and health problems.

# Measuring Obesity



# Body Mass Index (BMI)

- Calculated from a person's weight and height.
- Reliable indicator of body fatness for most people.
- Inexpensive & easy-to-perform screening for weight categories that may lead to health problems.
- Does not measure body fat directly, but correlates to direct measures of body fat like;
  - Skin fold thickness
  - underwater weighing
  - dual energy x-ray absorptiometry (DXA)
  - alternative for direct measures of body fat.

# BMI and Body Fat

- At the same BMI, women tend to have more body fat than men.
- At the same BMI, older people, on average, tend to have more body fat than younger adults.
- Highly trained athletes may have a high BMI because of increased muscularity rather than increased body fatness.

# Obesity classification.

**Obesity is divided into three separate classes, with Class III obesity being the most extreme of the three.**

| *With a BMI of:* | *You are considered:* |
|---|---|
| Below 18.5 | Underweight |
| *18.5 - 24.9* | *Healthy Weight* |
| 25.0 - 29.9 | Overweight |
| 30 or higher | Obese |

| Obesity class | BMI ($kg/m^2$) |
|---|---|
| Class I | 30.0- 34.9 |
| Class II | 35.0-39.9 |
| Class III (Extreme Obesity) | ≥ 40.0 |

CDC, NHLBI

# A Global Epidemic

- Obesity worldwide prevalence
  - 1995 200 million
  - 2000 300 million
  - 2008 857 million
  - 2013 2.1 billion

- 1997 WHO

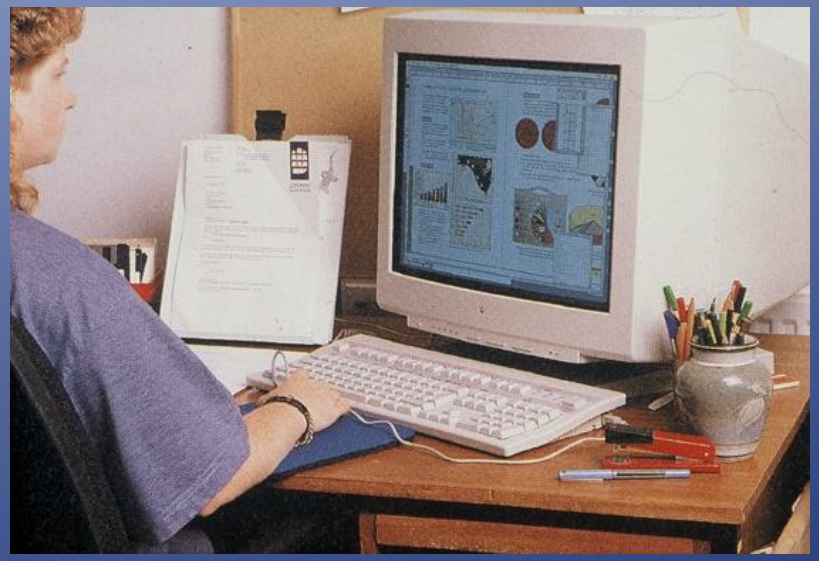
# A Global Epidemic

**Why is obesity accelerating in developing countries?**

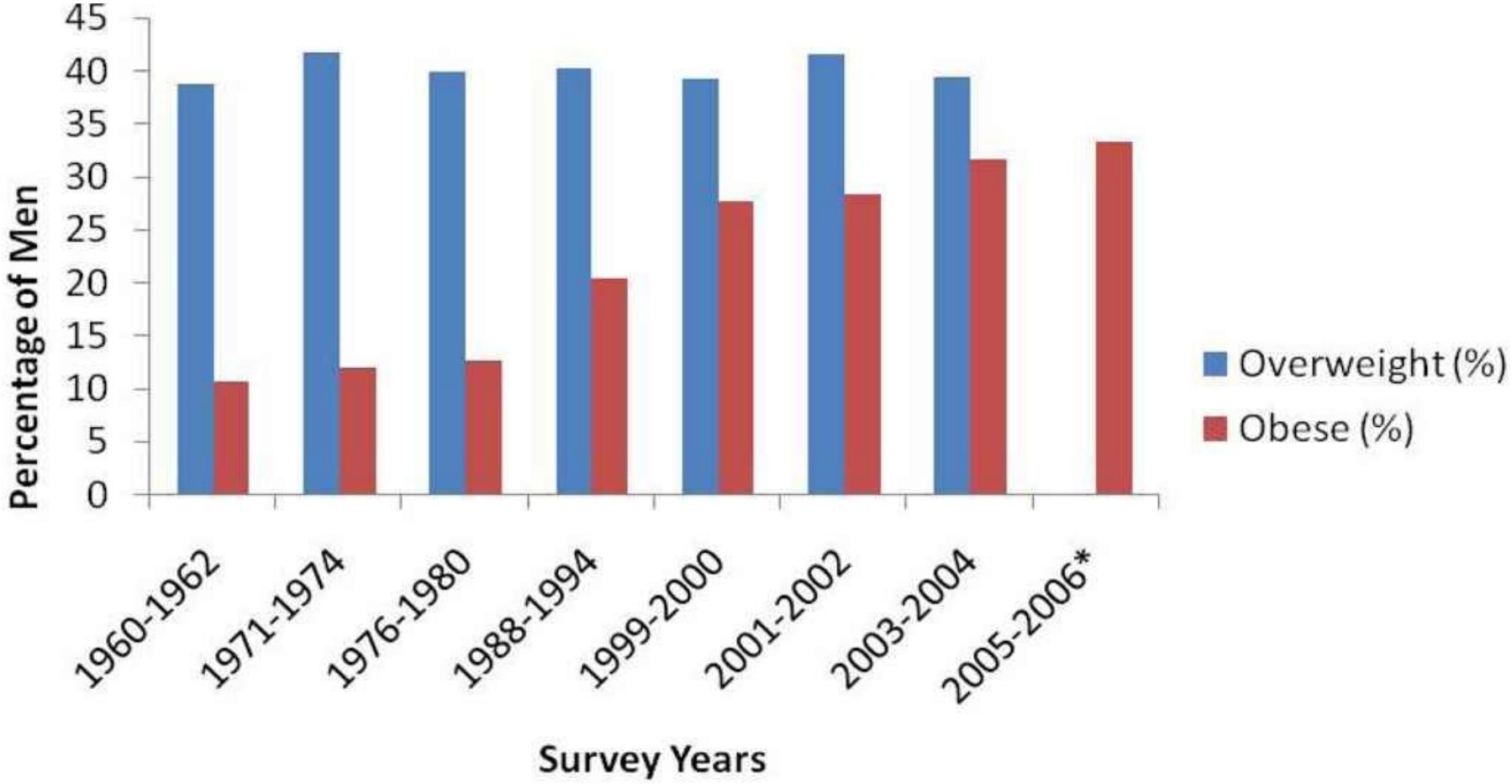
- **Increased consumption of energy dense, nutrient poor foods.**

- **Reduced physical activity.**

# From Ancient to Modern …..Work



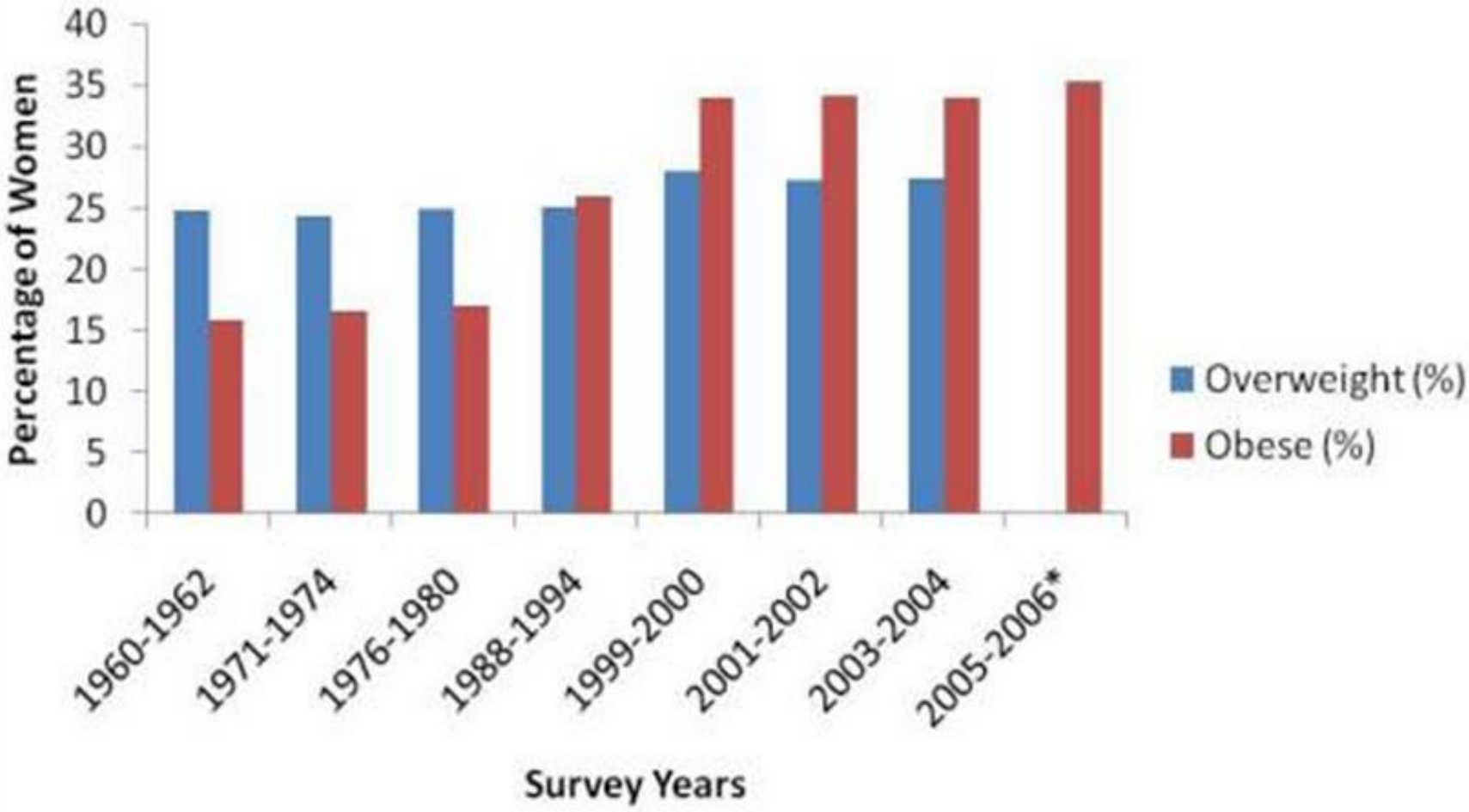
# Prevalence and Trends of Overweight and Obesity Among men Ages 20–74 Years in the United States: 1960–2006




**data not available for overweight for 2006*

Epidemiology of Obesity 2011 . Gastroenterology Clinic North Am 3991):1-7

# Prevalence and Trends of Overweight and Obesity Among Women Ages 20–74 Years in the United States: 1960–2006




**data not available for overweight for 2006*

Epidemiology of Obesity 2011 . Gastroenterology Clinic North Am 3991):1-7

# Highest obesity*

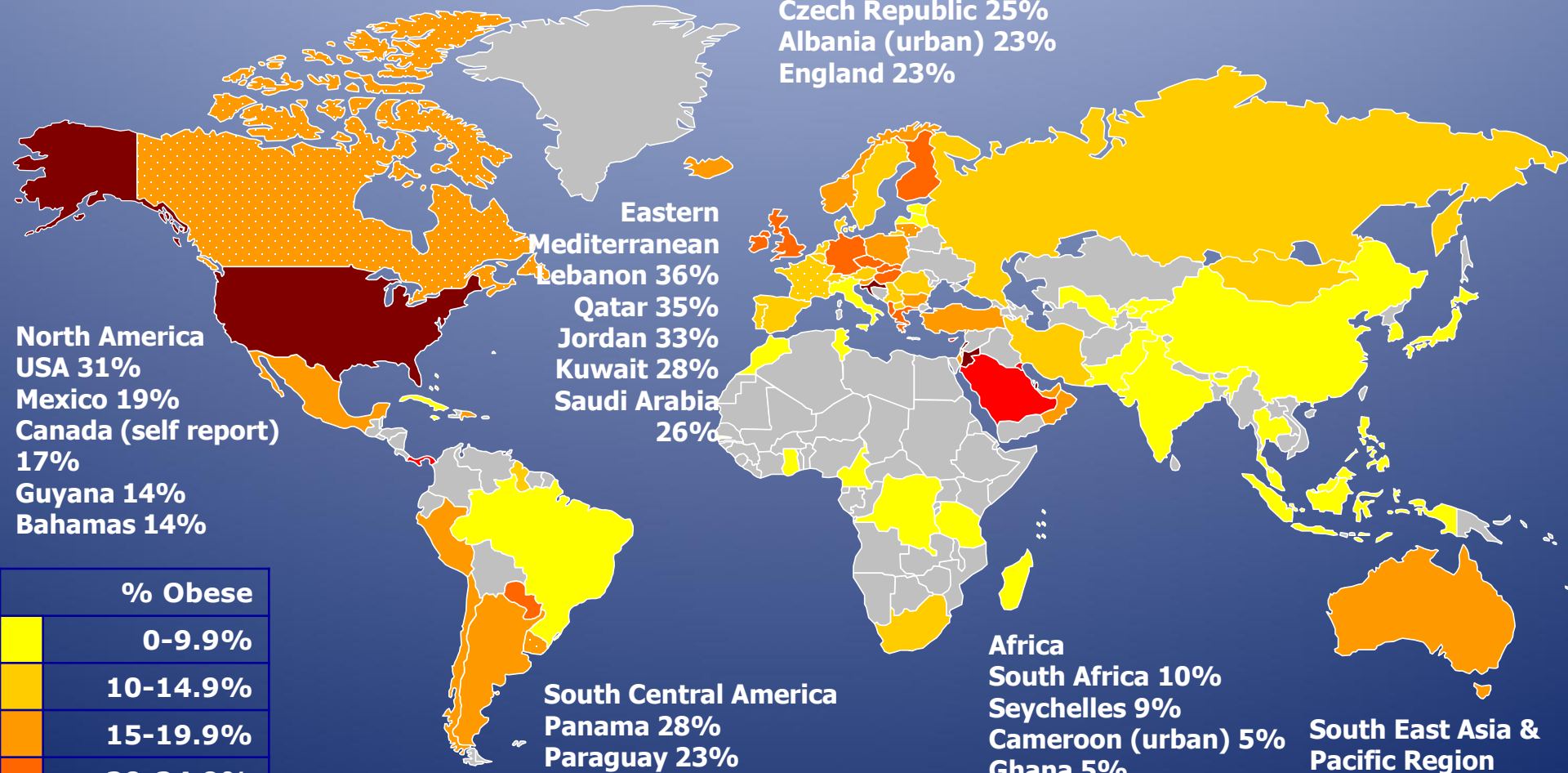
| | Men, % of total population | | Women, % of total population | |
|---|---|---|---|---|
| 1 | Lebanon | 36.3 | Qatar | 45.3 |
| 2 | Qatar | 34.6 | Saudi Arabia | 44.0 |
| 3 | Kuwait | 32.8 | West Bank and Gaza | 42.5 |
| 4 | Panama | 27.9 | Lebanon | 38.3 |
| 5 | United States | 27.7 | Panama | 36.1 |
| 6 | Cyprus | 26.6 | Albania | 35.6 |
| 7 | Saudi Arabia | 26.4 | Bahrain | 34.1 |
| 8 | West Bank and Gaza | 23.9 | United States | 34.0 |
| 9 | Bahrain | 23.3 | Egypt | 32.4 |
| 10 | Albania | 22.8 | United Arab Emirates | 31.4 |
| 11 | England | 22.7 | Iran | 30.0 |
| 12 | Germany | 22.5 | Kuwait | 29.9 |
| 13 | Scotland | 22.3 | Turkey | 29.4 |
| 14 | Ireland | 20.1 | Mexico | 29.0 |
| 15 | Israel | 19.9 | Scotland | 26.0 |
| 16 | Mexico | 19.4 | Israel | 25.7 |
| 17 | Australia | 19.3 | Mongolia | 24.6 |
| 18 | United Arab Emirates | 17.1 | Jamaica | 23.9 |
| 19 | Wales | 17.0 | England | 23.8 |
| 20 | Oman | 16.7 | Cyprus | 23.7 |
| 21 | Slovenia | 16.5 | Germany | 23.3 |
| | Turkey | 16.5 | Oman | 23.1 |
| 23 | Lithuania | 16.2 | Peru | 23.0 |
| 24 | Canada | 16.0 | Australia | 22.2 |
| | Peru | 16.0 | Morocco | 21.7 |
| 26 | Luxembourg | 15.3 | Russia | 21.6 |
| 27 | Sweden | 14.8 | Trinidad & Tobago | 21.1 |
| 28 | Portugal | 14.5 | Fiji | 19.3 |
| 29 | Switzerland | 14.1 | Mauritania | 19.2 |
| 30 | Mongolia | 13.8 | Wales | 18.0 |

* Data for these health rankings refer to the latest year available, 1999-2003. Obesity is defined as body-mass index of 30 or more

Source: "Pocket World in Figures", based on data from the World Health Organisation

# Global Prevalence of Obesity in Adult Males

With examples of the top 5 Countries in each Region



**European Region**
**Croatia 31%**
**Cyprus 27%**
**Czech Republic 25%**
**Albania (urban) 23%**
**England 23%**

**Eastern Mediterranean**
**Lebanon 36%**
**Qatar 35%**
**Jordan 33%**
**Kuwait 28%**
**Saudi Arabia 26%**

**North America**
**USA 31%**
**Mexico 19%**
**Canada (self report) 17%**
**Guyana 14%**
**Bahamas 14%**

| % Obese |
|---|
| 0-9.9% |
| 10-14.9% |
| 15-19.9% |
| 20-24.9% |
| 25-29.9% |
| ≥30% |
| Self Reported data |

**South Central America**
**Panama 28%**
**Paraguay 23%**
**Argentina (urban) 20%**
**Uruguay (self report) 17%**
**Dominican Republic 16%**

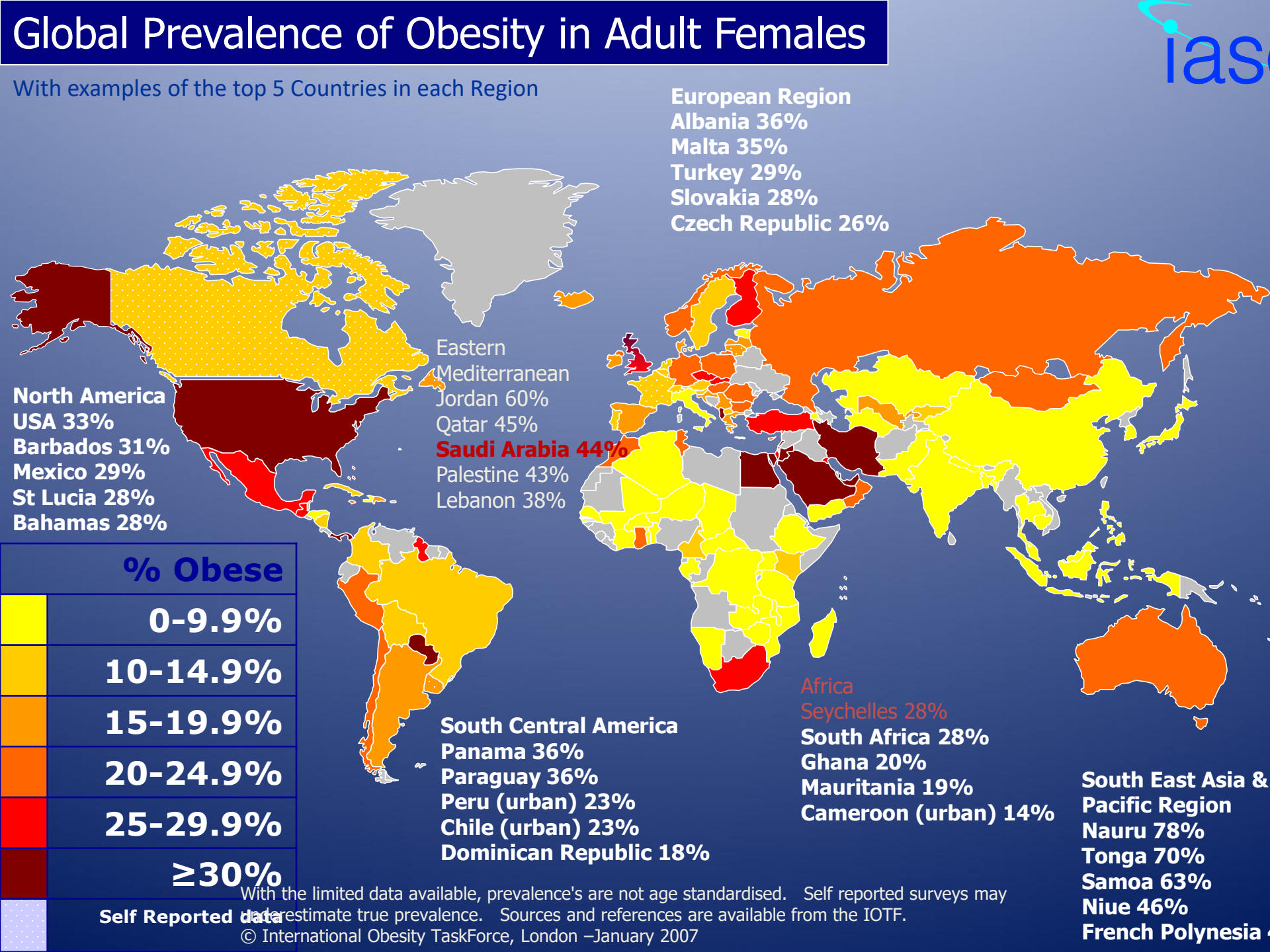
**Africa**
**South Africa 10%**
**Seychelles 9%**
**Cameroon (urban) 5%**
**Ghana 5%**
**Tanzania (urban) 5%**

**South East Asia & Pacific Region**
**Nauru 80%**
**Tonga 47%**
**Cook Island 41%**
**French Polynesia 36% Samoa 33%**

With the limited data available, prevalence's are not age standardised. Self reported surveys may underestimate true prevalence. Sources and references are available from the IOTF.

# Global Prevalence of Obesity in Adult Females

With examples of the top 5 Countries in each Region



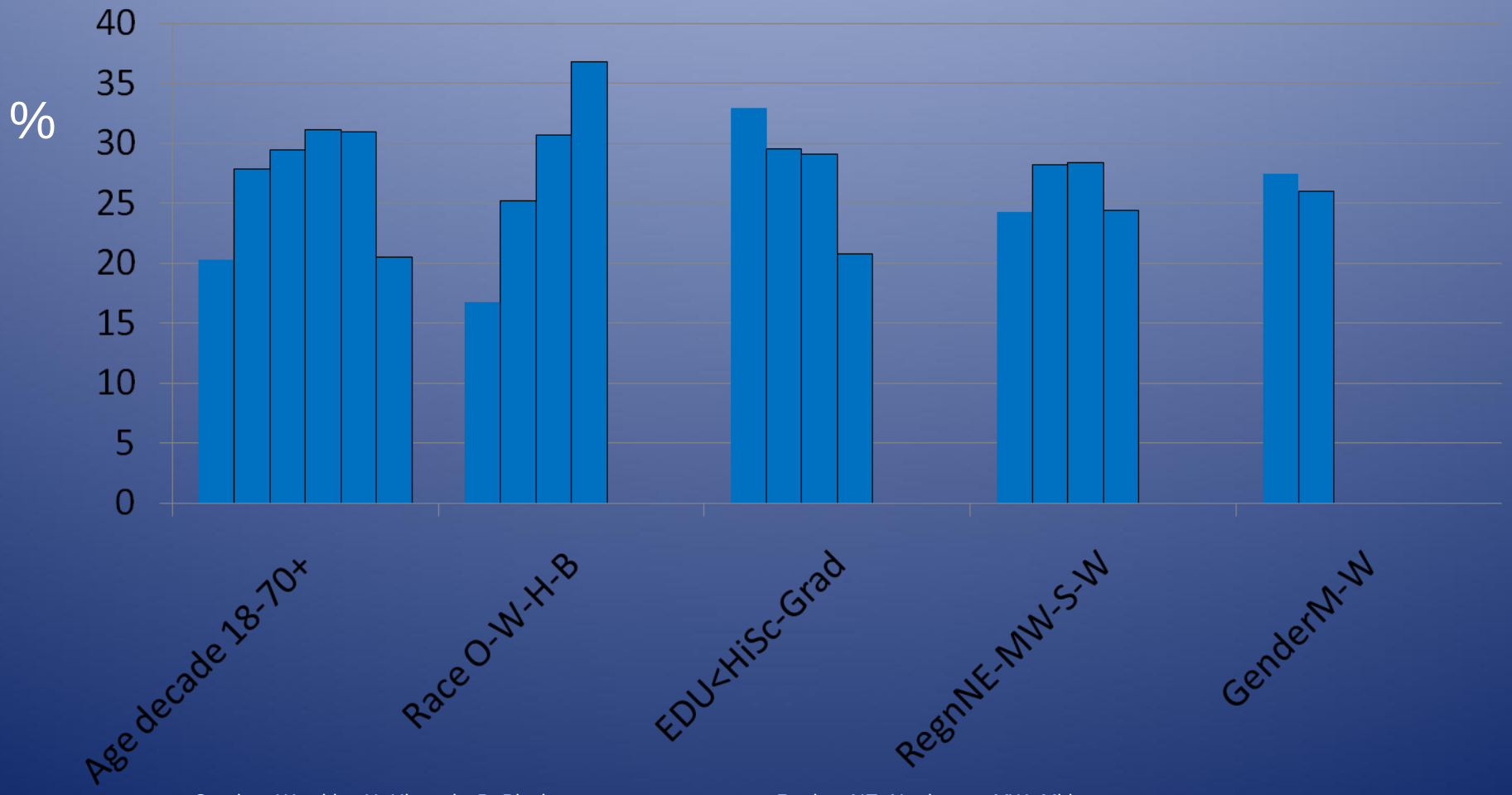

With the limited data available, prevalence's are not age standardised. Self reported surveys may underestimate true prevalence. Sources and references are available from the IOTF.

# Data from KSA National Surveys

| Studies by National Surveys KSA | Age group | Prevalence Obesity BMI>30kg/m$^2$ | | Prevalence Overweight BMI 25-29.9 kg/m$^2$ | | Self eported Physical inactivity | |
|---|---|---|---|---|---|---|---|
| | | Male | Female | Male | Female | Male | Female |
| 1990-93 (n=13177) | >15years | 16% | 20.26% | 27.23 | 25.20 | 43.3% | 84.7% |
| 1995-2000 (n=17232) | >30 years | 26.4% | 44.0% | 42.4% | 31.8% | 93.9% | 98.1% |

Alquaiz J et al. Women Health in Saudi Arabia. PJMS 2014

# Demographic Prevalence of Obesity (BMI≥30) : USA MMWR August 2010

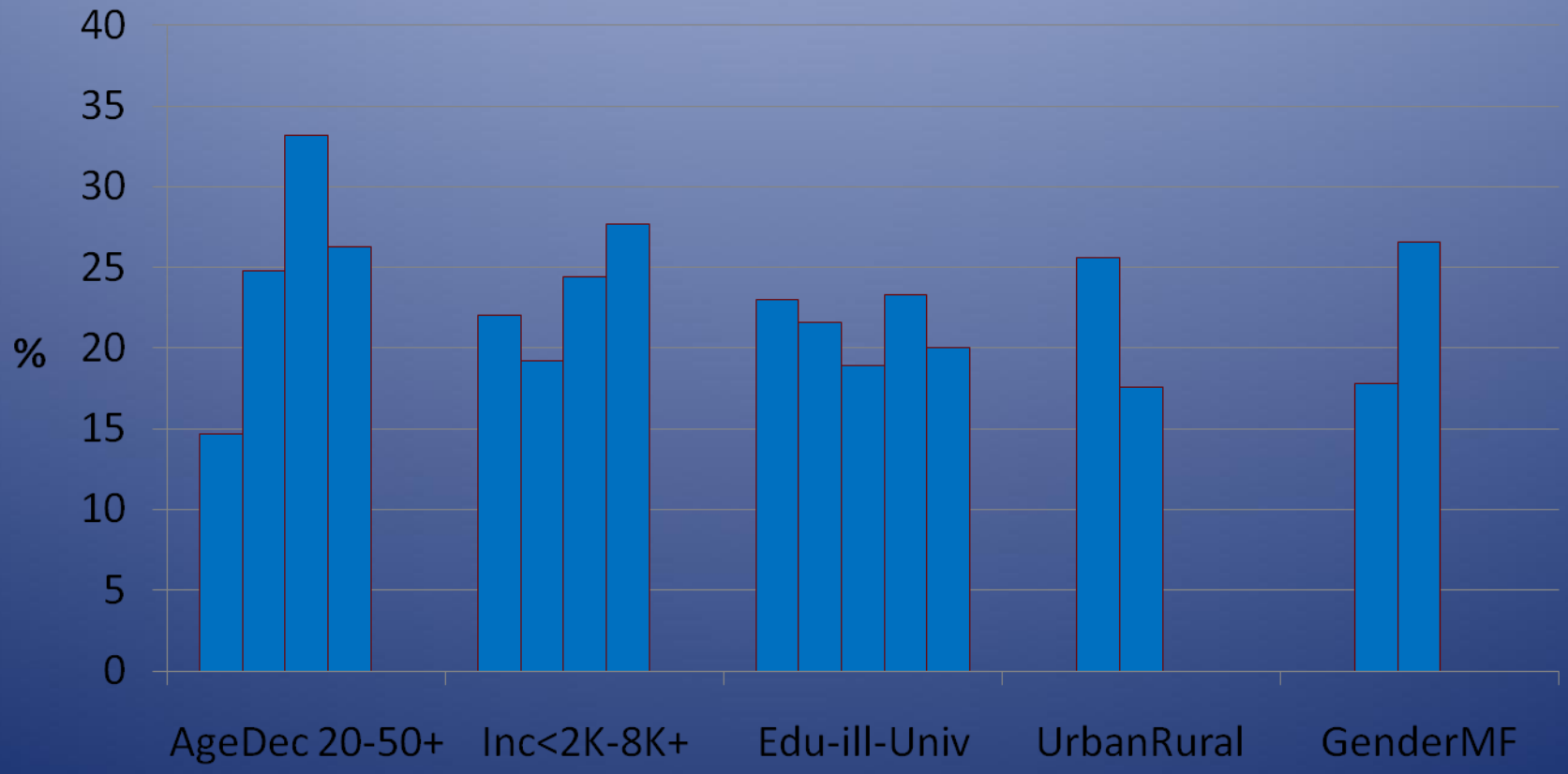



O=other, W=white, H=Hispanic, B=Blacks

Region: NE=North east, MW=Midwest, S=South, W=west

*MMWR: Morbidity and Mortality Weekly Report CDC USA*

# Demographic Prevalence of Obesity in Saudi Arabia (BMI≥30kg/m²) 1990-1993




*National Chronic Diseases metabolic Survey 1990-93 MOH & King Saud University*

# Other (local) studies showing the prevlanece of obesity and overweight

| Author , and place of study | Age group | No of subjects | Criteria used | Prevalence among Males% | Prevalence among Females% |
|---|---|---|---|---|---|
| Khashoggi et al (1994)Attendees at PHC Jedahh | 11-70 years Mean age 32.2 | 852 female | Obese BMI >30 | ---- | 64.3 |
| | | | Overweight BMI 25-29.9 | ---- | 26.8 |
| AL- Shammati et al (1994b) Attendees at PHC, Riyadh | Mean male = 34 y Female 32 y | 733 With back pain | Obese BMI >30 | | 47.0 |
| | | | Obese BMI >30 | 51.6 | |
| AL- Jassir et al (1998) Emploees of M.O.H Riyadh | 20 yrs and above | 1238 males | Overweight BMI 25-29.9 | 40.3 | ---- |
| | | | Obese BMI >30 | 18.4 | ….. |


M Alqarni SS (2016) A Review of Prevalence of Obesity in Saudi Arabia. J Obes Eat Disord 2:2. doi: 10.21767/2471-8203.100025

# Causes of Obesity

# Causes of Obesity

- **Not necessarily overeating.**
- Factors that predispose a person to gain excessive weight.
  - Eating patterns
  - Food packaging
  - Body image
  - Basal body temp
  - Biochemical differences
  - Quantity & sensitivity to satiety hormones

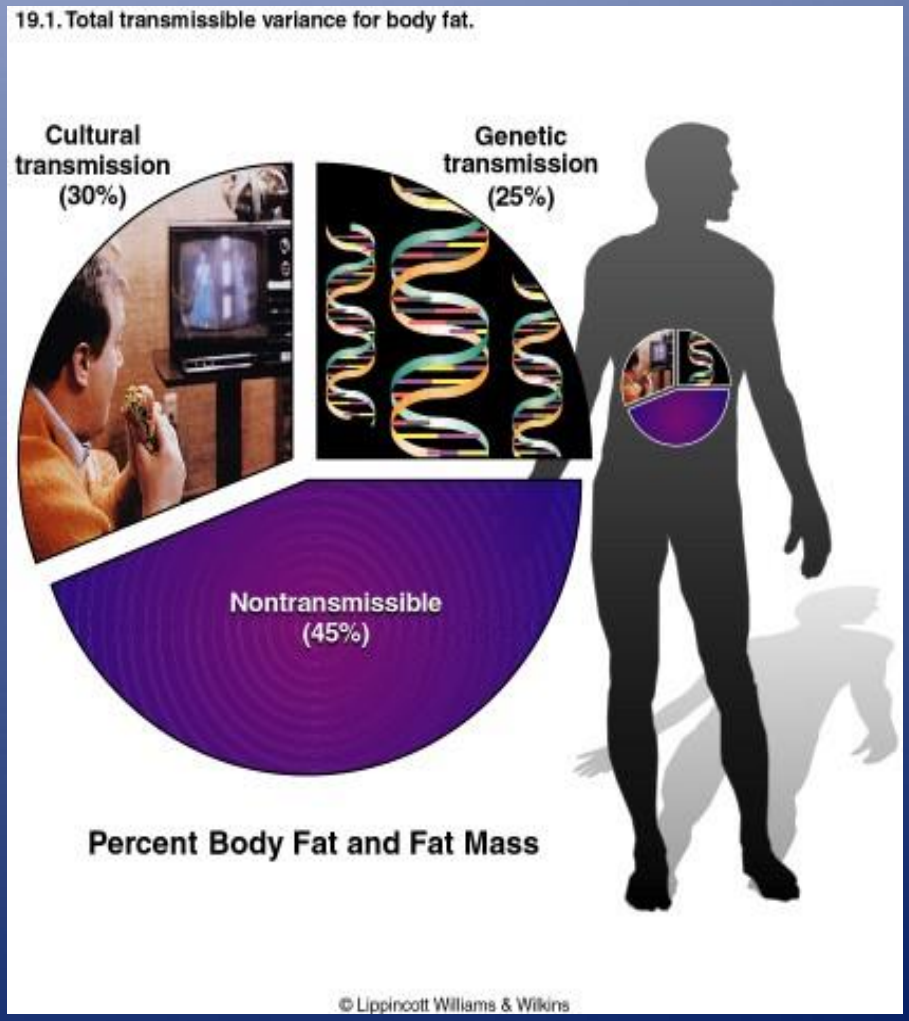
Eating environment
Food availability
Physical inactivity
Dietary thermogenesis

# Causes of Obesity

- **Characteristics of fast food linked to increased adiposity**:
  - Higher energy density
  - Greater saturated fat
  - Reduced complex carbohydrates & fiber
  - Reduced fruits and vegetables.

# Causes of Obesity

- **Genetics plays a role.**
  - How much variation in weight gain among individuals can be accounted for by genetic factors?
  - Largest transmissible variation is cultural.



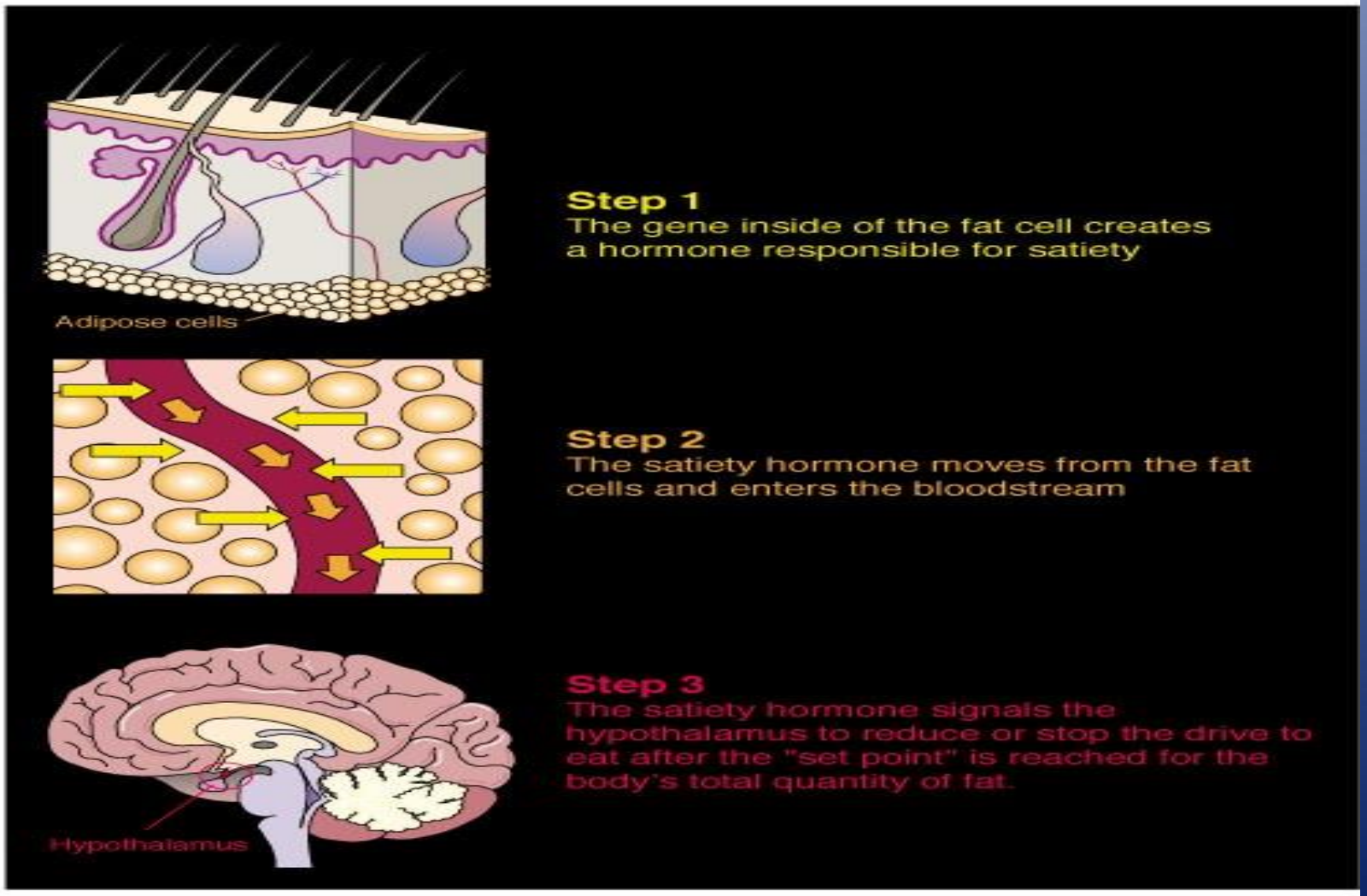
# Causes of Obesity

- A satiety hormone that influences the appetite control in the hypothalamus.

- There is a role of a mutant “obese” gene in obesity development.

# Causes of Obesity

**19.2. Genetic model for obesity**



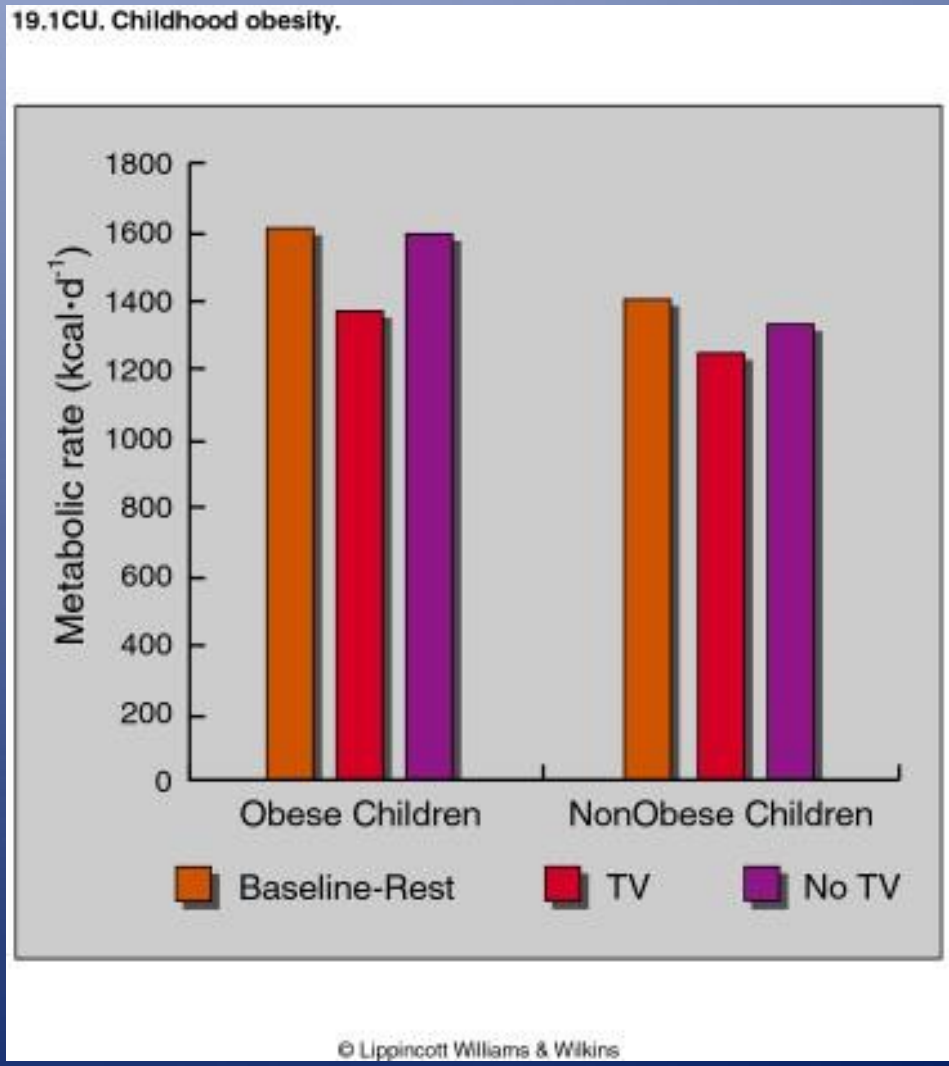
# Causes of Obesity

A defective ob gene causes **inadequate leptin production**. Thus, the brain receives an under assessment of body's adipose stores and urge to eat.

In addition to deficient leptin production, scientists also propose the possibility of **defective receptor action** (via a leptin receptor molecule on brain cells), which increases a person's resistance to satiety.

# Causes of Obesity

- Physical Activity: an important component
- For young & middle aged men, physical activity relates inversely to body fat levels.
- No relationship between caloric intake and body fat levels.



# Complications of obesity

# Children & adults

- Obesity is a **long term** process.
- Obesity frequently begins in childhood.
- **Obese parents** likely have overweight children.
- Regardless of final body weight as adults, overweight children exhibit more illnesses as adults than normal kids.

# Visceral Vs Peripheral

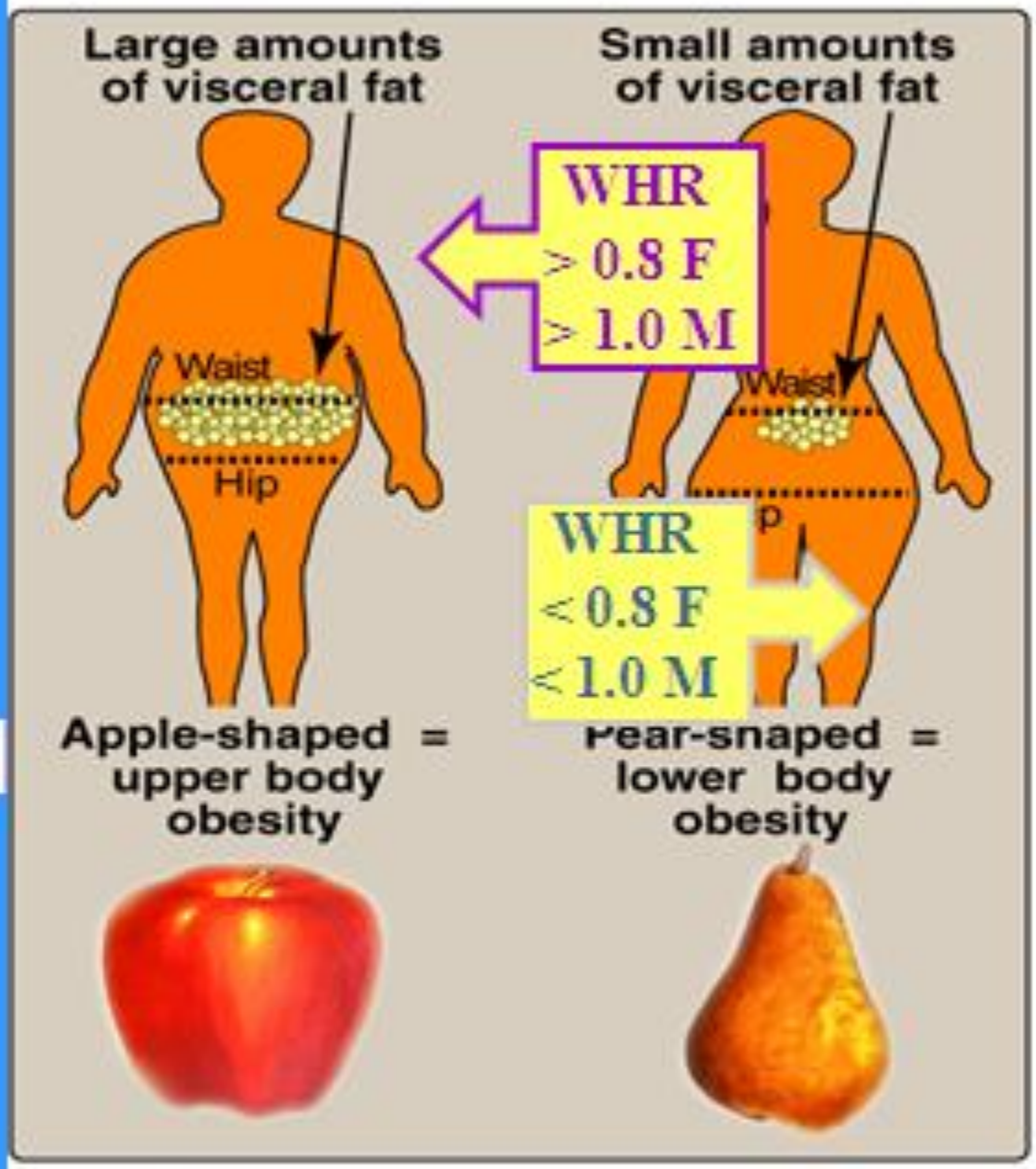



**Figure 26.3**

Individuals with more upper body fat (left) have greater health risks

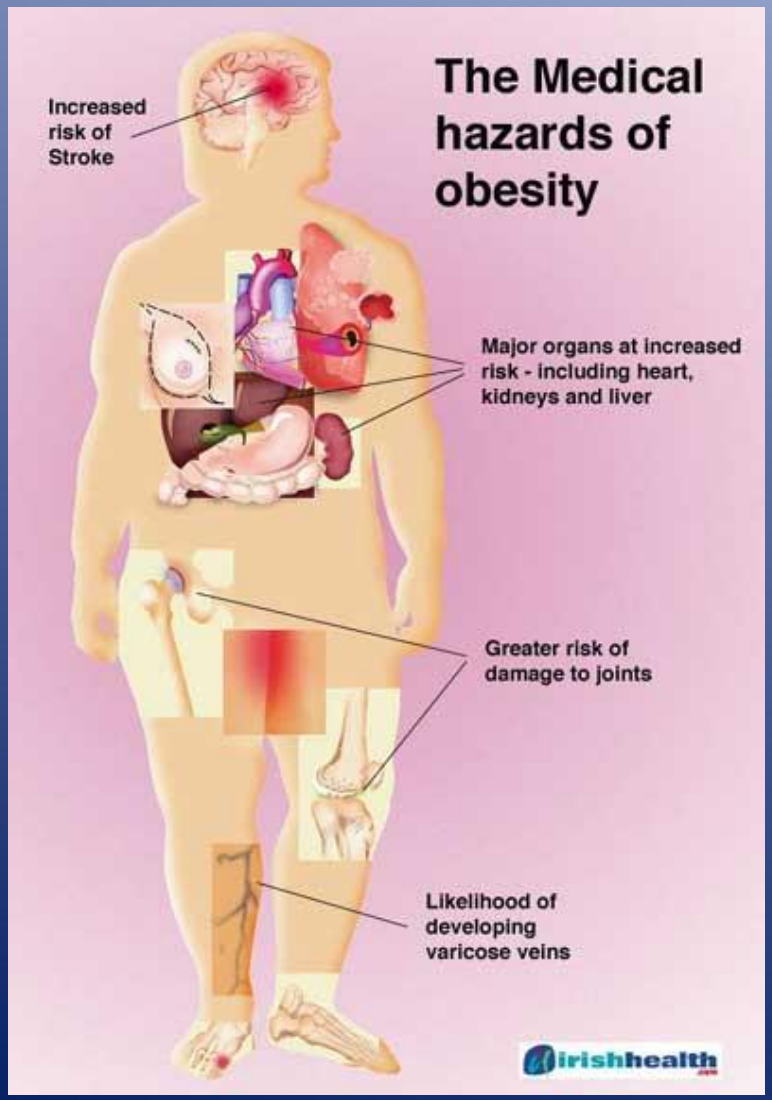
# Abdominal body fat increases health risks

**Degree of abdominal fat accumulation is correlated with increased risk of:**

- **Cardiovascular disease[1]**
- **Type 2 diabetes[2,3]**
- **Premature death[4]**
- **Some types of malignancies[5]**


[1]Hubert HB et al. Circulation 1996; 93: 1372–9
[2]Colditz GA et al. Am J Epidemiol 1990; 132: 501–13
[3]Chan JM et al. Diabetes Care 1994; 17: 961–9
[4]Soloman CG, Manson JE. Am J Clin Nutr 1997; 66 (Suppl. 4): 1055S–50S
[5]Schapira DV et al. Cancer 1994; 74: 632–9

# Obese Syndrome Components




- **Glucose intolerance**
- **Insulin resistance**
- **Dyslipidemia**
- **Type 2 diabetes**
- **Hypertenision**
- **Elevated plasma leptin concentration**
- **Increased visceral adipose tissue**
- **Increased risk of CHD & some cancers**

# 10kg Weight Loss in 100kg Patient With Obesity Related Co-morbidities

- **Mortality 20-25% fall in total mortality**
  **30-40% fall in diabetes related deaths**
  **40-50% fall in obesity related cancer deaths**

- **Blood pressure fall of approximately 10mm/Hg in both systolic and diastolic values**

- **Reduces the risk of developing diabetes by >50%**
  **Fall of 30-50% F. glucose. Fall of 15% HbAIC**

- **Lipids: Fall of 10% in total cholesterol**
  **Fall of 15% LDL**
  **Fall of 30% triglycerides**
  **Increase of 8% in HDL**

# Approach to Obesity at Clinical level

- A full history  with a dietary inventory and an analysis of the subject's activity level.
- Screening questions to exclude depression
- Screening for eating disorders  as 30% of patients suffer from them
- Determine any co-morbidities;
- Exclude the possible and rare secondary causes
- Requirements of treatment and belief to fulfill
- Behavior assessment for readiness
- Family support, time and financial considerations

# Approach at community level

- Empowering parents, and caregivers
- Healthy foods in schools & restaurants
- Access to healthy affordable food
- Avenues for physical activity (www.letsmove.gov)
- Safe neighborhoods; playgrounds, parks
- Physical education in schools/child care facilities
- Encourage breast feeding
- Farmers markets; local fruits and vegetables available
- Any barriers considered

# Approach to control epidemic of obesity and overweight

- Early recognition & awareness
- Prompt action by individuals, parents, families physicians, communities & others
- Policies for conducive Environment
- Increased physical activity in all age groups
- Nutrition: Breast feeding & dietary determinants
- Behavior modifications at all levels, and by all health seekers and health providers
- Behavioral surveillance programs to detect changes
- Research at basic, clinical, and public health levels

# Summary

- Obesity is affected by a complex interaction between the environment, genetic predisposition, & human behavior.
- It has increased risk of numerous chronic diseases, from diabetes and cancers to many digestive diseases.
- The problem of overweight and obesity is one of the most pressing global issue with massive health care cost.
- Demands attention from the healthcare community, researchers, and policy makers.

# Thank You