



# Epidemiology of Diabetes mellitus

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# Objectives

1. To list the types of Diabetes Mellitus
2. To describe the prevalence of Diabetes Mellitus
3. To recognize the importance of diagnostic criteria for estimating the prevalence of diabetes mellitus
4. To discuss the risk factors and complications of type II diabetes mellitus

# Diabetes Mellitus

## Definition

A metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both

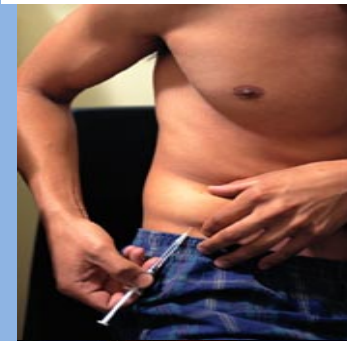
# Types of diabetes

**Type 1 (5-10%)** sudden onset absolute deficiency in insulin. Usually affects younger age group (not always)



**Type 2 (90 - 95%)** gradual onset of relative insulin insensitivity. Usually older age group (not always)

**Gestational diabetes** Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy



**Secondary diabetes** The diabetes is not the main illness, a secondary condition that results because of the main illness. If it is possible to treat the main illness successfully the diabetes may/will disappear e.g. cystic fibrosis, chronic pancreatitis, infections.



**Pre-diabetes** Impaired glucose tolerance - a person with pre-diabetes has a blood sugar level higher than normal, but not high enough for a diagnosis of diabetes; & is at higher risk for developing type 2 diabetes. May remain undiagnosed for years; risk of complications same as for T2DM



# Diagnosis of diabetes



## Symptoms

- Thirst
- Passing lots of urine
- Malaise
- Infections (thrush)
- Weight loss

**BUT – many years of pre-diabetes (type 2) before these symptoms appear!**

## Biochemical tests

- Random plasma glucose
- Fasting plasma glucose
- Oral glucose tolerance test – 2h glucose

# Fasting Blood sugar

- Non diabetic: FBS < 110 mg/dl (6.1 mmol/L).
- Glucose Intolerance: FBS 110 -125 mg/dl (6.1-6.9 mmol/L). (Increased risk of DM)
- Diabetic: FBS >126 mg/dl (>7 mmol/L)  
OR Random BS >200 mg/dl (>11.1 mmol/L) .

# Diagnosis based on:

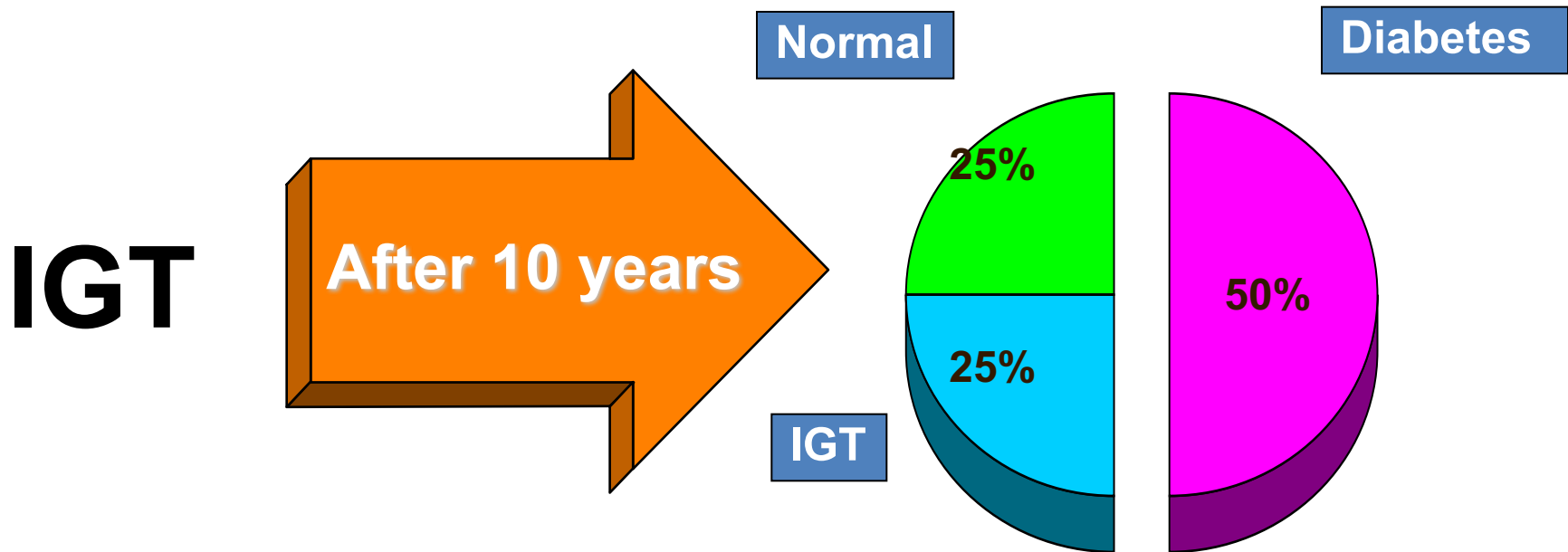
Glucose Tolerance Test 2 hr post 75 gm glucose

If  $< 7.8$  mmol/L = normal GTT

If  $\geq 7.8$  mmol/L and  $< 11.1$  mmol/L = Impaired GTT

If  $\geq 11.1$  mmol/L = provisional diagnosis of Diabetes

# Natural History of IGT





# Why is diabetes so important?

## The burden to patients, carers, NHS

### ■ Complications

- Cardiovascular
- Eyes
- Renal - Hypertension, renal failure
- Feet
- Skin, infections, sexual, psycho-sexual, depression
- Quality of life
- Premature mortality

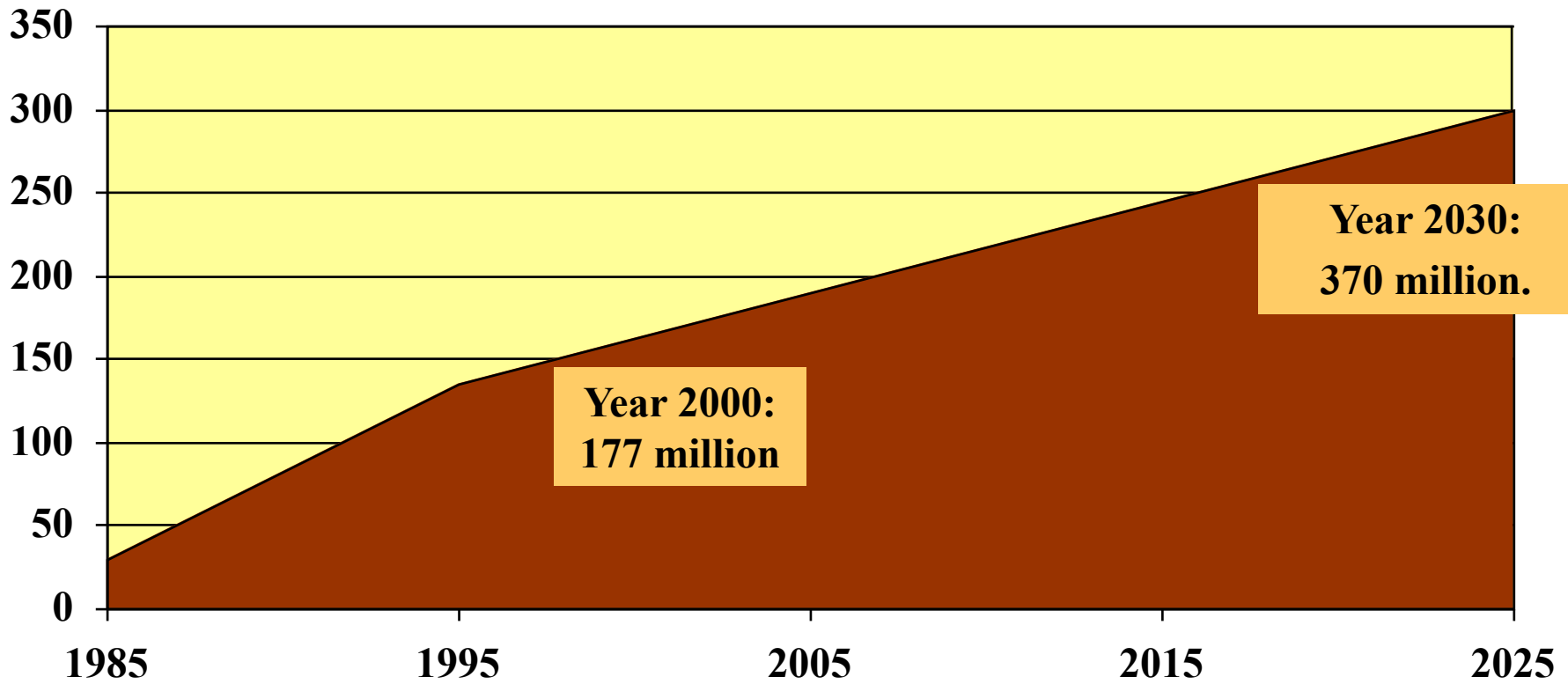
### ■ Cost

# Costs - Fact File

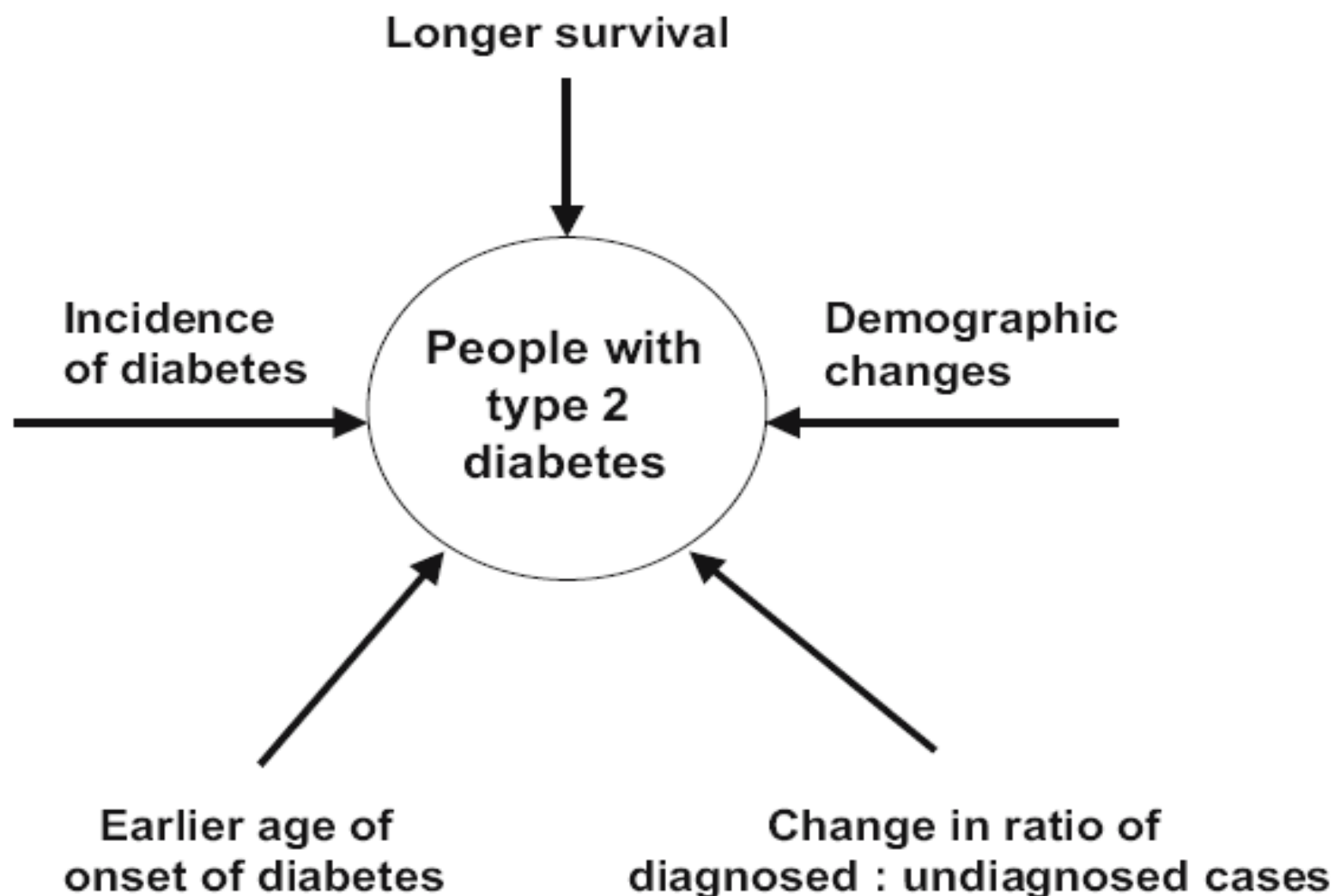
- Studies have shown that diabetes is a costly disease
- Type 2 diabetes accounted for between 3% and 6% of total healthcare expenditure in eight European countries
- Hospital in-patient costs are the largest single contributor to direct healthcare costs

# Prevalence of diabetes

Millions



- Urbanization and lifestyle changes
- increased numbers of people being diagnosed with type 2 diabetes, and enhanced survival rates of those diagnosed will increase prevalence.
- Longevity

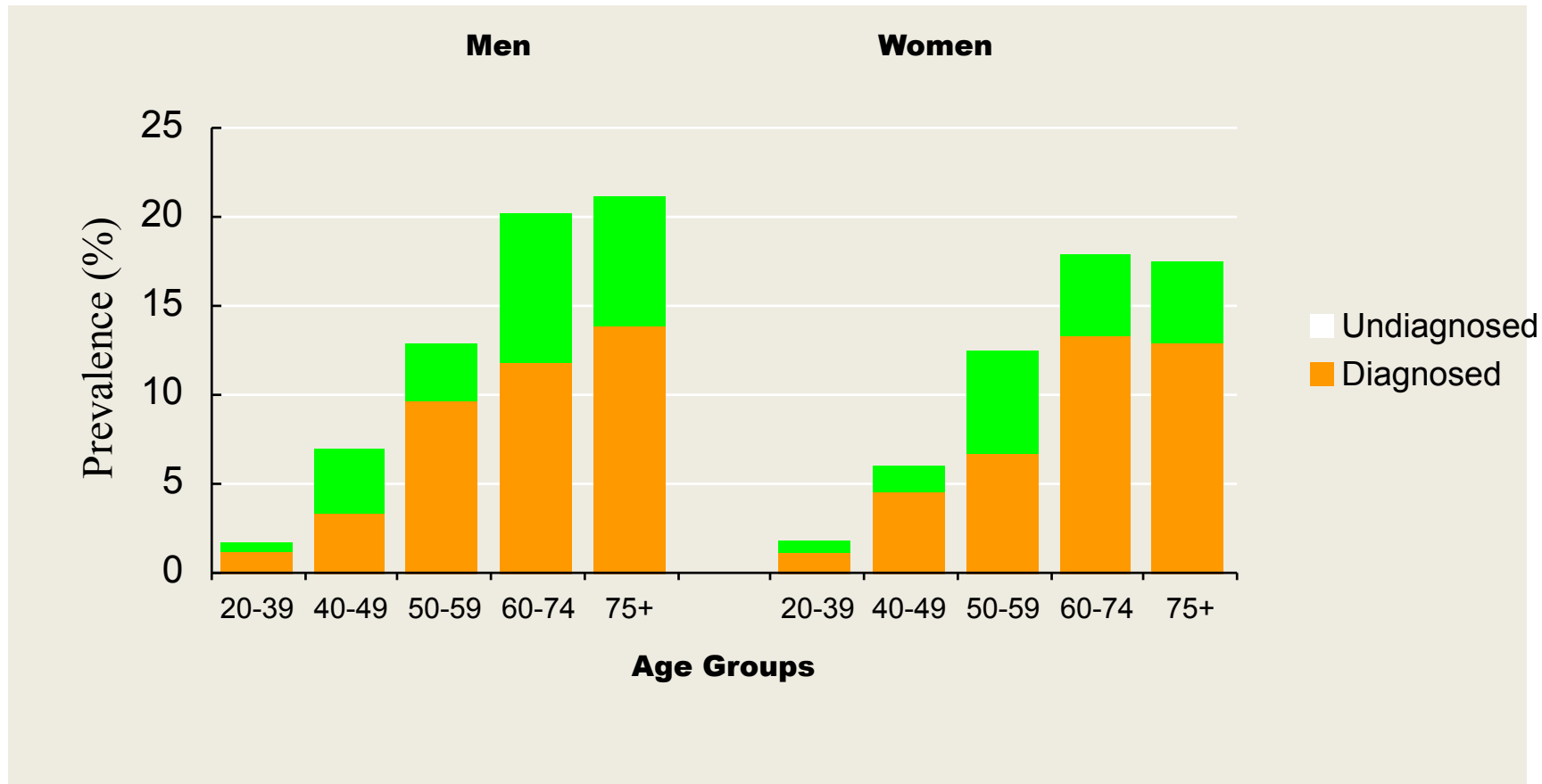


**Fig. 1** Diabetes epidemiological model. Factors directly affecting the prevalence of diabetes included in the present analysis

# Epidemiology of diabetes

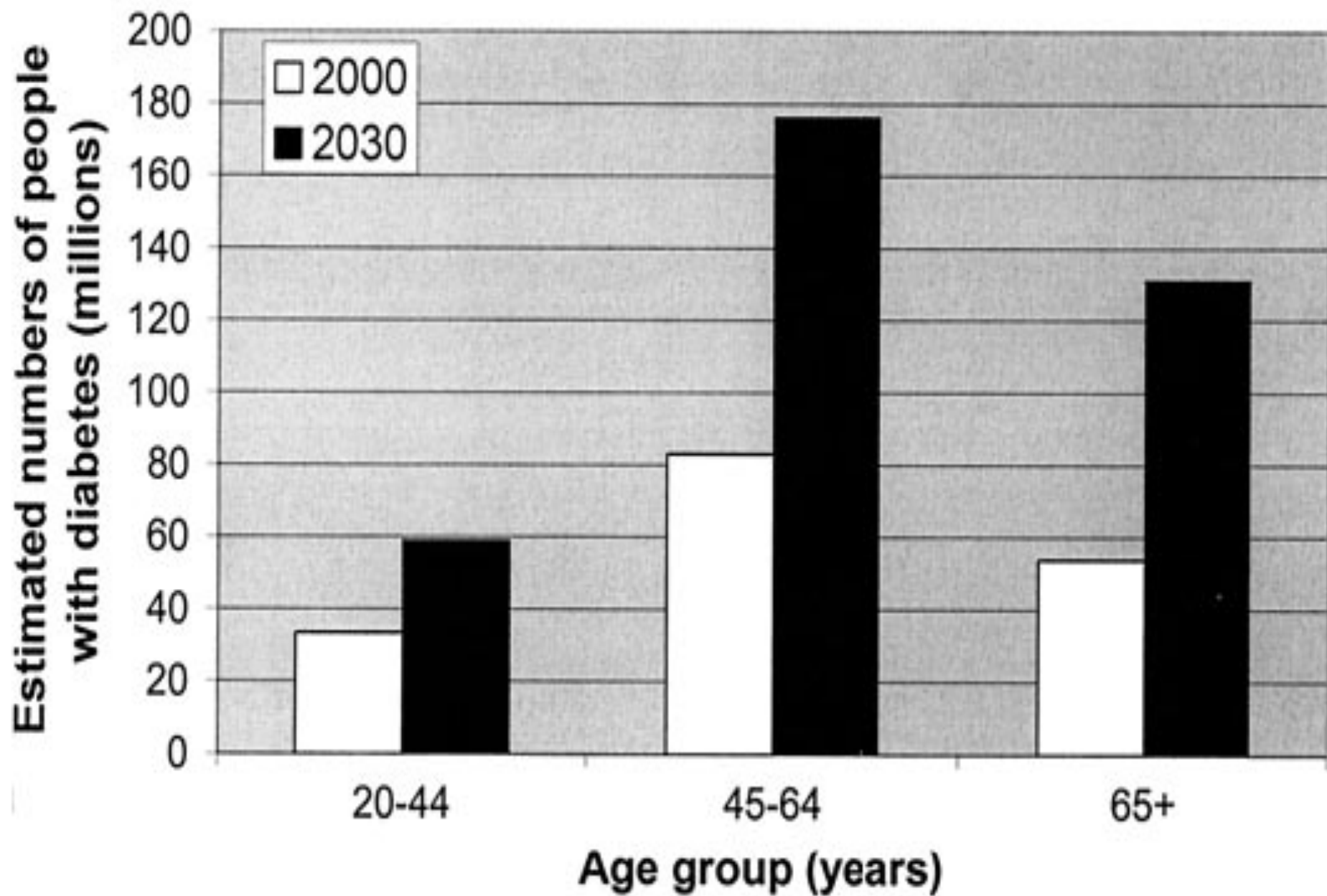
- Prevalence worldwide is increasing
  - 2.8% in 2000;
  - 4.4% in 2030 worldwide.
  - 177 million in 2000; 370 million in 2030
  - Greatest rise in developing world
  - Prevalence estimates only include reported and diagnosed persons
  - There is a large % that is undiagnosed as well as a large % at high risk of developing DM

# Diagnosed and Undiagnosed Prevalence of Diabetes by Age in the US (NHANES III)



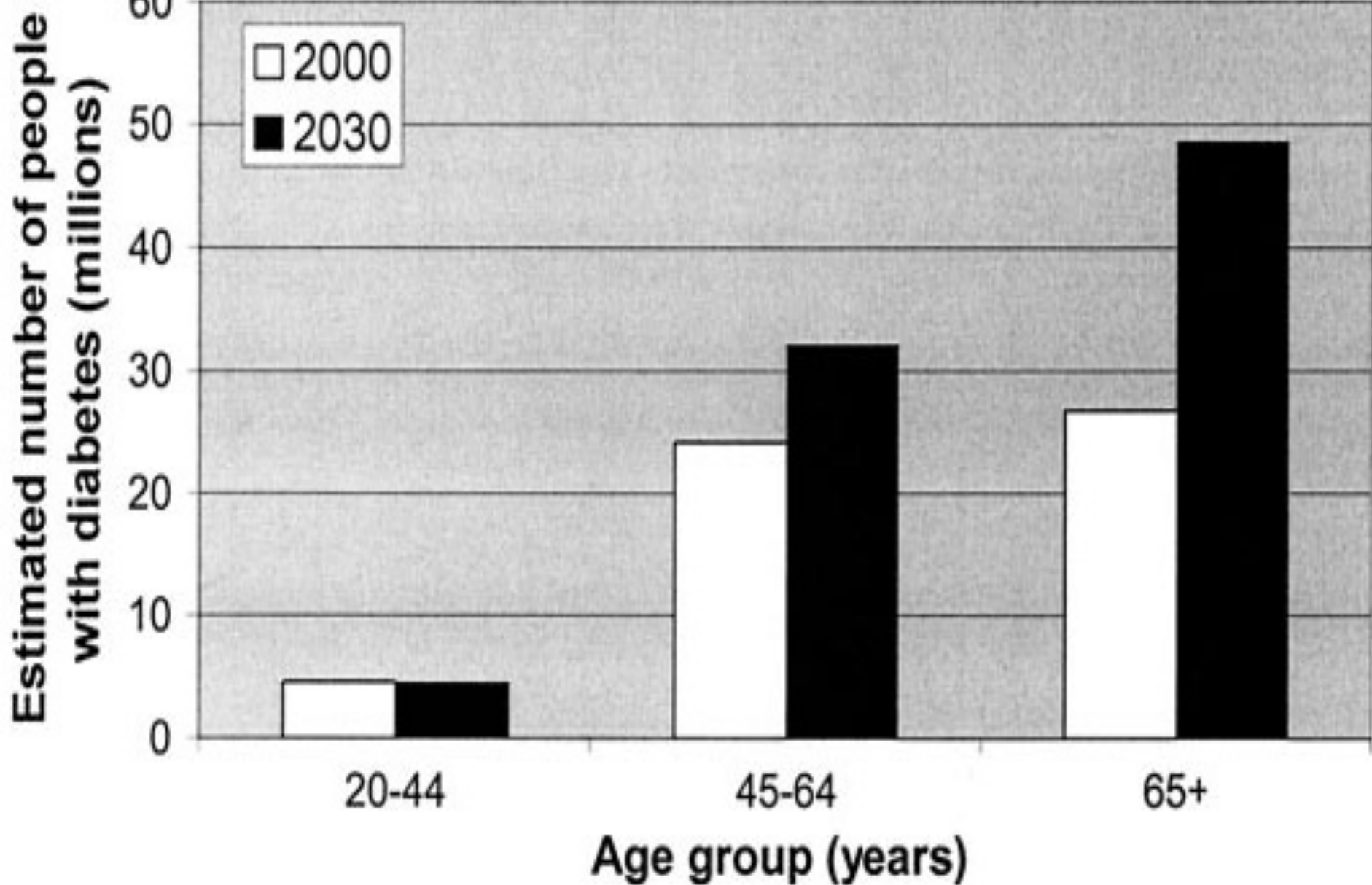
*Harris et al., Diabetes Care, 1998*

## World

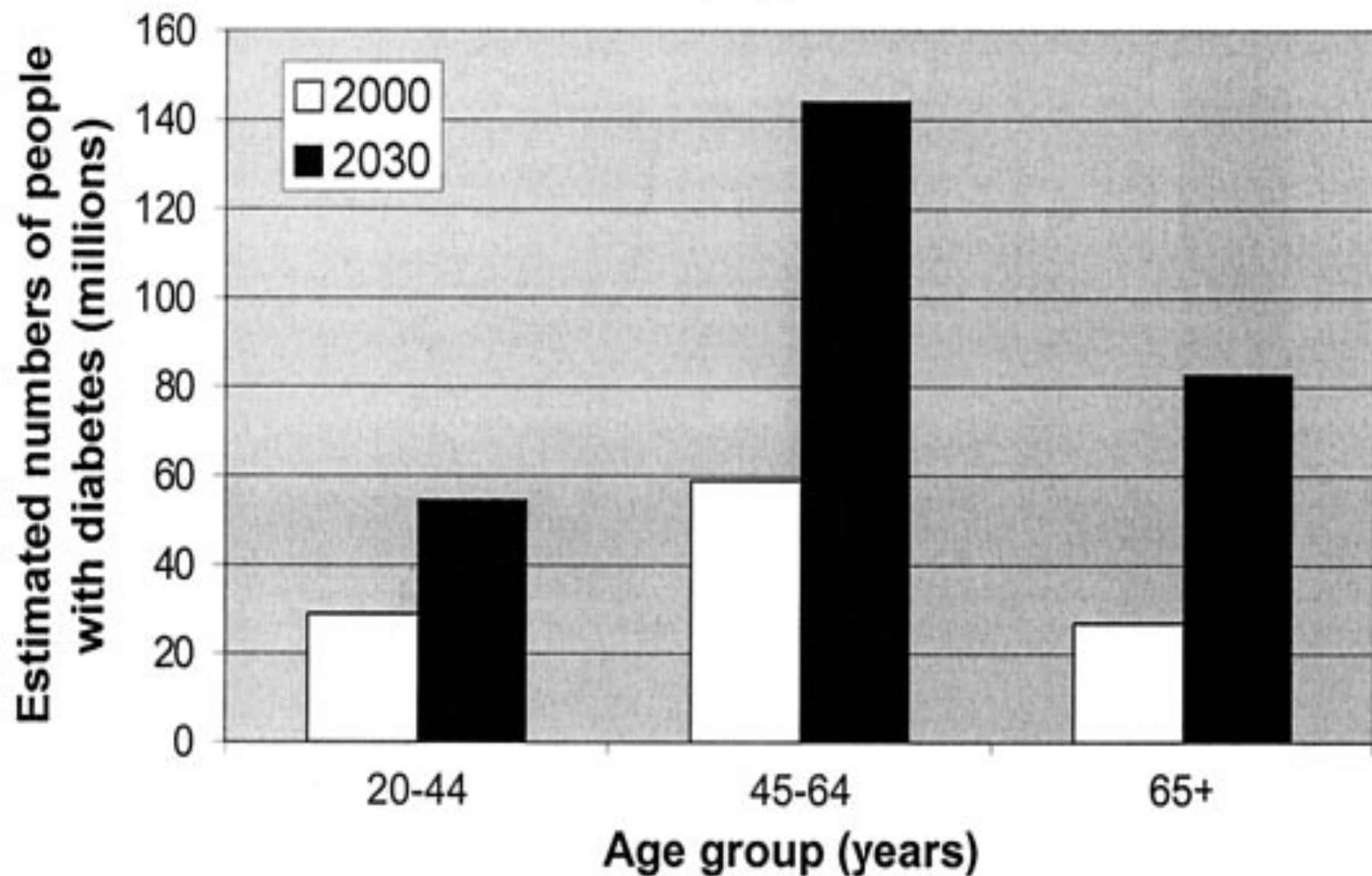




## Developed countries



## Developing countries



# Epidemiology of Diabetes in USA

- Diabetes affects 25.8 million people of all ages
- 8.3% of the U.S. population
  - Diagnosed: 18.8 million
  - Undiagnosed: 7.0 million
- Leading cause of kidney failure, nontraumatic lower-limb amputation, & new cases of blindness among adults
- Major cause of heart disease and stroke
- Seventh leading cause of death

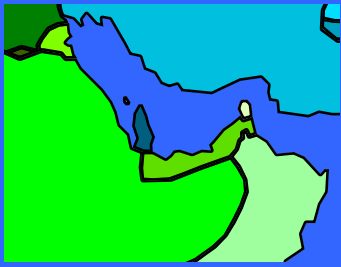
# Annual U.S. Diabetes Burden in 2050

- By 2050, prevalence of total diabetes (diagnosed & undiagnosed) is projected to increase from 1 in 10 adults to between 1 in 5 and 1 in 3 adults
- Largely attributed to three key factors
  - Aging of the U.S. population
  - Increasing size of higher-risk minority populations
  - Declining mortality among those with diabetes

# Estimated Number of People with Diabetes Worldwide, 2010 and 2030

Country/Territory	2010 Millions	Country/Territory	2030 Millions
1 India	50.8	1 India	87.0
2 China	43.2	2 China	62.6
3 USA	26.8	3 USA	36.0
4 Russian Federation	9.6	4 Pakistan	13.8
5 Brazil	7.6	5 Brazil	12.7
6 Germany	7.5	6 Indonesia	12.0
7 Pakistan	7.1	7 Mexico	11.9
8 Japan	7.1	8 Bangladesh	10.4
9 Indonesia	7.0	9 Russian Federation	10.3
10 Mexico	6.8	10 Egypt	8.6

# Diabetes Mellitus: Comparative Prevalence 2010



## Diabetes Mellitus

an Epidemic  
Disease in the

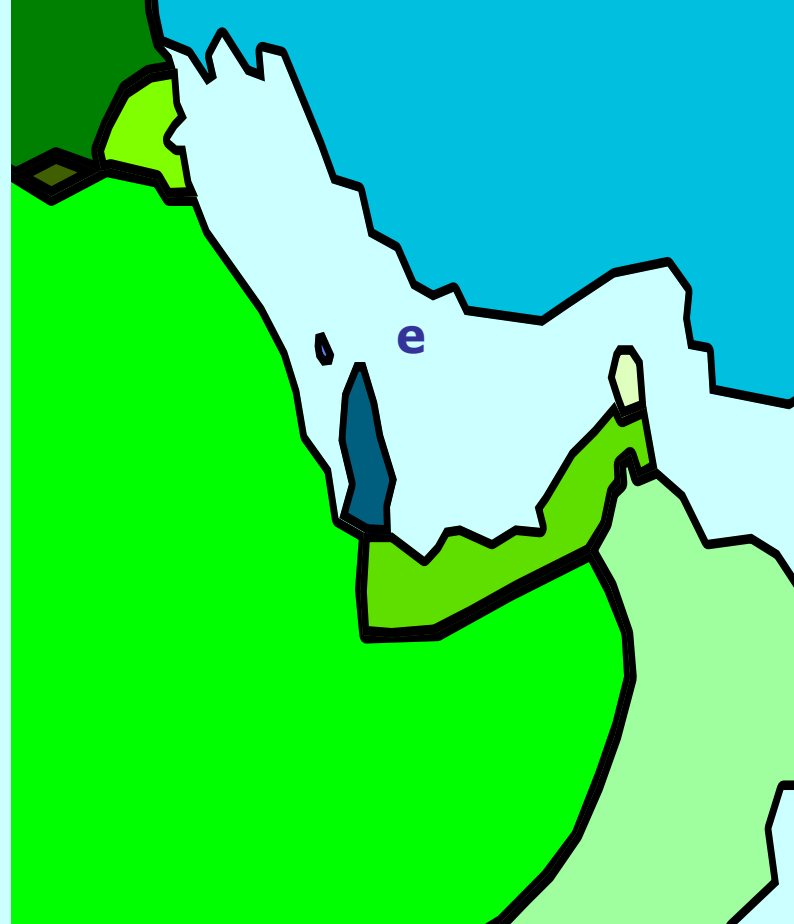
Gulf Countries

Epidemiological  
Data

Kuwait  
14.6

UAE  
18.7

Saudi Arabia  
16.8



Bahrain  
15.4

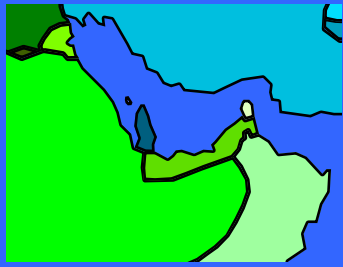
Qatar  
15.4

Oman  
13.4

*Comparative prevalence: WHO standard; adjusted for age to compare with other countries*

International Diabetes Federation: Fourth edition  
[https://www.idf.org/sites/default/files/The\\_Global\\_Burden.pdf](https://www.idf.org/sites/default/files/The_Global_Burden.pdf)

## Impaired Glucose Tolerance Prevalence 2010



### Diabetes Mellitus

an Epidemic  
Disease in the

Gulf Countries

Epidemiological  
Data

Kuwait  
18.8

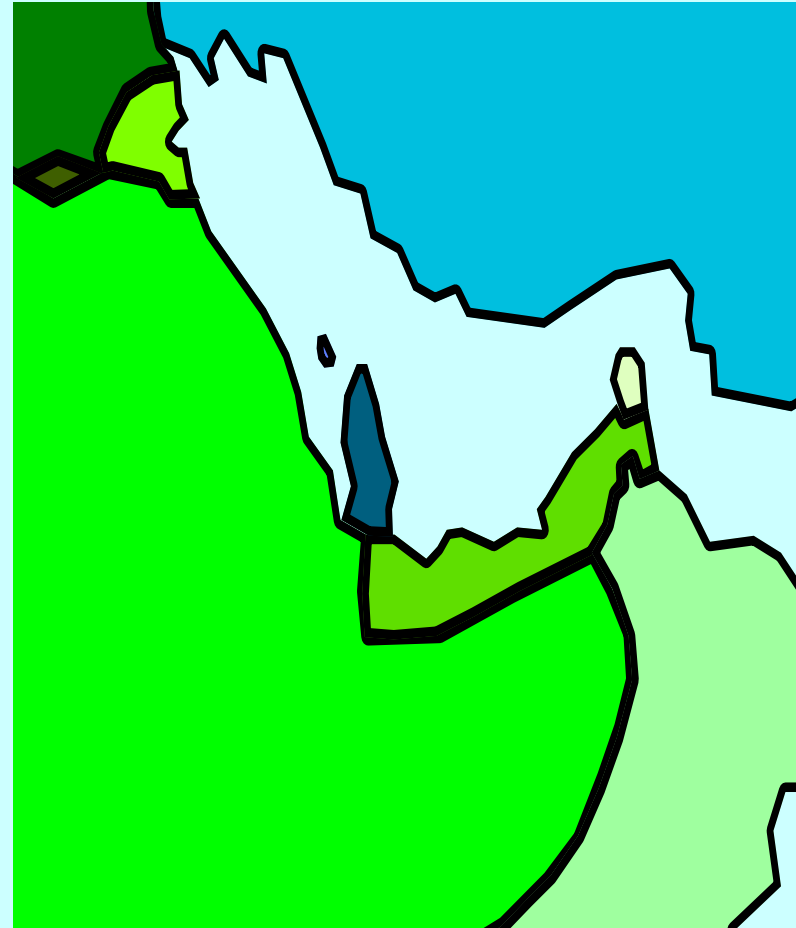
UAE  
18.8

Saudi Arabia  
12.5

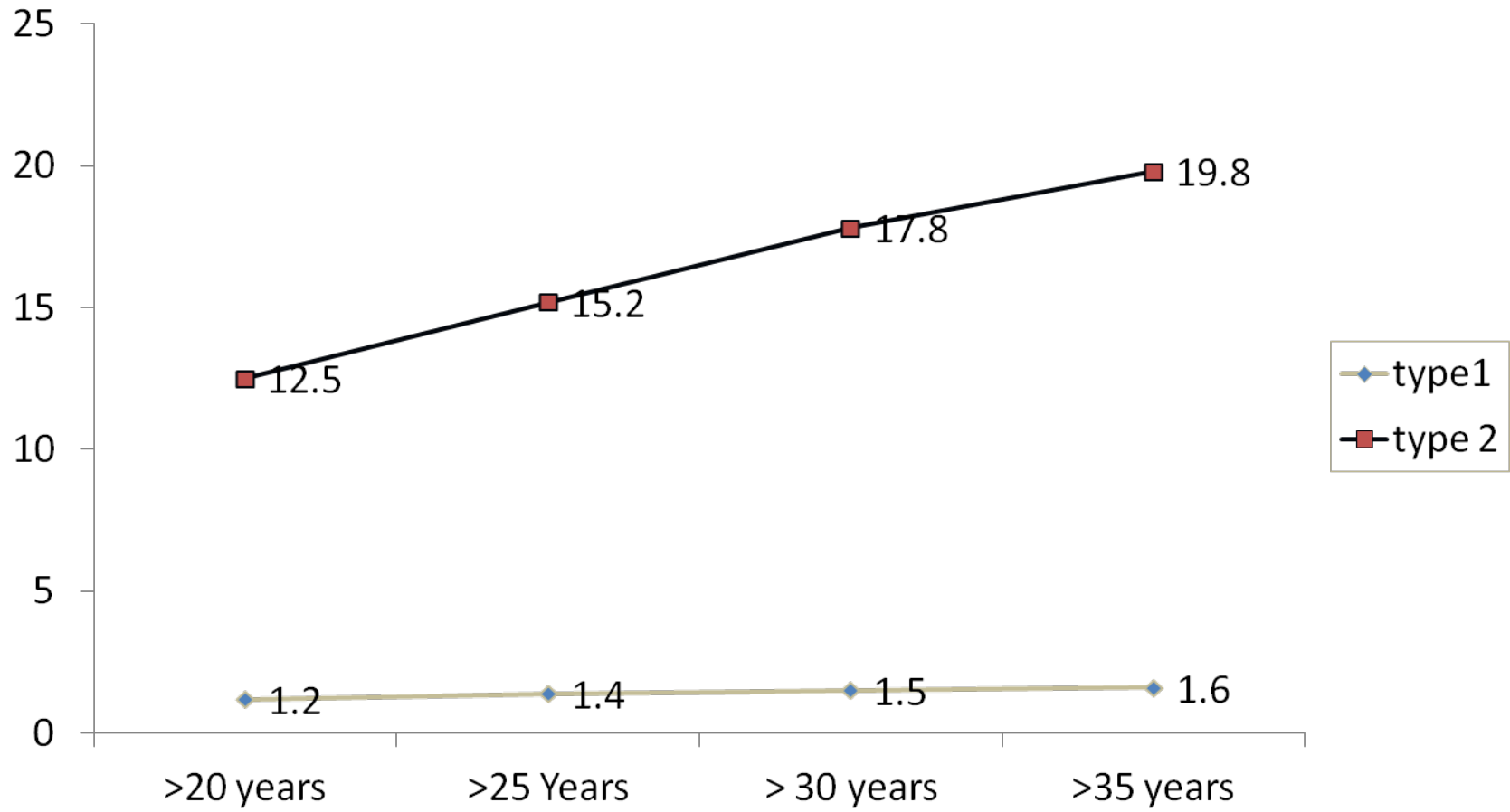
Bahrain  
18.8

Qatar  
18.8

Oman  
10.9

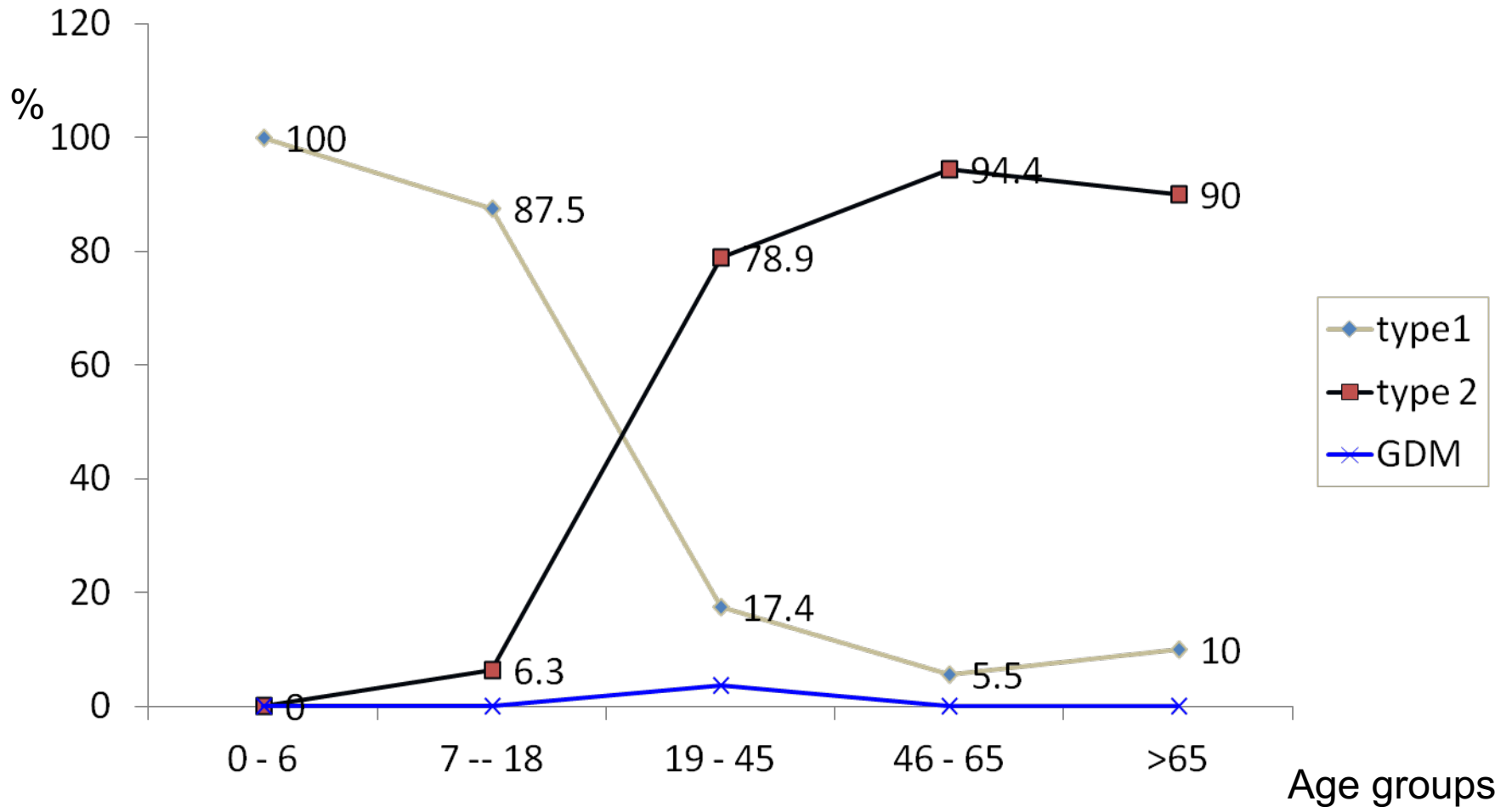


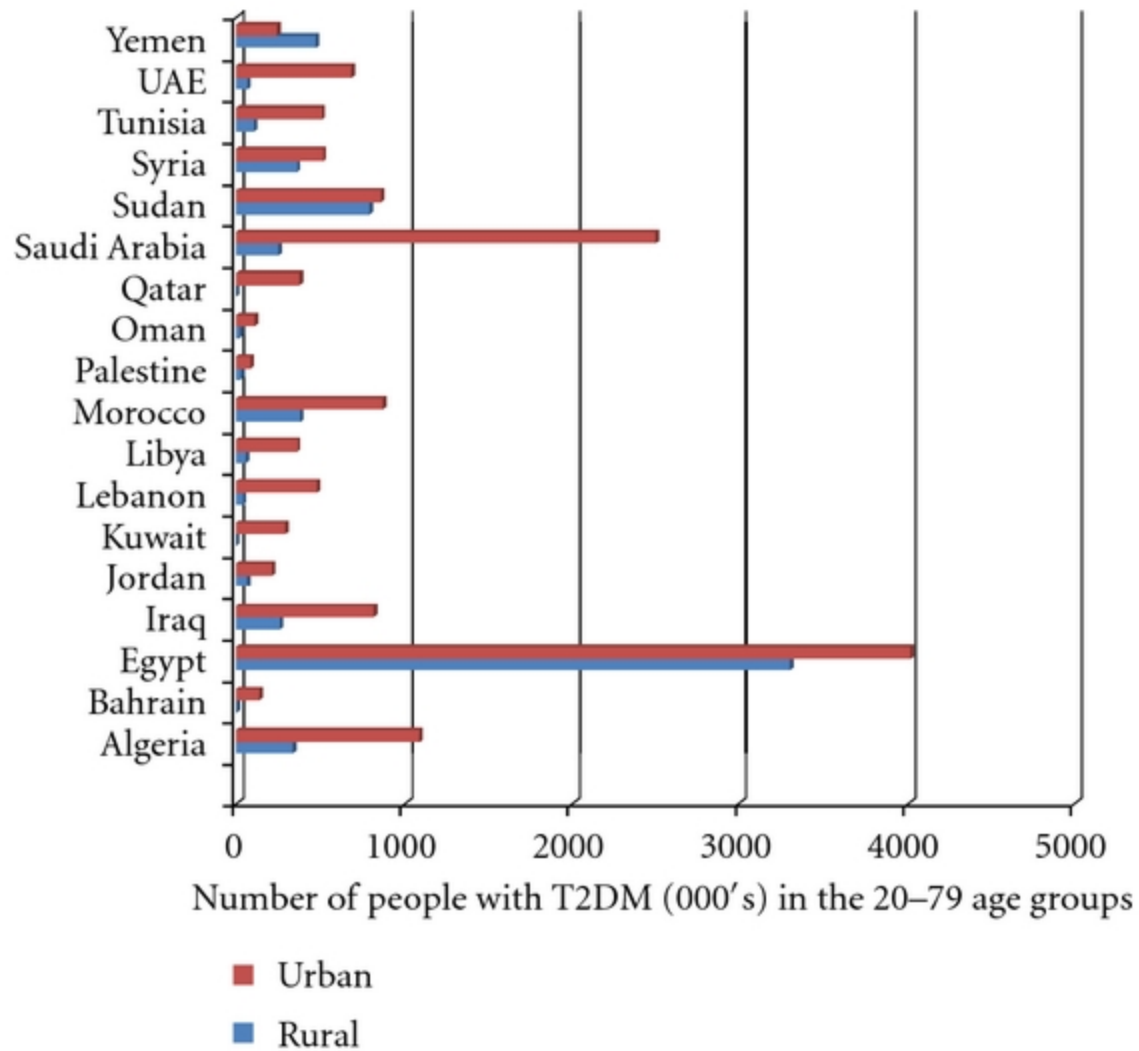
# Diabetes mellitus & age distribution in KSA





# Types of DM and age in KSA





# Stepwise Approach to Non Communicable Diseases

## WHO data from some EM countries

Country	Year of field work	Diabetes %	Hypertension %	Overweight & Obesity %
Iraq	2006	10.4	40.4	66.9
Jordan	2007	16	25.5	67.4
Saudi Arabia	2005	17.9	26	
Syrian Arab Republic	2003	19.8	28.8	56.3
Kuwait	2005	16.7	24.6	81.2
Egypt	2005	16.5	33.4	76.4
Sudan	2005	19.2	23.6	53.9

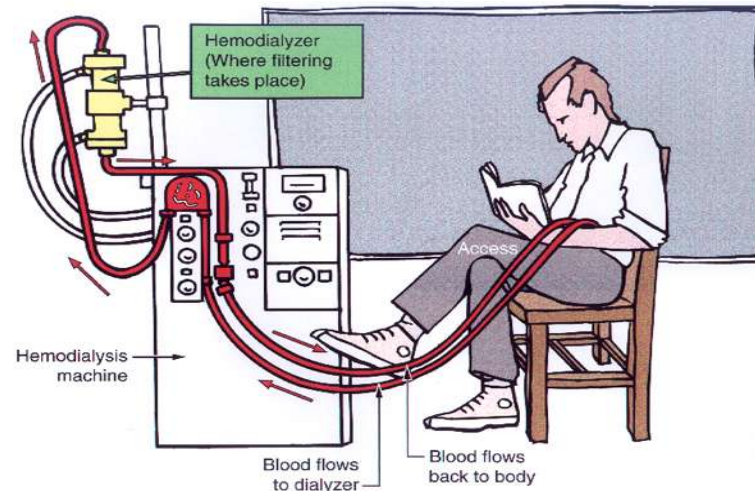
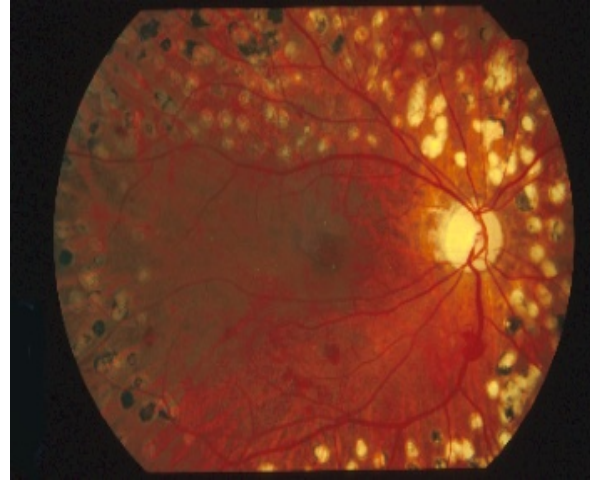
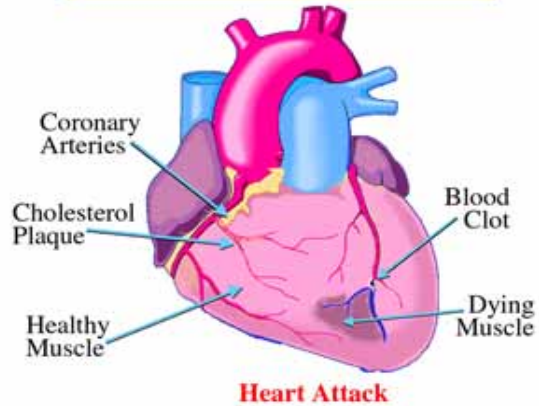
# Stepwise Approach to Non Communicable Diseases

## WHO data from some EM countries

Country	Year of field work	Hyper-cholestrolemia %	Smoking %	Low physical activity %	Low intake fresh fruit vegetables %
Iraq	2006	37.5	21.6	56.7	92.3
Jordan	2007	26.2	29	5.2	14.2
Saudi Arabia	2005	19.3	12.9	33.8	91.6
Syrian Arab Republic	2003	33.5	24.7	32.9	95.7
Kuwait	2005	42	15.7	91.5	89
Egypt	2005	24.2	21.8	50.4	79
Sudan	2005	19.8	12	86.8	1.7/day

# Diabetic complications

## Ischemic Heart Disease



# Diabetic complications

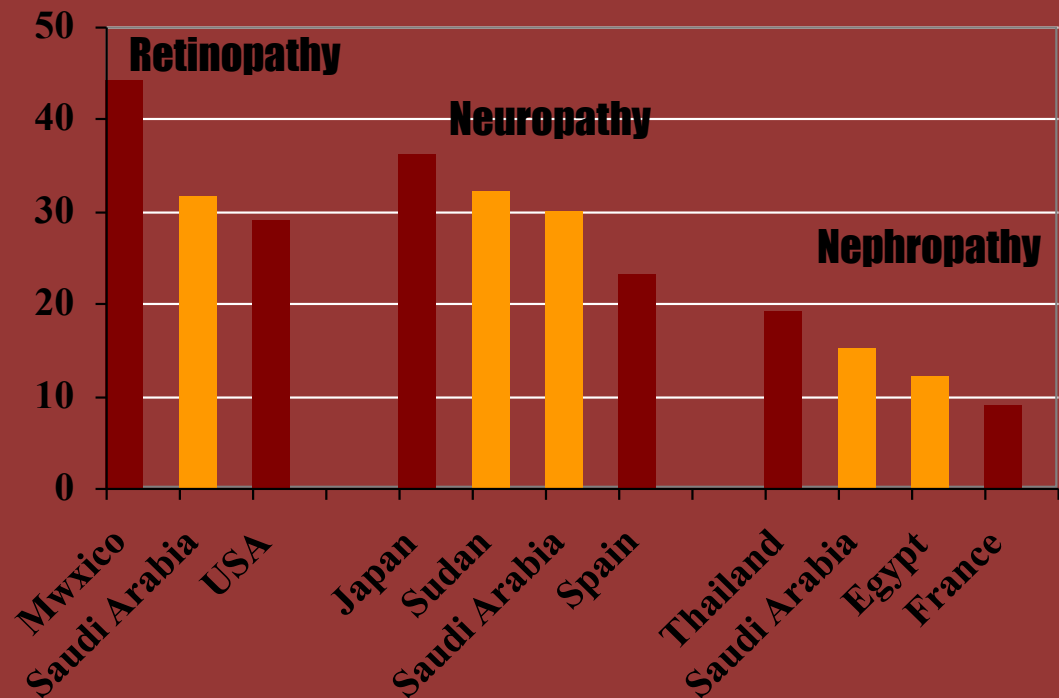
- Diabetes accounts for more than **5% of the global deaths**, which are mostly due to **CVD**.
- Diabetes is responsible for over **one third of end-stage renal disease** requiring dialysis.
- **Amputations** are at least **10 times** more common in people with diabetes.
- A leading cause of **blindness & visual impairment**. Diabetics are **20 times** more likely to develop blindness than non-diabetics.

# Diabetes Complications in the Gulf Countries

## Prevalence of microvascular complications:

Comparing data from Arab countries with data of the highest & lowest prevalence world wide in the year 2000.

The major complications will be soon the highest in Arab countries due to the lack of prevention programs.



WHO report 2000.

# RETINOPATHY

## Chronic complication of diabetes in North Africa 1995-2012

Author (year)	Location	Sample	Setting	Type of Diabetes	Prevalence %
Macky 2011	Egypt	1325	Clinic	Mixed	20.5
Kadiki 1999	Egypt	960	Clinic	Type 2	30.5
Elbagir 1995	Sudan	91	Clinic	Mixed	43
Harzallah 2006	Tunisia	370	Inpatient /clinic	Mixed	8.1



# ALBUMINURIA AND NEPHROPATHY

## Chronic complication of diabetes in North Africa 1995-2012

Author (year)	Location	Sample	Setting	Type of Diabetes	Prevalence
<b>ALBUMINURIA</b>					
Herman 1998	Egypt	1451	clinic	Mixed	21.0
Elbagir 1995	Sudan	128	clinic	Mixed	<i>Proteinuria:</i> 22
<b>NEPHROPATHY</b>					
Herman 1998	Egypt	1451	clinic	Mixed	6.7
Kadiki 1999	Libya	960	clinics	Type 2	25.2
Harzallah 2006	Tunisia	370	inpatient & Clinic	Mixed	13.1

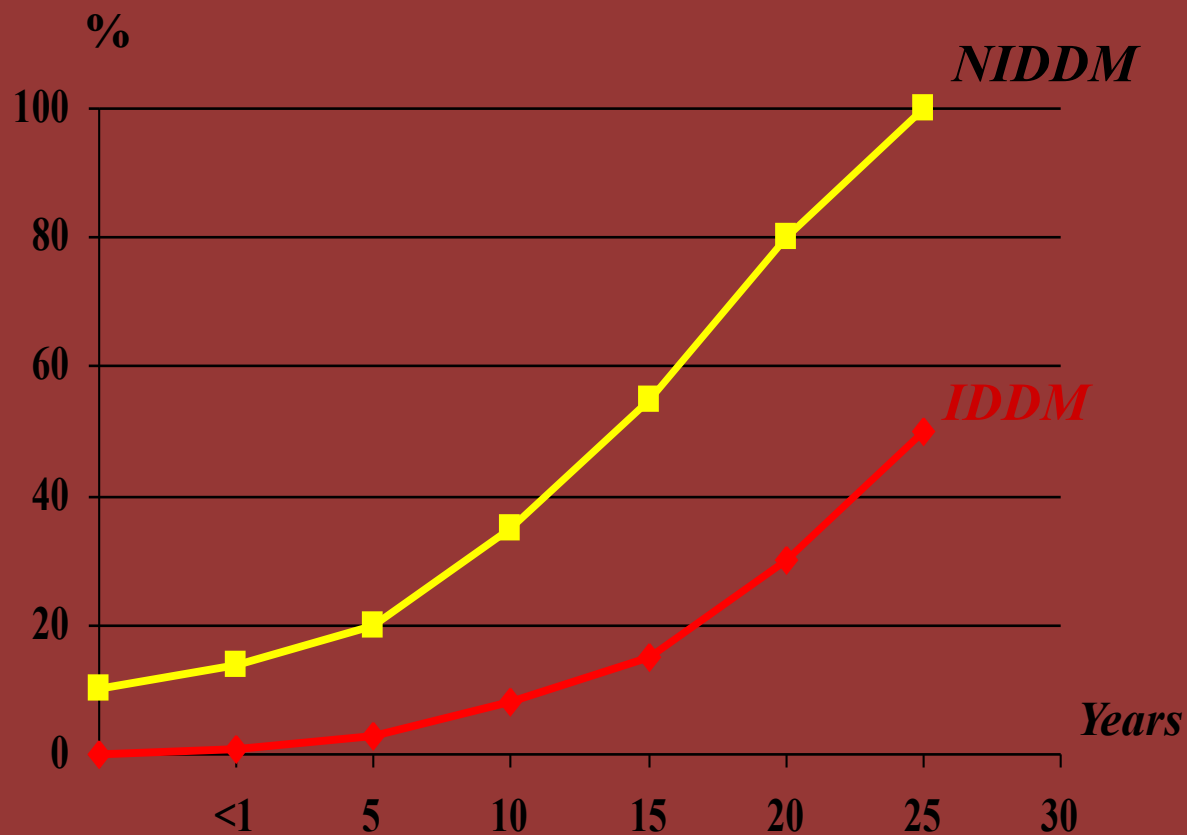
# NEUROPATHY

## Chronic complication of diabetes in North Africa 1995-2012

Author (year)	Location	Sample	Setting	Type of Diabetes	Prevalence %
Herman 1998	Egypt	1451	Clinic	Mixed	21.9
Kadiki 1999	Libya	960	Outpatient	Type 2	45.7
Elmagir. 1998	Sudan	128	Outpatient	Mixed	36.7
Harzallah 2006	Tunisia	370	Inpatient/ clinic	Mixed	24.3

# Diabetes Complications

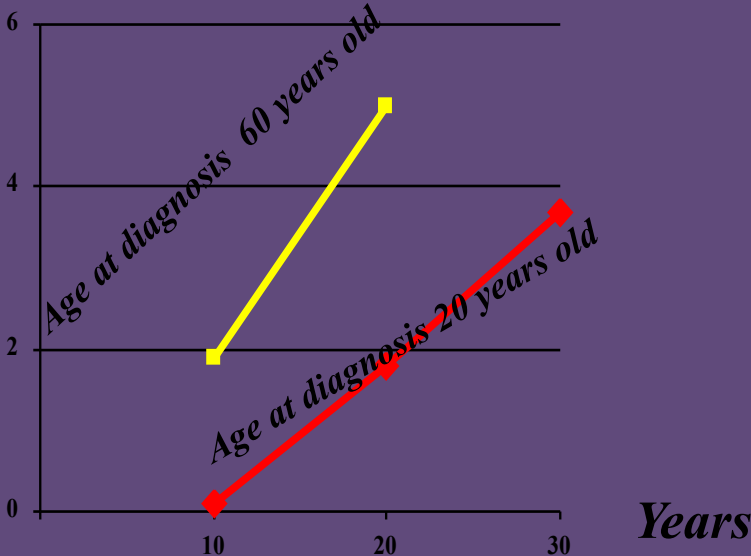
## NEUROPATHY WITH DURATION



# Diabetes Complications

## BLINDNESS BY DURATION OF DIABETES

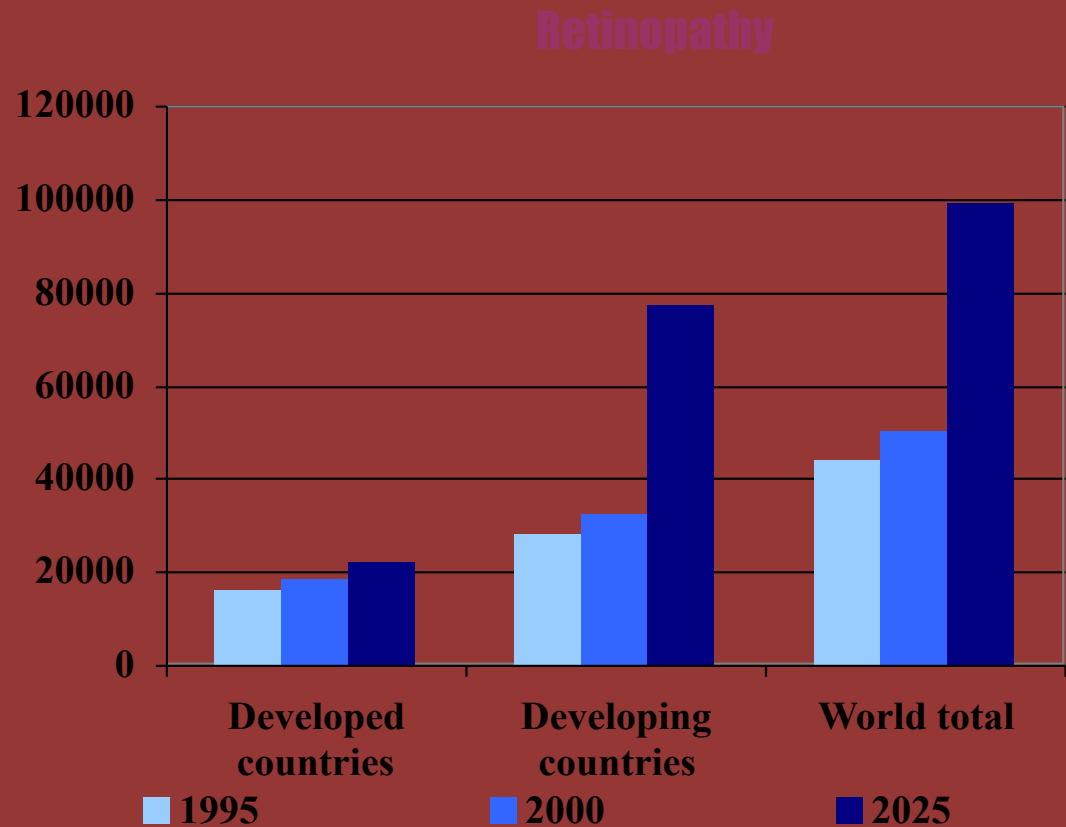
%



# Diabetes Complications

## Retinopathy:

Number of persons with diabetic retinopathy in different countries and according to the time.



# Diabetes Complications

## Prevalence of Retinopathy in Saudi diabetic patients

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**31.5%**

IDDM	42.5%
NIDDM	25.3%

## Risk factors for Retinopathy in Saudi diabetic patients

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- ① Duration > 10 years.
- ② Presence of nephropathy.
- ③ Older than 60 years.
- ④ Poor diabetes control.
- ⑤ Use of insulin.

# Risk factors

- ▣ Risk factors for Type 2 DM are complex including **obesity, genetic and life style factors** (overfeeding and sedentary life). There is pathophysiological changes (weight gain insulin resistance and reduction of insulin secretion) may lead to glucose intolerance and diabetes.
- ▣ Important factors are physical inactivity, dietary imbalance

# Obesity

▣ **Contributes to the resistance to endogenous insulin.**

■ **RR risk of DM in females (ref. BMI < 22)**

- ▣ **22-23                      3.0**
- ▣ **24-25                      5.0**
- ▣ **> 31                        40**

**(Colditz & al, Ann Int Med, 1995, 122; 481-6)**



## Risk factors: Contd

- Genetic factors may play a part in development of all types; autoimmune disease and viral infections may be risk factors in Type I DM.
- Physiologic or emotional stress: causes prolonged elevation of stress hormone levels (cortisol, epinephrine, glucagon and growth hormone), which raises blood glucose levels, placing increased demands on the pancreas.

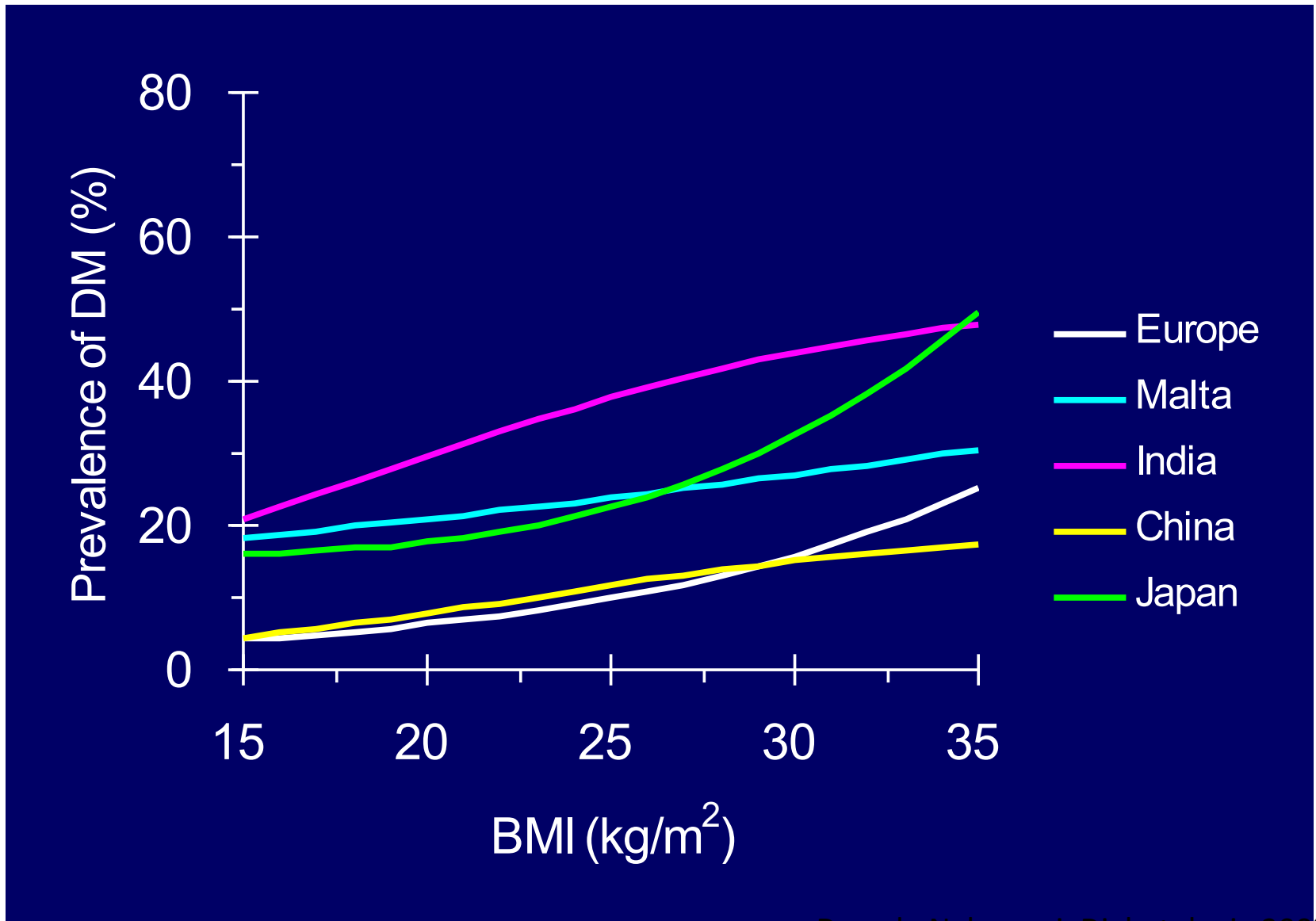
## Predisposing factors

- Pregnancy: causes weight gain and increases levels of estrogen and placental hormones, which antagonize insulin
- Medications that are known to antagonize the effects of insulin: thiazide diuretics, adrenal corticosteroids, oral contraceptives.

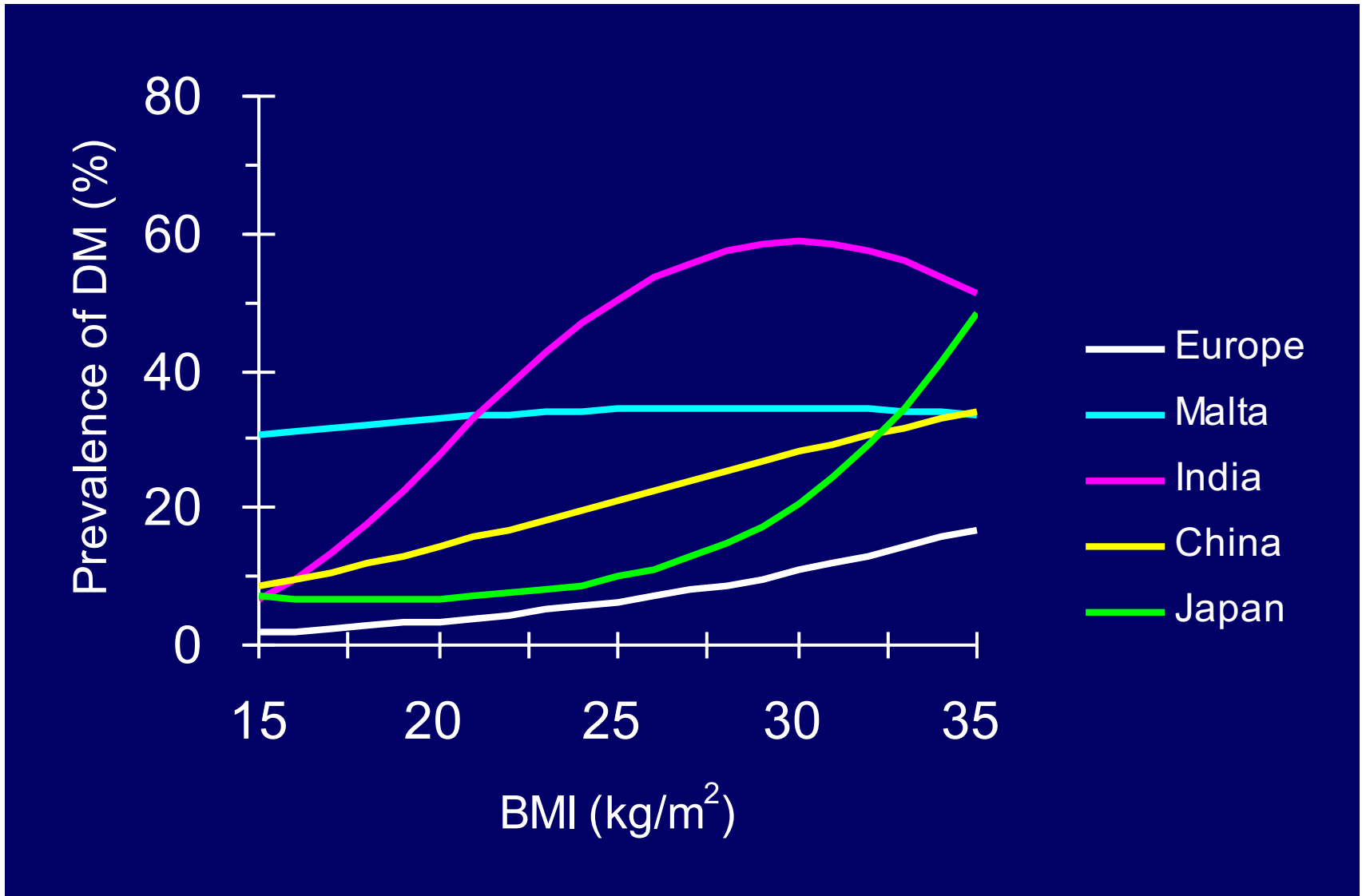
# Diabetes and Obesity

- ❑ Females of BMI  $>35$  has 93 times the risk of developing diabetes compared to those with BMI  $<21$
- ❑ Increase in mean weight by one kg increase the risk of diabetes by 4.5% ( recent data - 9%)
- ❑ Ethnic populations, changed lifestyles, become more obese-  $\uparrow$ diabetes
- ❑ Not all obese have diabetes, but most of people with diabetes have excess weight

# Prevalence of DM in 60 years old Men



# Prevalence of DM in 60 years old Women



# Future Directions

- **Tackling environmental factors and lifestyle**
- **Appropriate use of screening tools to control diabetes mellitus**
- **Early interventions in high risk populations**
- **Therapeutic and management choices and updated criteria for treatment**
- **Rehabilitation services for complications**

- ‘Obesity and physical activity are the most preventable risk factors for diabetes, and could potentially lead to more than 50% reduction in prevalence of the diabetes’



World diabetes day

14 November



# References

- <http://www.diabetesatlas.org/content/global-burden>.
- [Al-Madani A. Diabetes Complications in the Gulf Countries. Presentation.](#)
- Ibtihal Fadhil. RA/ NCD/ Health promotion and Protection /EMRO/WHO Diabetes and Other Non-Communicable Diseases / EM Regional Perspective. First BA Regional Workshop on the Epidemiology of Diabetes and Other Non-Communicable Diseases , Bibliotheca Alexandrina. 5-13 January 2009.
- WILD S, ROGLIC G, GREEN A, SICREE R, KING R. Global Prevalence of Diabetes. Estimates for the year 2000 and projections for 2030. DIABETES CARE 2004; 27 (5):1047-53.

Thank You