Nutrition as a Key to Economic Development: The Case for Armenia

Diabetes mellitus

John P. Bilezikian, MD
Professor of Medicine
College of Physicians and Surgeons
New York, NY USA

OUTLINE OF PRESENTATION

- **Epidemiology**
- **Morbidity, Mortality, Economics**
- **Risk Factors** (selective discussion, not including genetics, smoking, eceesive alcohol, drugs, etc)
  - Obesity
  - Lack of Exercise
- **Complications** (including skeletal health)
- **Conclusions**

Worldwide Estimates: 2012

- **366 million** people had diabetes in 2011; by 2030 this number is likely to rise to **552 million**

- The number of people with type 2 **diabetes is increasing** in every country

- **80%** of people with diabetes live in **low- and middle-income countries**

- The **greatest number** of people with diabetes are between **40 to 59** years of age

Worldwide Estimates: 2012

- **183 million** people with diabetes are **undiagnosed (50% of total with diabetes)**
- Diabetes caused **4.6 million deaths** in 2011
- Diabetes caused at least **465 billion US dollars** in healthcare expenditures in 2011; **11% of total healthcare expenditures** in adults (20-79 years)
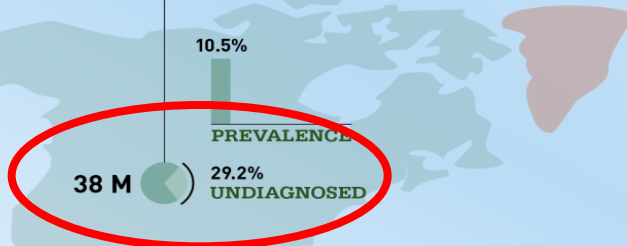- **41% increase in expenditures vs 2007**

Global Impact

NORTH AMERICA AND CARIBBEAN

More healthcare dollars were spent on diabetes in this region than any other

1 in 10 adults in this region has diabetes

10.5%
PREVALENCE

38 M 29.2% UNDIAGNOSED

MIDDLE EAST AND NORTH AFRICA

1 in 9 adults in this region has diabetes

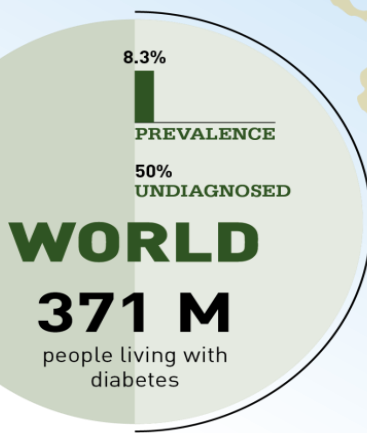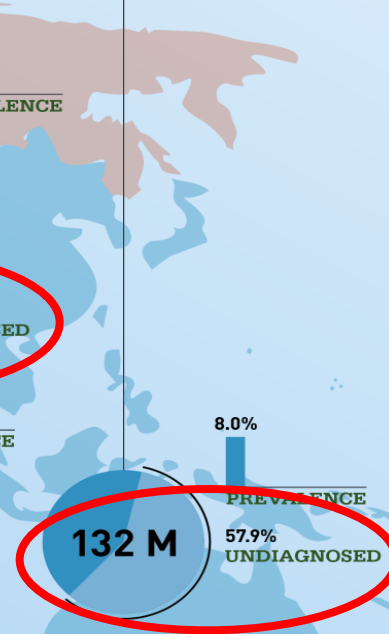More than half of people with diabetes in this region don't know they have it

34 M 52.9% UNDIAGNOSED

10.9%
PREVALENCE
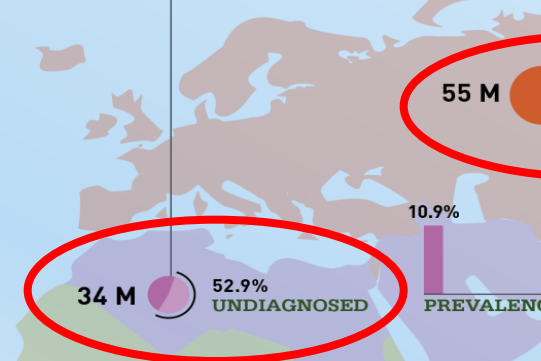
EUROPE

1 out of every 3 dollars spent on diabetes healthcare was spent in this region

21.2 million people in this region have diabetes and don't know it

55 M 38.6% UNDIAGNOSED

6.7%
PREVALENCE
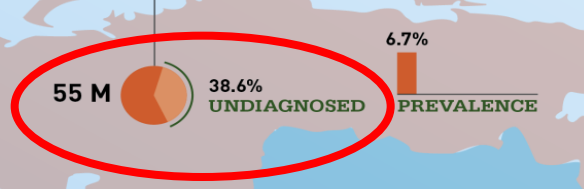
WESTERN PACIFIC

1 in 3 adults with diabetes lives in this region

6 of the top 10 countries for diabetes prevalence are Pacific Islands

70 M 51.1% UNDIAGNOSED

8.7%
PREVALENCE

8.0%
PREVALENCE

132 M 57.9% UNDIAGNOSED

8.3%
PREVALENCE

50% UNDIAGNOSED

WORLD

371 M

people living with diabetes

9.2%
PREVALENCE

26 M 45.5% UNDIAGNOSED

SOUTH AND CENTRAL AMERICA

Only 5% of all healthcare dollars for diabetes were spent in this region

1 in 11 adults in this region has diabetes

4.3%
PREVALENCE
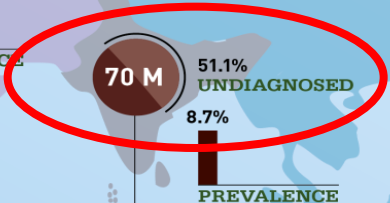
15 M 81.2% UNDIAGNOSED
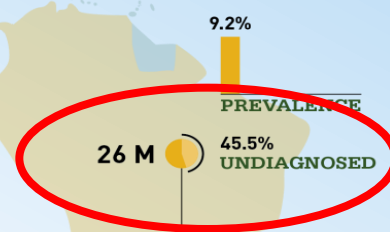
AFRICA

Over the next 20 years, the number of people with diabetes in the region will almost double

This region has the highest mortality rate due to diabetes
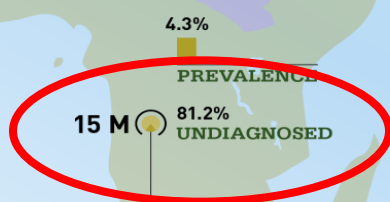
SOUTH-EAST ASIA

1 in 5 of all undiagnosed cases of diabetes is in this region

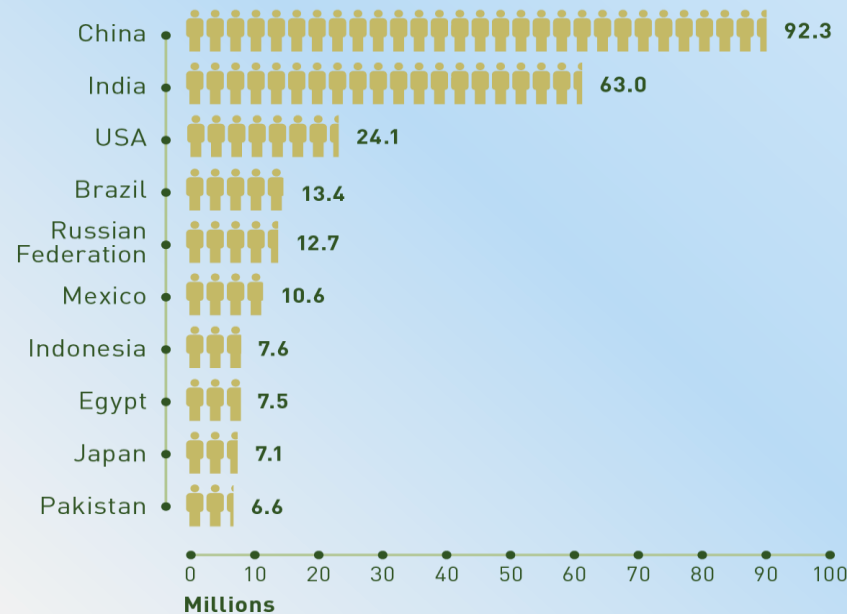1 in 4 deaths due to diabetes occurred in this region

*all estimates are presented as comparative rates

International Diabetes Federation

The Top 10 Countries: Numbers of People with Diabetes (in Millions)

More than **371 million** people have diabetes.

TOP 10 COUNTRIES/TERRITORIES FOR PEOPLE WITH DIABETES (20-79 YEARS)

Country	Millions
China	92.3
India	63.0
USA	24.1
Brazil	13.4
Russian Federation	12.7
Mexico	10.6
Indonesia	7.6
Egypt	7.5
Japan	7.1
Pakistan	6.6

0 10 20 30 40 50 60 70 80 90 100

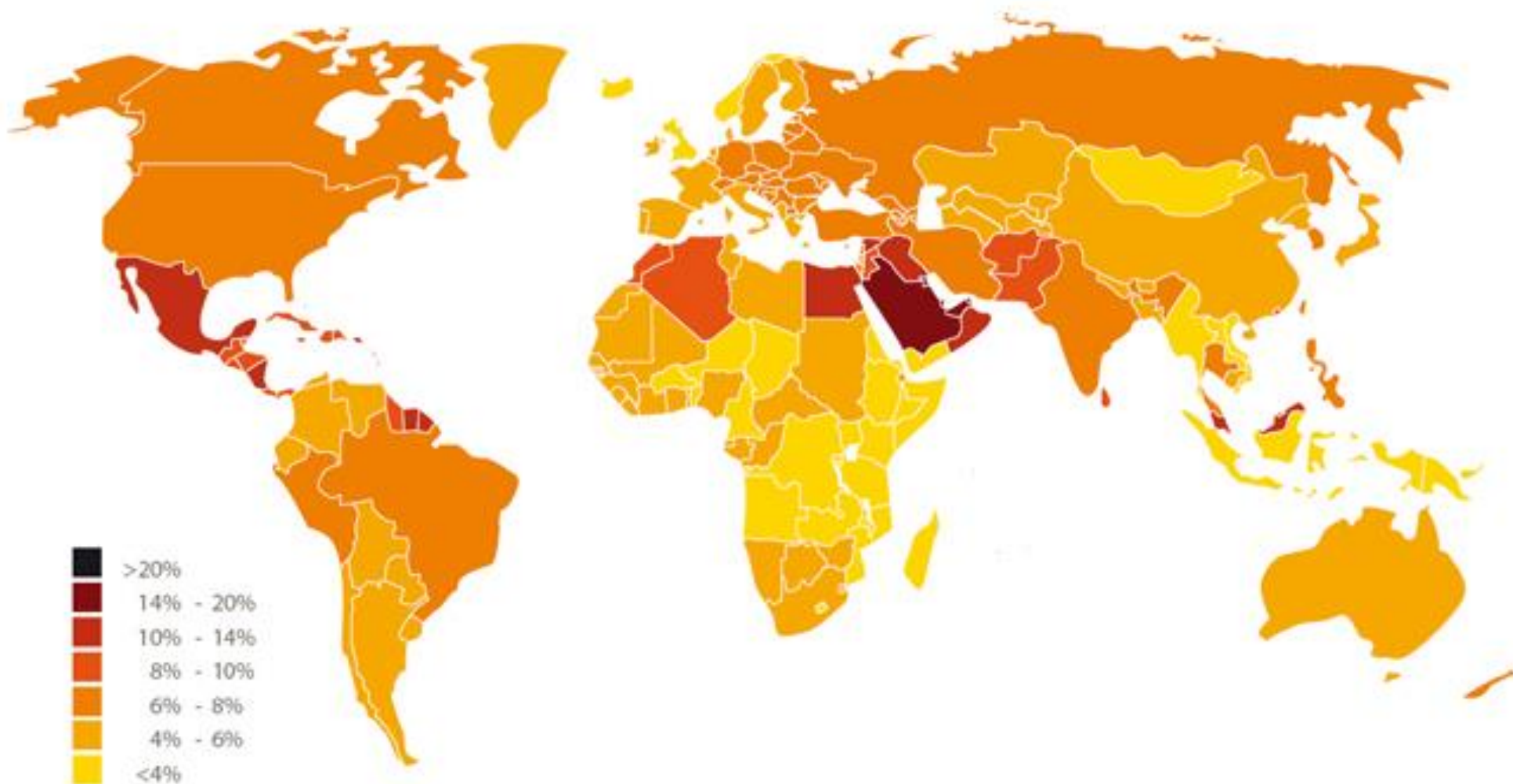**Millions**

The Top 10 Countries: Prevalence

The number of people with diabetes is **increasing** in every country.

TOP 10 COUNTRIES/TERRITORIES FOR PREVALENCE* (%)
OF DIABETES (20-79 YEARS)

COUNTRY /TERRITORY	PREVALENCE (%)
1 Federated States of Micronesia	37.2
2 Nauru	30.1
3 Marshall Islands	27.1
4 Kiribati	25.5
5 Tuvalu	24.8
6 Kuwait	23.9
7 Saudi Arabia	23.4
8 Qatar	23.3
9 Bahrain	22.4
10 Vanuatu	22.0

*comparative prevalence

International Diabetes Federation

Prevalence estimates of diabetes, 2007

■	>20%
■	14% - 20%
■	10% - 14%
■	8% - 10%
■	6% - 8%
■	4% - 6%
■	<4%

International Diabetes Federation

Prevalence estimates of diabetes, 2025

Legend:
- >20%
- 14% - 20%
- 10% - 14%
- 8% - 10%
- 6% - 8%
- 4% - 6%
- <4%
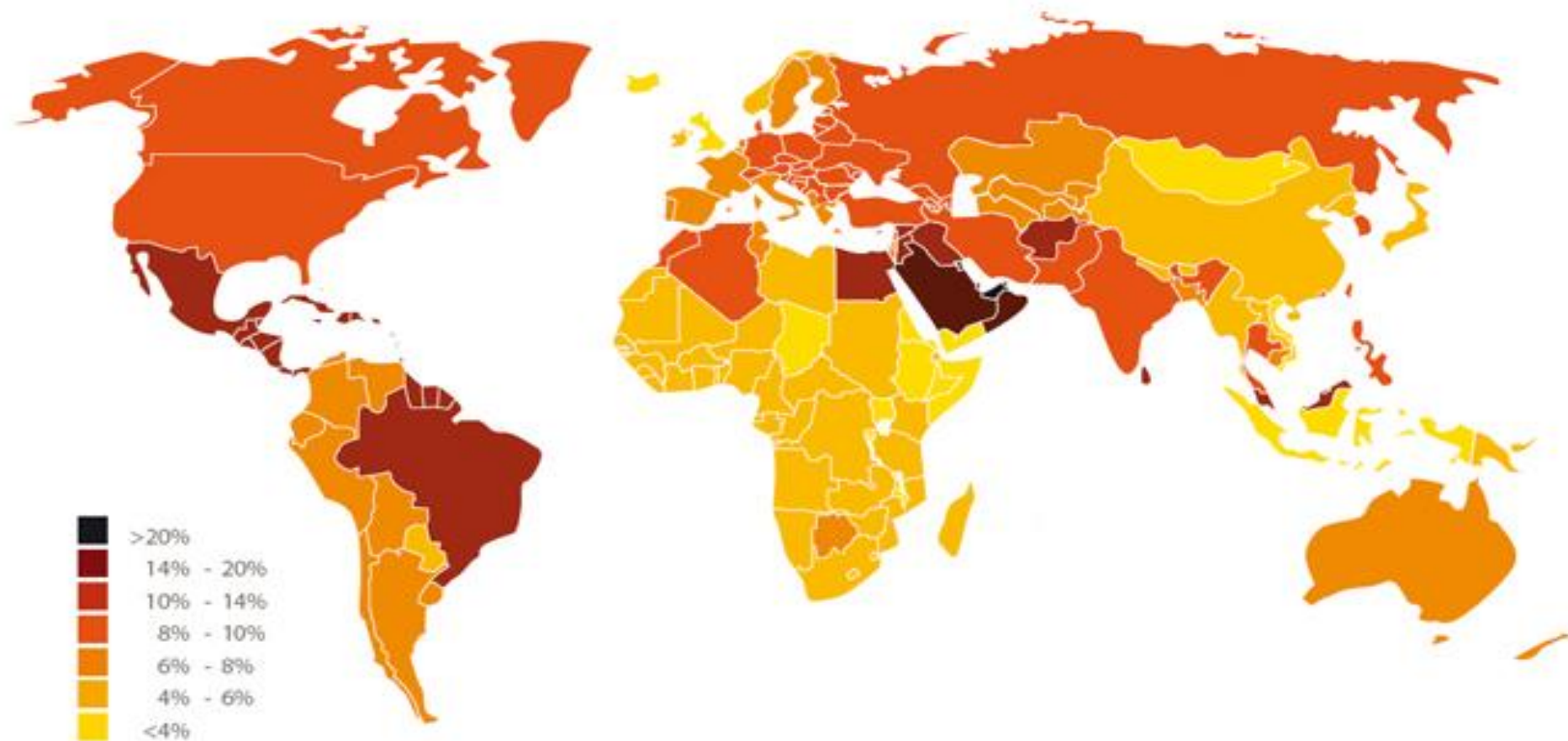
SOURCE: *DIABETES ATLAS THIRD EDITION*, © INTERNATIONAL DIABETES FEDERATION, 2006

International Diabetes Federation

Prevalence: Europe

Map 3.2. Prevalence*(%) estimates of diabetes (20-79 years), 2011, Europe Region

Legend:
- < 4
- 4-6
- 6-6.8
- 6.8-7.6
- 7.6-8
- > 8

*comparative prevalence
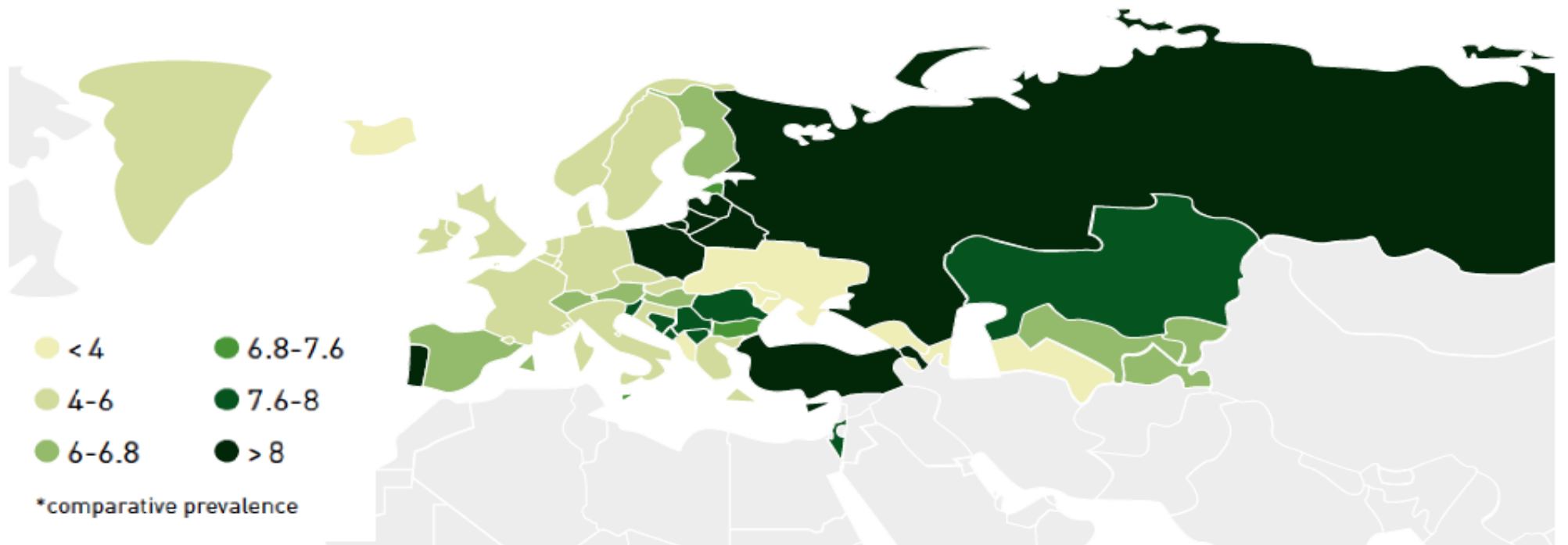
■ **52.6 million, or 8.1% of the adult population**

International Diabetes Federation

Prevalence of diabetes in adults by age, 2013
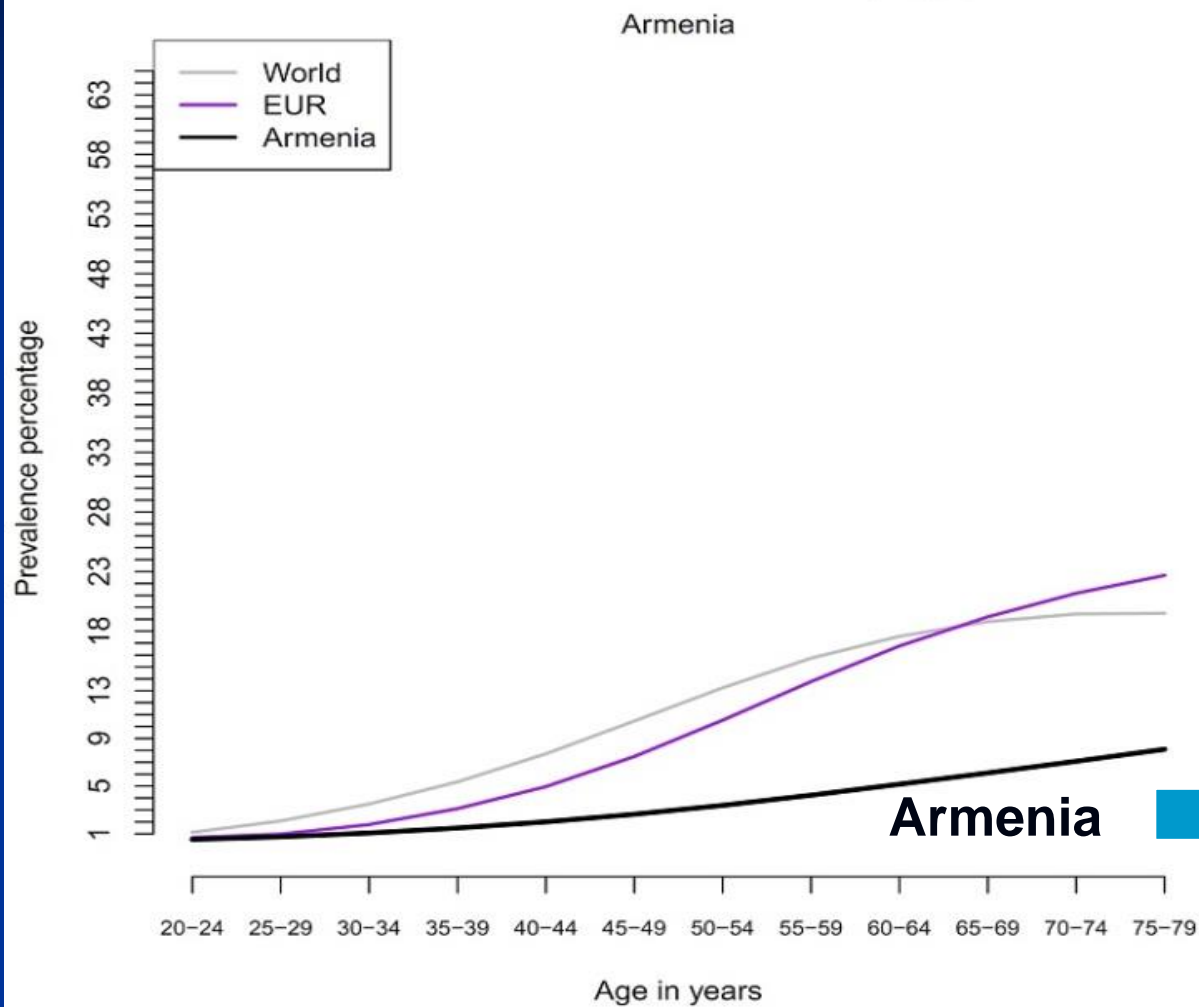
Armenia

Total cases: 54,950
Undiagnosed: 19,270

IDF, 2013

Diabetes in Armenia
(from AUA report, 2012)

- Incidence: 3-fold increase over 10 years from 96.1/100,000 to 264.9/100,000
- Prevalence: increased from 1.3% to 2.06% over 10 years
- 10% of the Armenian population will have diabetes by the year 2030!

OUTLINE OF PRESENTATION

- Epidemiology
- **Morbidity, Mortality, Economics**
- Risk Factors (selective discussion, not including genetics, smoking, eceesive alcohol, drugs, etc)
  - Obesity
  - Lack of Exercise
- Complications (including skeletal health)
- Conclusions

Diabetes in Armenia:
Morbidity, Mortality, and Quality of Life
(AUA report and IDF)

- **Morbidity:**
  - Among children: approximately 3-fold increase over 10 years
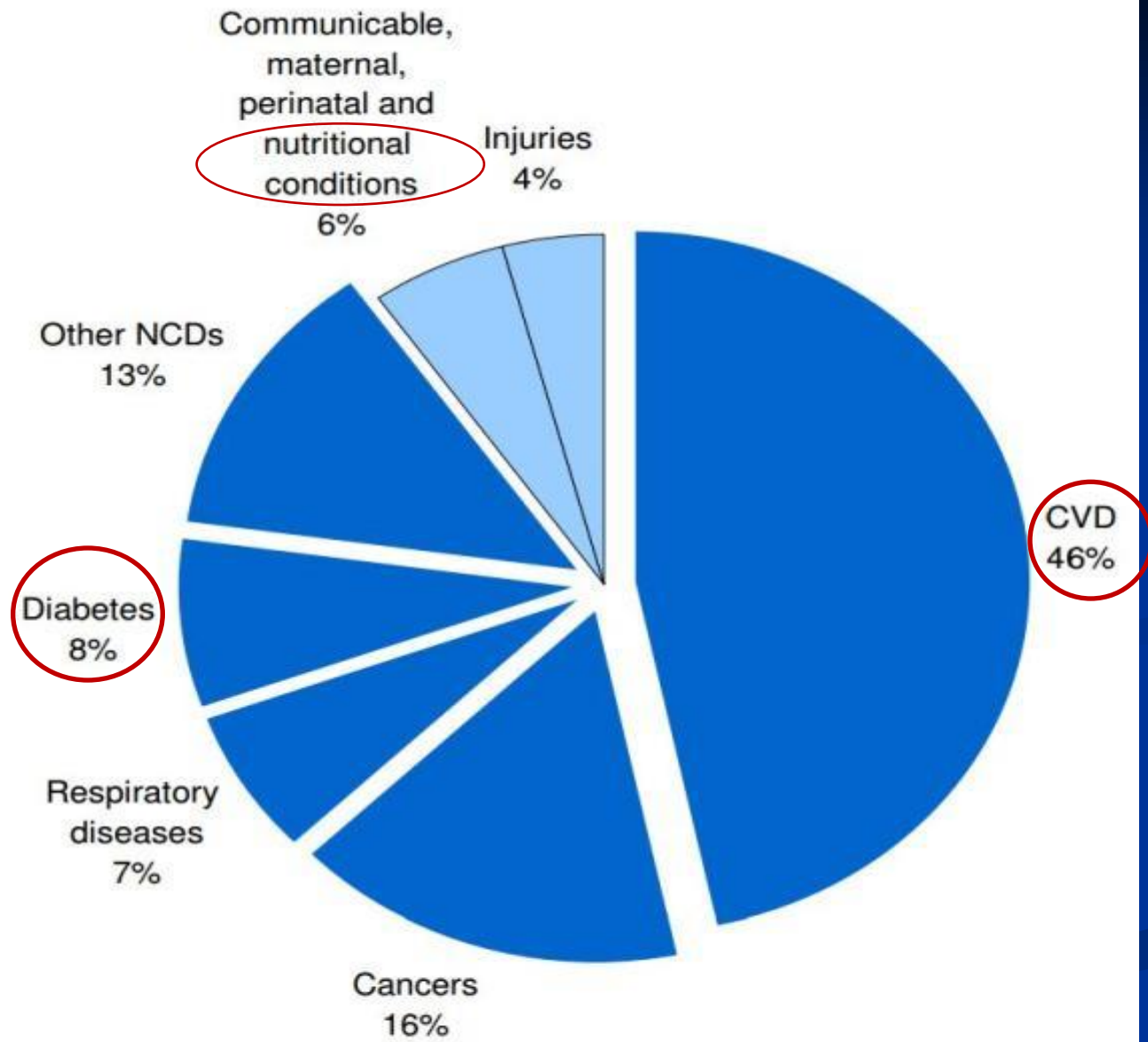 - Will increase by 0.9% yearly over the next 20 years
- **Mortality:**
  - Compared to Georgia: 4.6-fold higher (2009)
- **Disability-adjusted life years**
  - Compared to Georgia: 3-fold higher (2009)

Armenia: Leading Causes of Death, 2010

Communicable, maternal, perinatal and nutritional conditions 6%

Injuries 4%

Other NCDs 13%

CVD 46%

Diabetes 8%

Respiratory diseases 7%

Cancers 16%

NCDs are estimated to account for 90% of all deaths.

2010 total population: 3,092,072
Income group: Lower middle

Spending for Diabetes Care and Deaths due to Diabetes: US- Armenia

Mean annual health care per person spent on diabetes care in Armenia: $187 (USD)- from IDF, 2013 (About 1% of what the US spends!)

4.8 million people **died** and 471 billion USD were **spent** due to diabetes in 2012.

HEALTHCARE EXPENDITURES AND DEATHS PER 1,000 DUE TO DIABETES BY INCOME GROUP
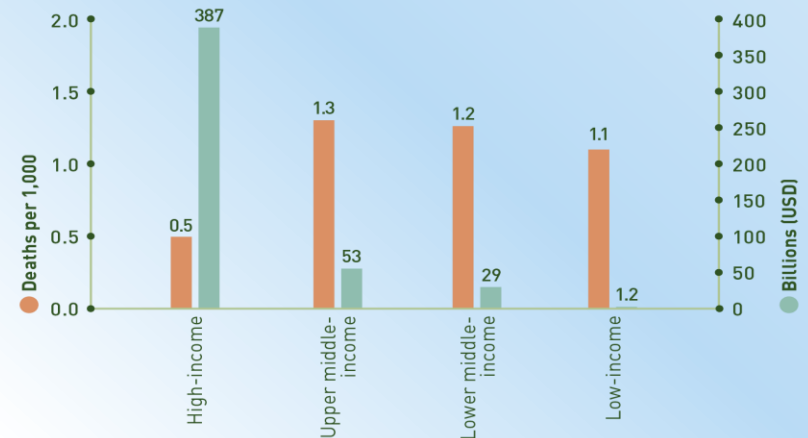
High-income: 0.5 deaths per 1,000 / 387 Billions (USD)
Upper middle-income: 1.3 / 53
Lower middle-income: 1.2 / 29
Low-income: 1.1 / 1.2

OUTLINE OF PRESENTATION

- Epidemiology

- Morbidity, Mortality, Economics

- Risk Factors (selective discussion, not including genetics, smoking, excessive alcohol, drugs, etc)
  - Obesity
  - Lack of Exercise

- Complications (including skeletal health)

- Conclusions

Risk factors for Diabetes

- **Three most important risk factors:**

  - OBESITY
  - OBESITY
  - OBESITY

The Double Burden in Armenia

Under nutrition

Over nutrition

NOT JUST IN ARMENIA!

1 Billion people in the world today are underweight
1 Billion people in the world today are overweight

99 Million Americans are obese, 2011

165 Million Americans will be obese by 2030

Wang YC, et al. Lancet. 2011 Aug 27;378(9793):815-25.

Diabetes and Obesity are parallel epidemics

The Growing Epidemic of Type 2 Diabetes in Relation to Obesity
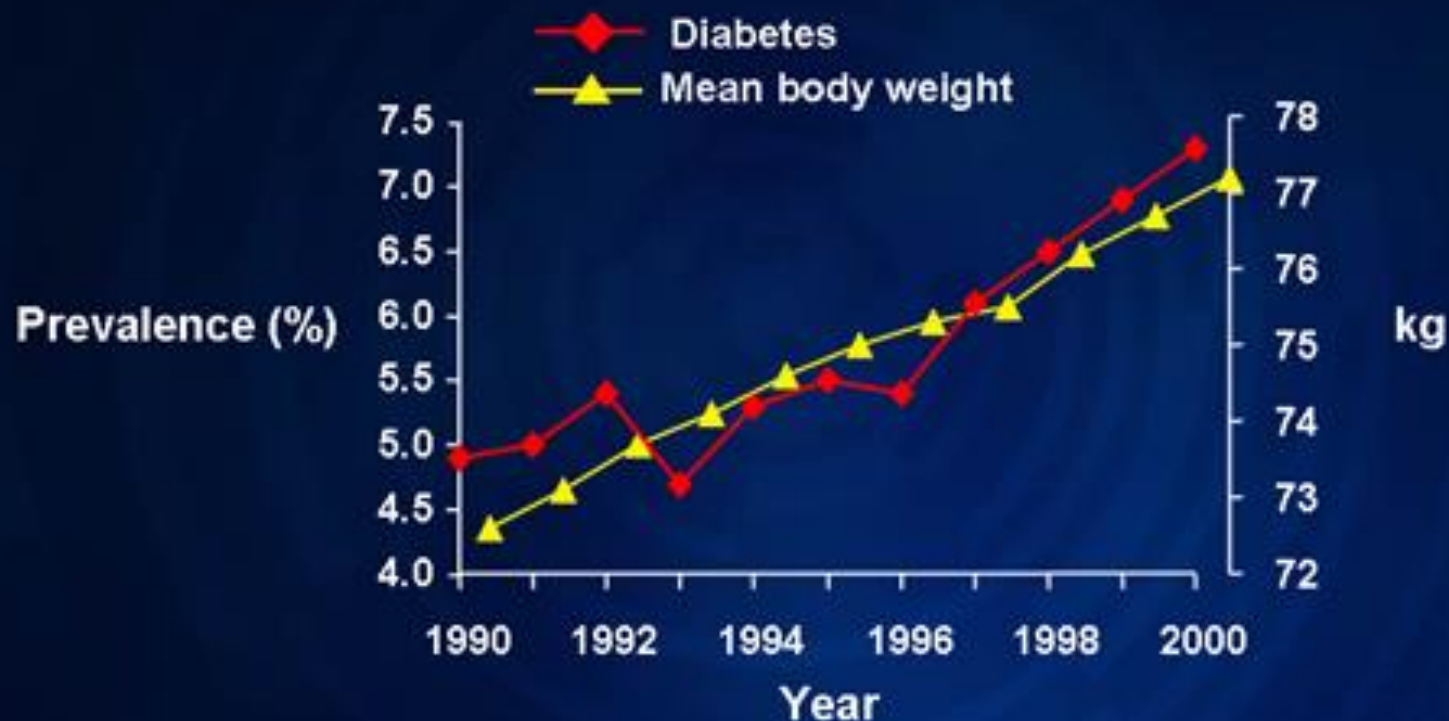
Mokdad AH et al. *Diabetes Care*. 2000;23:1278-1283; Mokdad AH et al. *JAMA*. 1999;282:1519-1522; Mokdad AH et al. *JAMA*. 2001;286:1195-1200.

Diabetes and Obesity in the United States

■ "In the U.S., one-third of adults and *16–18%* of youth are obese, up from 5 to 6% three decades ago.

■ Increases in rates of type 2 diabetes have closely followed the increases in obesity. In the U.S., diabetes affects 8.3% of the population, including 18.8 million with diagnosed diabetes and another 7 million who remain undiagnosed."
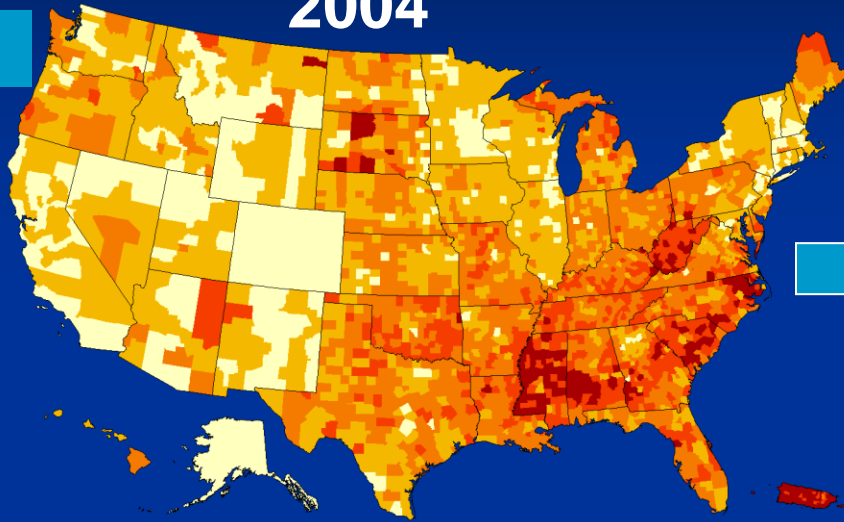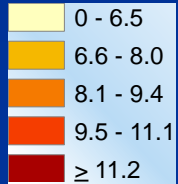
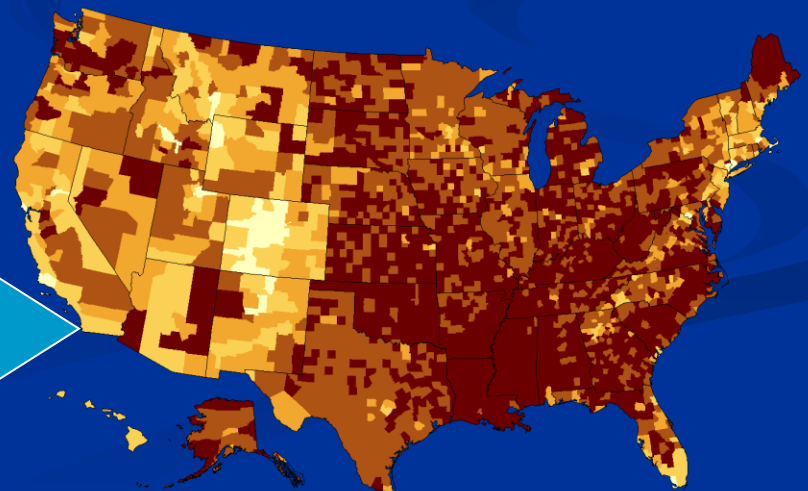# Estimates of Diabetes and Obesity among Adults aged ≥ 20 years: US

2004 **2010**

Diabetes

Percent
- 0 - 6.5
- 6.6 - 8.0
- 8.1 - 9.4
- 9.5 - 11.1
- ≥ 11.2

Obesity

Percent
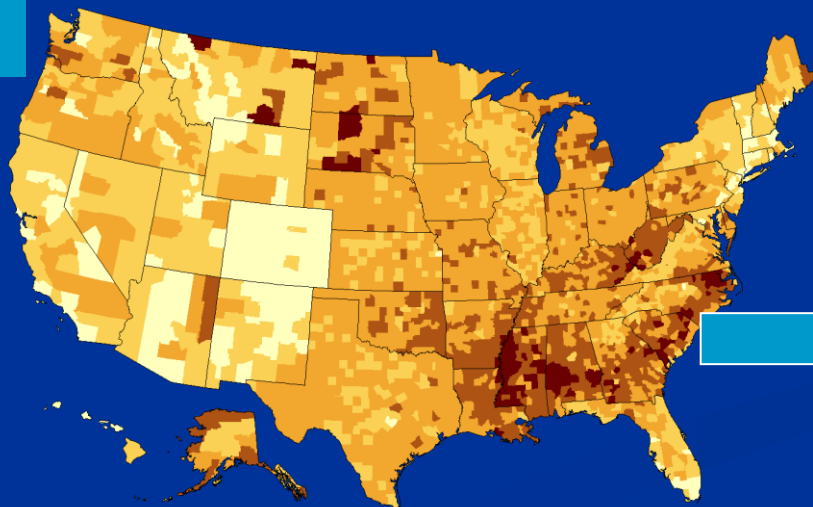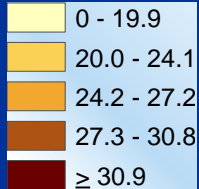- 0 - 19.9
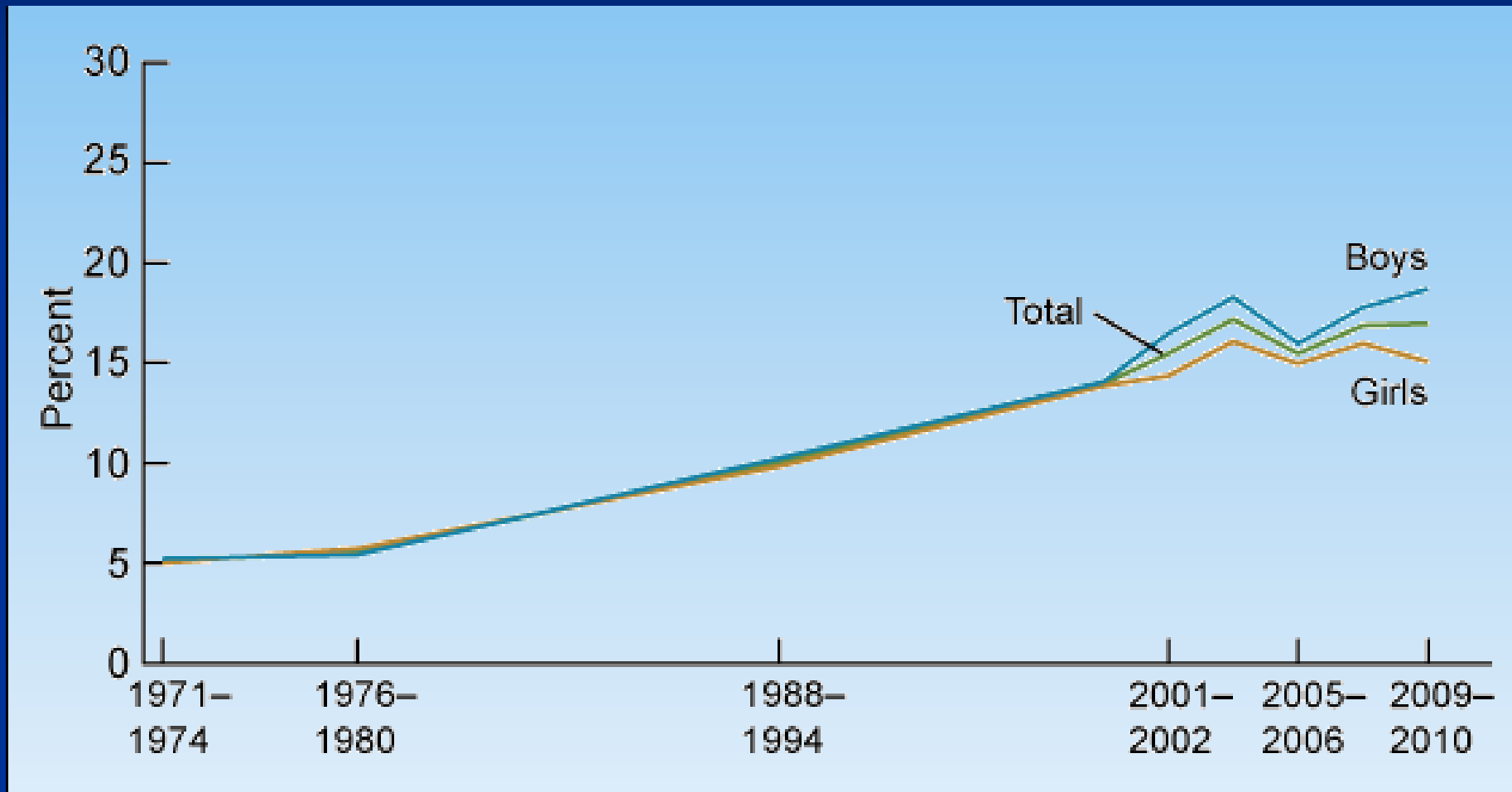- 20.0 - 24.1
- 24.2 - 27.2
- 27.3 - 30.8
- ≥ 30.9

www.cdc.gov/diabetes
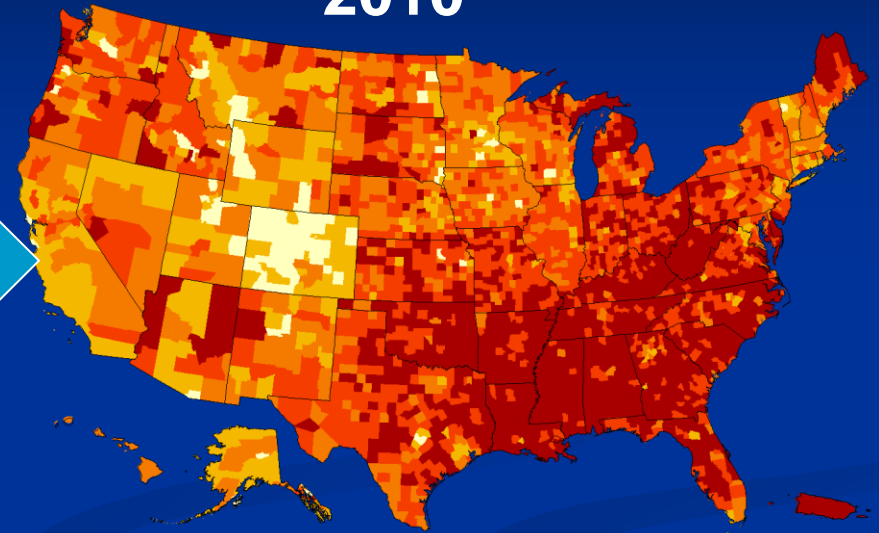
CDC: Trends in obesity among children and adolescents aged 2–19 years, by sex: United States, 1971–1974 through 2009–2010

Armenian Children: Obesity

- **11% in 2005 to 15% in 2010**

- **After the Soviet Union, healthy school food canteens were transformed into school cafes with…**

  - **chips, burgers, hot dogs, buns, popcorns, soft drinks, crackers and candy bars**

  - **Lots of sweeteners and preservatives of little nutritional value**

1. Armenia Demographic and Health survey, 2010   http://www.measuredhs.com/pubs/pdf/FR252/FR252.pdf
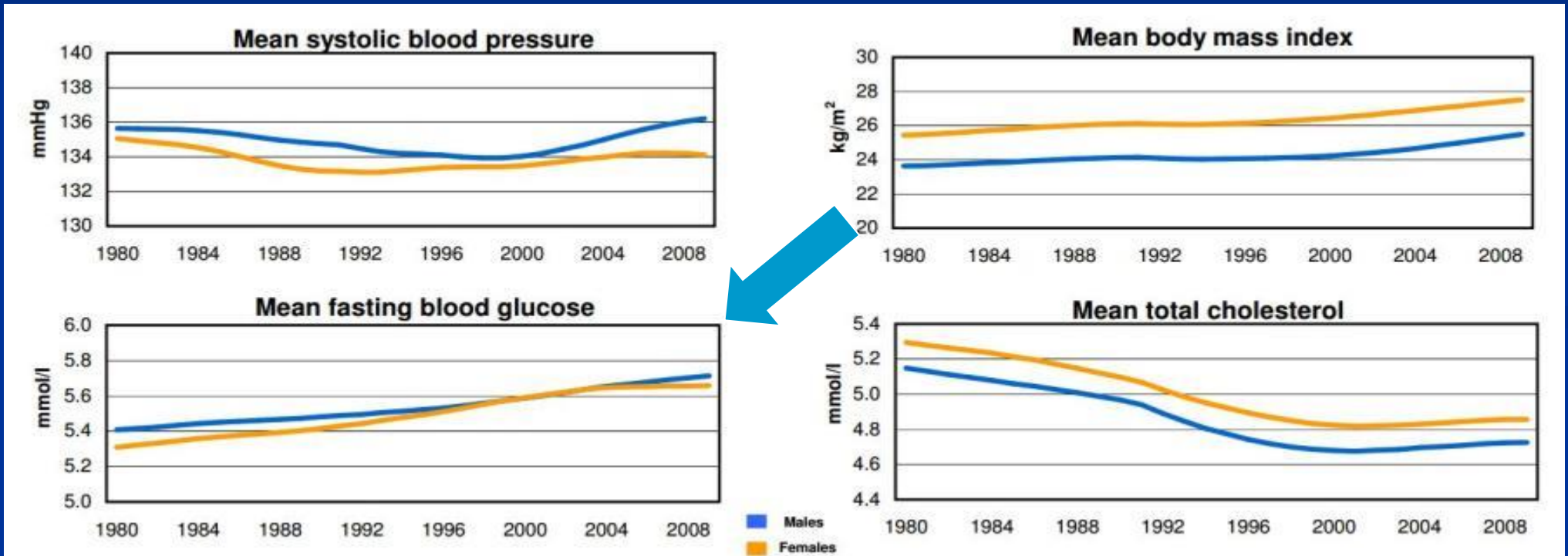2. http://www.armenianow.com/society/health/41791/armenian_children_obesity_schools_canteens_healty_life_style

Obesity: Armenia's Shared Problem

Obesity Rates (BMI ≥30)	U.S. (2009-2010)[1]	Armenia (2010)[2]	
Men	35.5%	40%	
Women	35.8%	30%	
Boys (ages 2-19)	18.6%		
Girls (ages 2-19)	15.0%		
Children (under age 5)		15.0%	

1. Data from the National Health and Nutrition Examination Survey, 2009–2010 http://www.cdc.gov/nchs/data/databriefs/db82.htm
2. Armenia Demographic and Health survey, 2010 http://www.measuredhs.com/pubs/pdf/FR252/FR252.pdf

Armenia: Metabolic Risk Factor Trends

2010 total population: 3,092,072
Income group: Lower middle

World Health Organization - NCD Country Profiles 2011 http://www.who.int/nmh/countries/arm_en.pdf

28
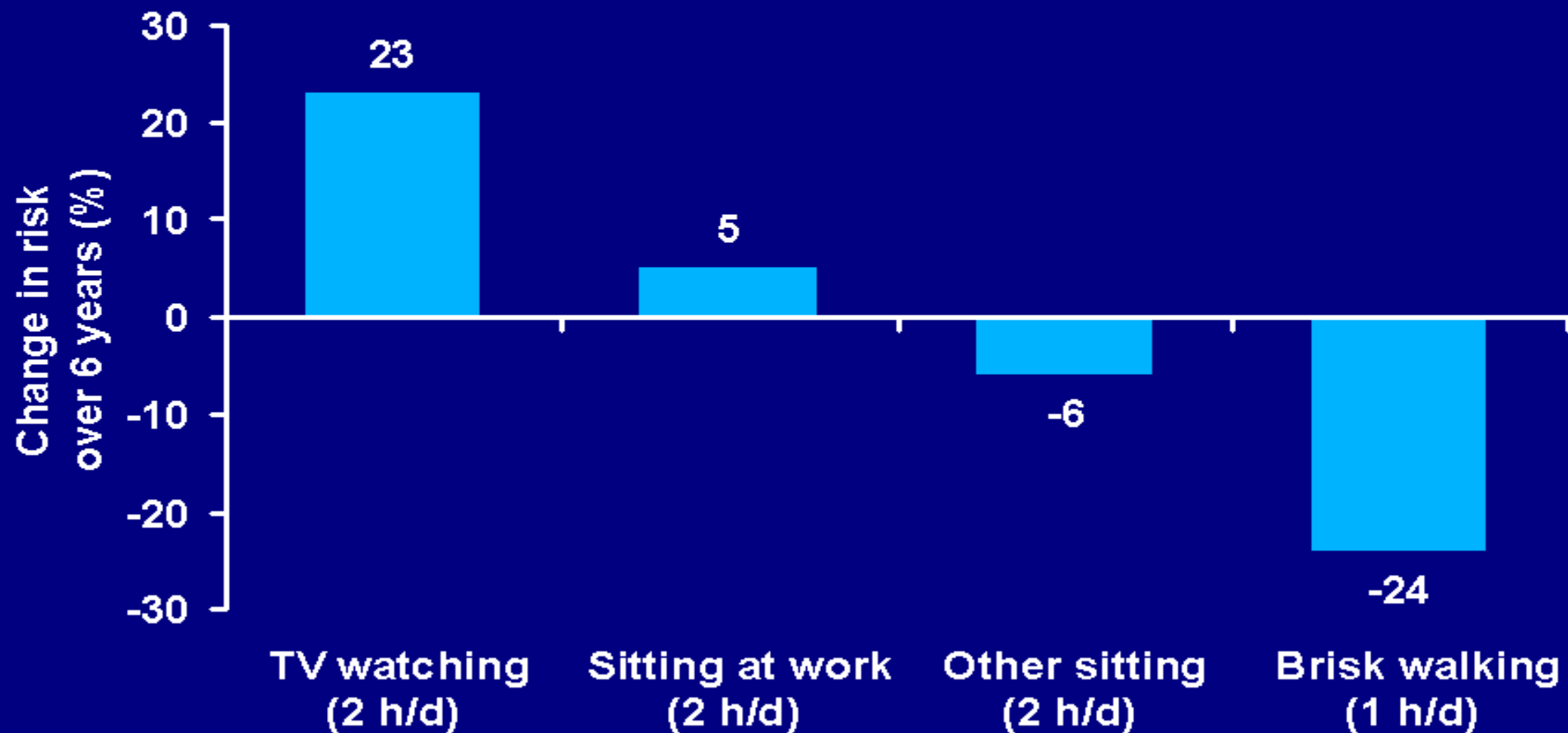
Risk factors for Diabetes

- **Important risk factors:**
  - OBESITY
  - **EXERCISE**

Television Watching and Risk of Obesity

Hu FB et al. *JAMA.* 2003;289:1785-1791.

Complications of Diabetes Mellitus

- Besides morbidity and mortality statistics in Armenia, there are sparse individual data on specific complications of diabetes such as cardiovascular and peripheral vascular disease, eye disease, nephropathy, neuropathy etc.

- But data from other sources are compelling and clear

"Ticking Clock" Hypothesis

For	The "clock starts ticking"
Microvascular complications	**At *onset* of hyperglycemia**
Macrovascular complications	***Before* the diagnosis of hyperglycemia**

WHO. *Diabetologia* 1985;28:615-640
Haffner SM et al. *JAMA* 1990;263:2893-2898.

Survival Post-MI in Diabetic and Nondiabetic Men and Women:
Minnesota Heart Survey
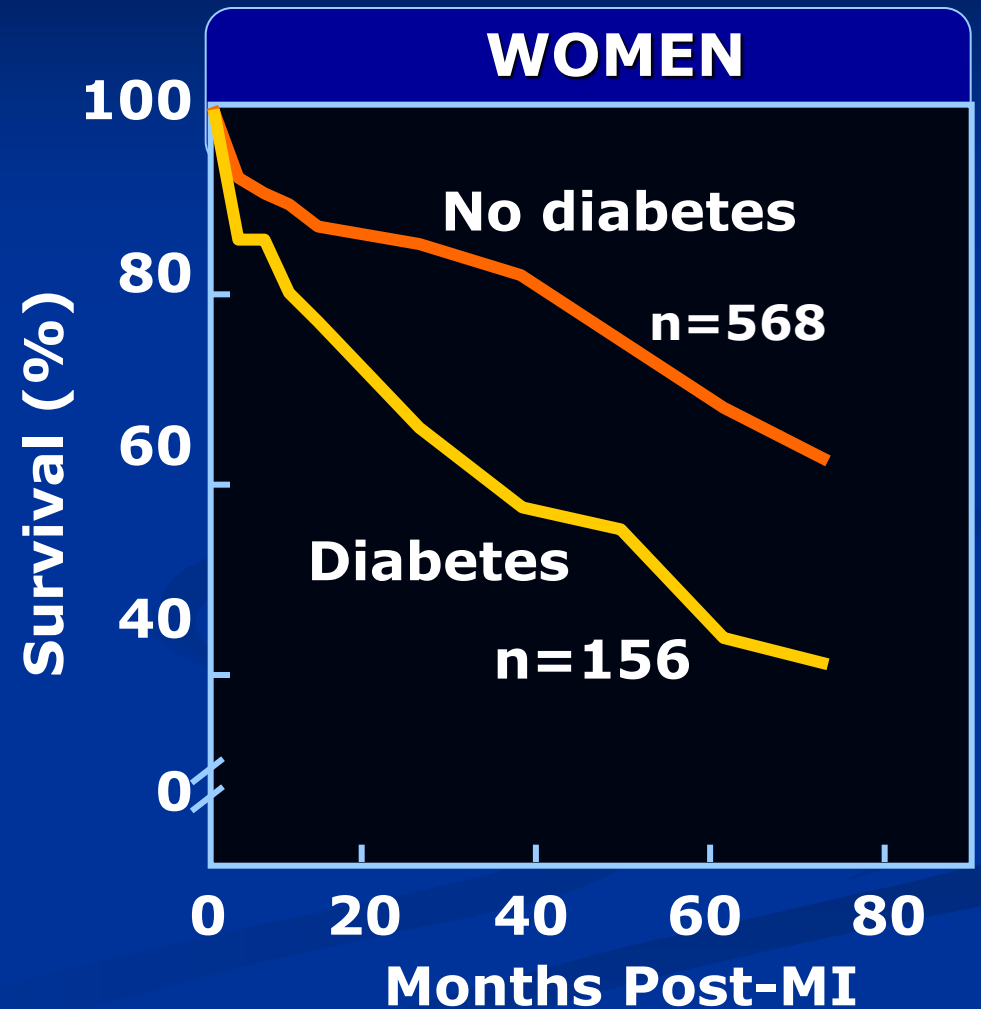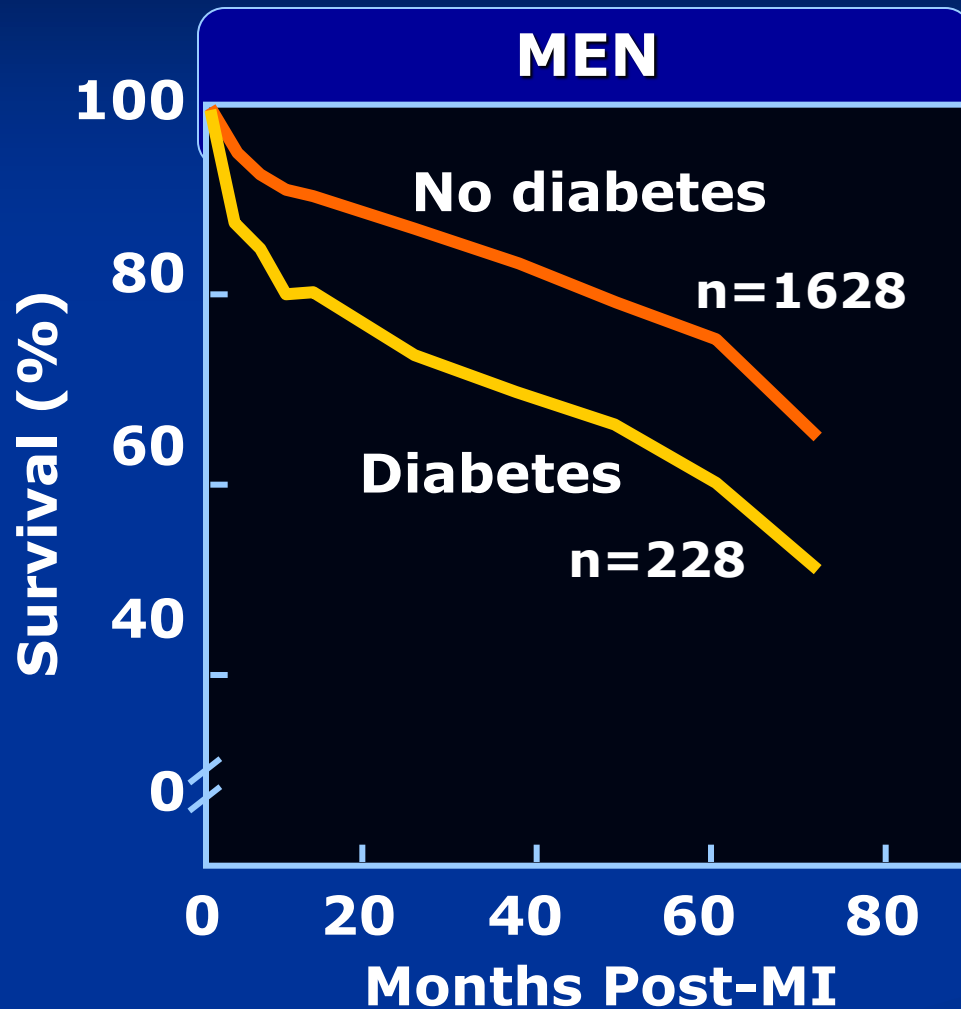
A "new" complication of Diabetes Mellitus: Osteoporosis

Risk factors for Osteoporosis

Not on most lists:

Type 2 Diabetes mellitus

A paradox: Type 2 Diabetes Mellitus should protect against osteoporosis

- **Protective Factors:**
  - **Average or higher BMD than age-matched controls**
  - **Greater weight in general**

Expectations of fracture risk in Diabetes Mellitus based upon bone mineral density

Should be lower than age- and weight-matched controls

Type 2 Diabetes

- Expectation:
  - Lower Fracture Risk

but....

- Fracture risk is higher
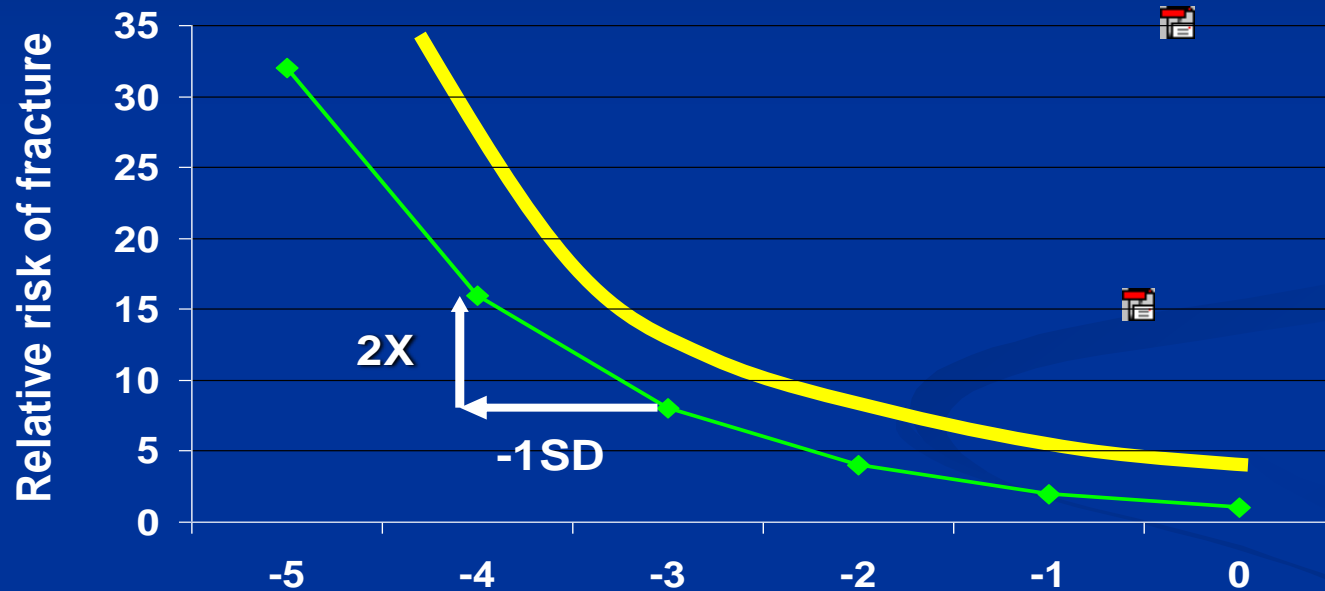
Increased Fractures are at Multiple Sites in T2D

WHI (n=93,676; 7 years follow-up)
RR for fracture in T2D:

- Hip 1.41
- Foot 1.44
- Upper arm 1.30
- Ankle 1.34
- Spine 1.28
- Forearm 0.98

Bonds JCEM 2006

BMD Can Predict Fracture in T2D

**But for a given T- score,
T2D will have a higher fracture risk**

T score difference of 0.6 for same fracture risk

Moving forward…

- **Merging data with governmental policy and the realities of the situation in Armenia…**

- **The AUA Report, 2012**

Health in Times of Transition
Rapid Appraisal of Diabetes Care in Armenia
Qualitative Research

**Collaborative Research between
College of Health Sciences
American University of Armenia
and**

**London School of Hygiene and Tropical Medicine &
Curatio International Foundation**

Study team:

Hripsime Martirosyan, MD, MPH, Varduhi Petrosyan, MS, PhD, Byron Crape, MSPH, PhD

Dzovinar Melkom Melkomian, DVM, MPH

Marianna Koshkakaryan, MD, MPH, Yeva Sahakyan, MD, MPH, Ruzanna Grigoryan, MD, MPH, Nune Truzyan, DVM, MPH

Yerevan 2012

Health in Times of Transition
Rapid Appraisal of Diabetes Care in Armenia
Qualitative Research

➢ Scholarly review of government policies, implementation, results, and a blue print for further improvements in the diagnosis and care of Armenian patients with diabetes mellitus

➢ Survey of health care professionals and patients (n=91) in Yerevan and in Shirak marz (including Gyumri)

Positive findings:

- **Government policies have targeted diabetes for special attention**

- **Infrastructure for diabetes care exists**

- **Overall, there is a sufficient number of trained endocrinologists and other health care provides to meet the demand**

- **Insulin is distributed free as are some antidiabetic drugs**

- **Drugs are available to diabetes patients at the clinics**

- **Access to insulin is improved**

Negative findings:

- **Health care providers are adequate but overly centered in Yerevan**

- **Short and inconstant supply of antidiabetic drugs**

- **Availability of antidiabetic drugs is not keeping up with the ever-changing landscape**

- **Expensive consumables (glucometers, strips, syringes, etc)**

- **Laboratory tests may not be available and are expensive**

- **Screening for complications are not routine**

Is there reason to be optimistic?

- Government attention
- Dedicated professionals in Armenia and elsewhere are actively advocating for change
- Specific recommendations from AUA's task force
- The compelling argument to improve the situation

YES!

But, there is much work to be done

Shnorhagalutyun!