Diabetes in IRAN

Global & regional and National reports on the prevalence of Diabetes mellitus

Alireza Esteghamati,MD

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Global picture

- Diabetes is a global issue.

- Diabetes kills and disables, striking people at their most productive age impoverishing families or reducing the life expectancy of older people.

- Diabetes is a common threat that does not respect borders or social class.

- No country is immune from diabetes and the epidemic is expected to continue

The burden of diabetes drains :

- National healthcare budgets
- Reduces productivity
- Slows economic growth
- Causes catastrophic expenditure for vulnerable households
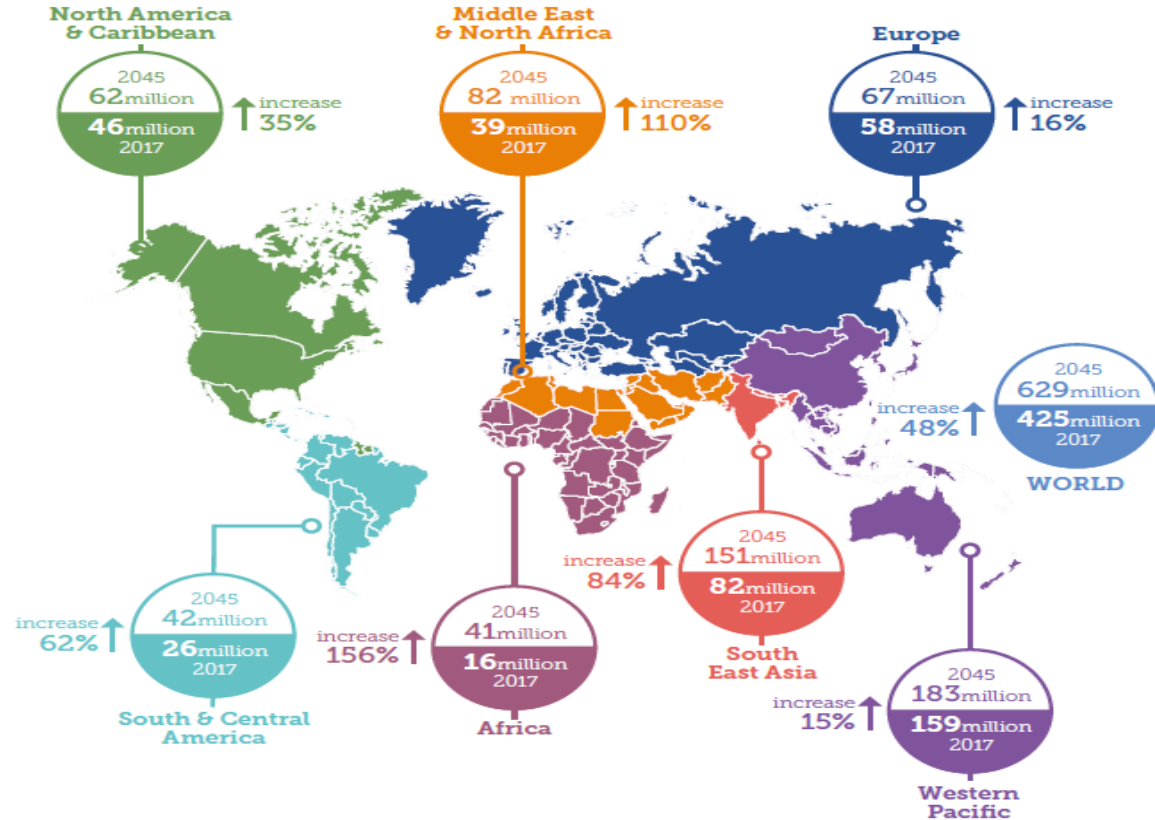- Overwhelms healthcare systems

DM affected 415 million people in 2017, and this number is expected to rise to 629 million by 2045.

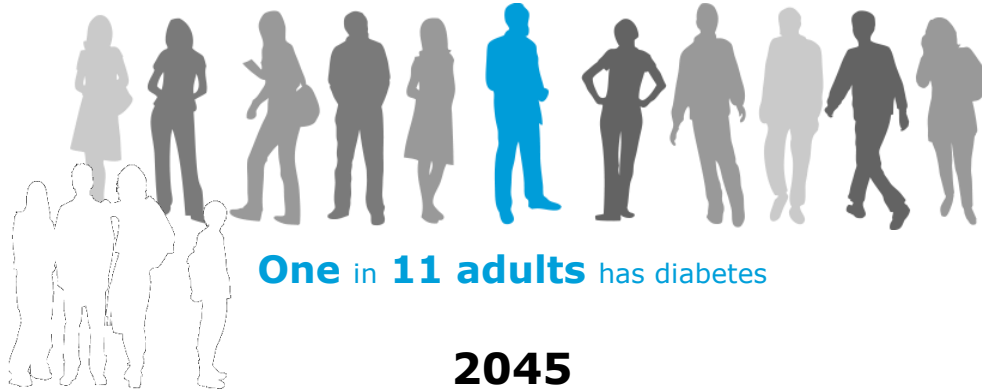Number of people with diabetes worldwide and per region in 2017 and 2045 (20-79 years)

World

2017 425 million

2045   629 million

North America & Caribbean
2045 62 million
46 million 2017
increase 35%

Middle East & North Africa
2045 82 million
39 million 2017
increase 110%

Europe
2045 67 million
58 million 2017
increase 16%

WORLD
2045 629 million
425 million 2017
increase 48%

South & Central America
2045 42 million
26 million 2017
increase 62%

Africa
2045 41 million
16 million 2017
increase 156%

South East Asia
2045 151 million
82 million 2017
increase 84%

Western Pacific
2045 183 million
159 million 2017
increase 15%

Global prevalence of diabetes (2017 and 2045)

2017

One in **11 adults** has diabetes

2045

One in **10 adults** will have diabetes

Number of **men** with diabetes

2015 221 million
2045 328.4 million

Number of **women** with diabetes

2015 203.9 million
2045 313.3 million

International Diabetes Federation. *IDF Diabetes Atlas, 7th edition.* Brussels, Belgium: International Diabetes Federation, 2015. http://www.diabetesatlas.org

Global prevalence of diabetes (2017 and 2045)

2017

Number of **men** with diabetes

- There is evidence that <u>type 2 diabetes is increasing in children and adolescents in some countries</u>, although reliable data are sparse

- Many of these children and adolescents risk developing complications in early adulthood, which would increase the burden on families, healthcare systems and society

One in **10 adults** will have diabetes

2015 199.5 million
2040 313.3 million

International Diabetes Federation. *IDF Diabetes Atlas, 7th edition.* Brussels, Belgium: International Diabetes Federation, 2015. http://www.diabetesatlas.org

Prevalence of diabetes: urban vs rural environments

Figure 3.3 Diabetes prevalence in urban and rural settings in 2017 and 2045 (20-79 years)
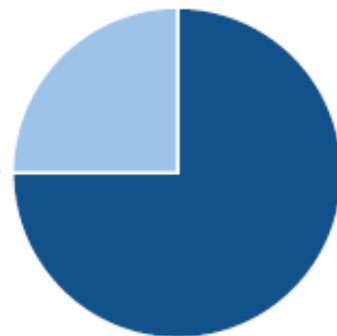
Number of people with diabetes

2017

145.7 million

279.2 million

2045

156.0 million

472.6 million

Rural

Urban

Regional disparities

Number of deaths related to diabetes (2017)
Compared with HIV/AIDS, tuberculosis and malaria

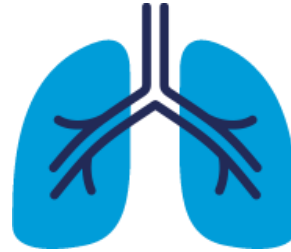## Adults who died from diabetes, HIV/AIDS, tuberculosis and malaria

4.0 million
From diabetes
2017
IDF

1.1 million
From HIV/AIDS
2013
WHO 2013*

1.8 million
From tuberculosis
2013
WHO 2013*

0.4 million
From malaria
2015
WHO 2015*

Cost of DM

- In the US the total estimated cost of diagnosed diabetes in 2012 was $ 245 billion, including $ 176 billion in direct medical costs and $69 billion in reduced productivity.

- 41% increase from previous estimate of $ 174 billion (in 2007 dollars).

American Diabetes Association. Economic costs of diabetes in the U.S in the 2012 . Diabetes Care 2013;April 36(4) :1036-1044

Cost of DM in two studies

- In Iran, the annual direct costs of DM were estimated to be $590 million in 2009.

- In another study we evaluated the cost of diabetes related micro- and macrovascular complications in Iranian people with type 2 diabetes mellitus.

- Average para clinic cost per patient was 393 ± 47 and average inpatient cost per patient was 1520 ± 104 USD in 2014

Esteghamati A, Khalilzadeh O, Anvari M, et al. The economic costs of diabetes: a population-based study in Tehran, Iran. Diabetologia 2009;52:1520–7.

Farshchi A Esteghamati A[1], Sari AA, Kebriaeezadeh A, Abdollahi M, Dorkoosh FA, Khamseh ME, Aghili R, Keshtkar A, Ebadi M.J Diabetes Metab Disord. 2014 Mar 4;13(1):42

Presentation of the new
IDF **DIABETES ATLAS**
MENA Region

IDF Congress 2017
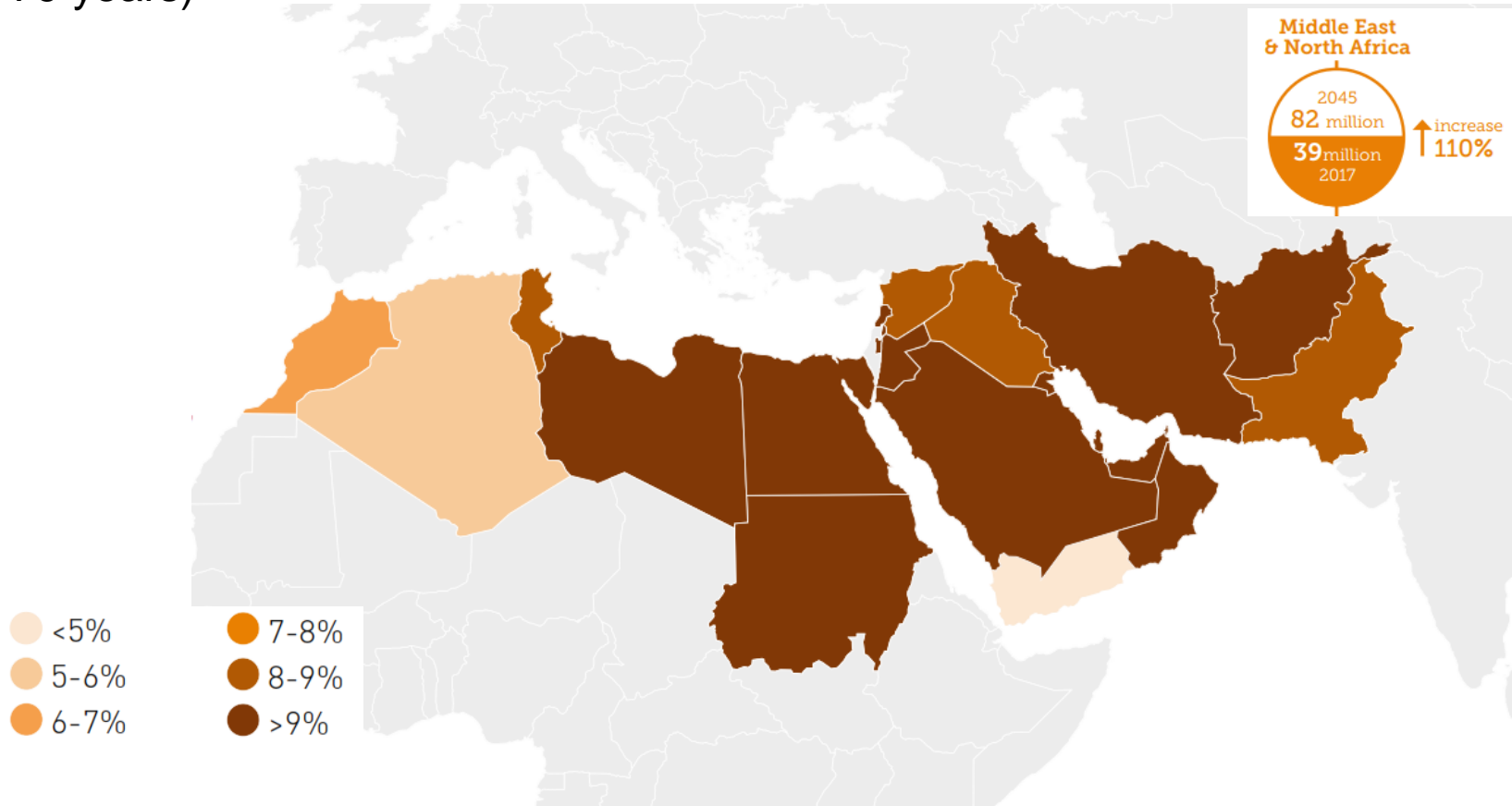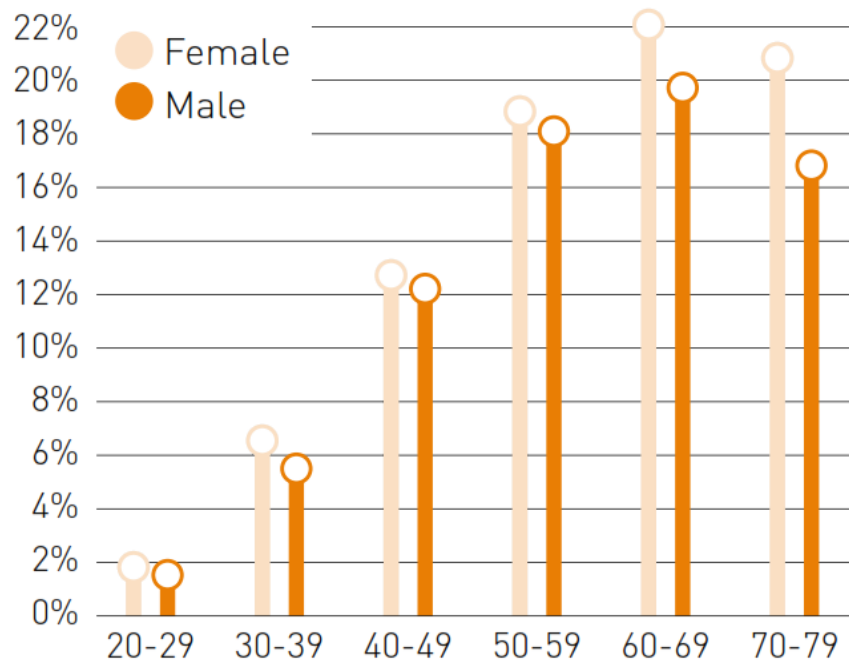
Diabetes in the MENA region

Number of people with diabetes in the MENA region in 2017 and 2045 (20-79 years)

Middle East & North Africa

2045
82 million

↑increase
110%

39 million
2017

Legend:
- <5%
- 5-6%
- 6-7%
- 7-8%
- 8-9%
- >9%

Diabetes in the MENA region

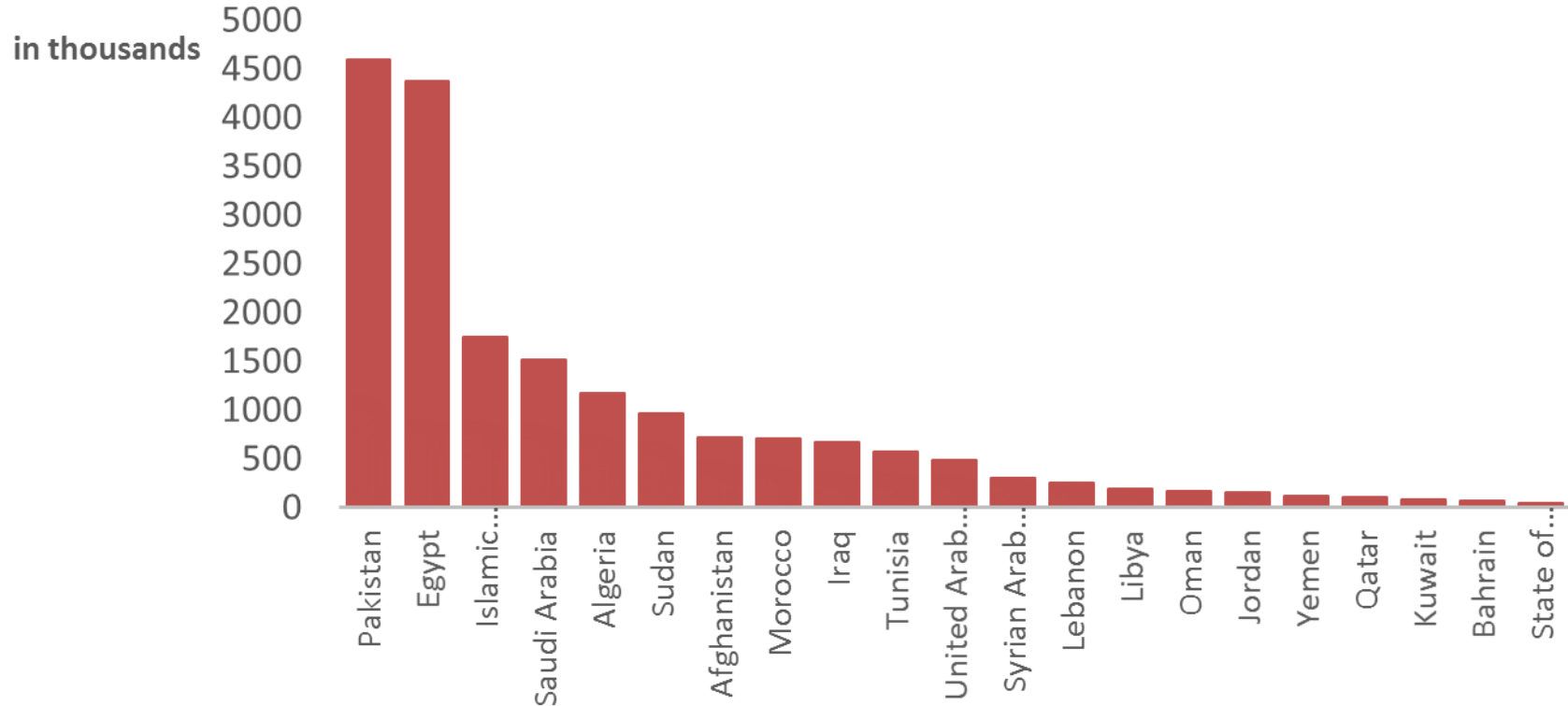Figure 4.3.1 Prevalence (%) estimates of diabetes by age and sex, Middle East and North Africa Region, 2017

Diabetes in the MENA region

Top 5 countries for number of people with diabetes (20-79 years), 2017

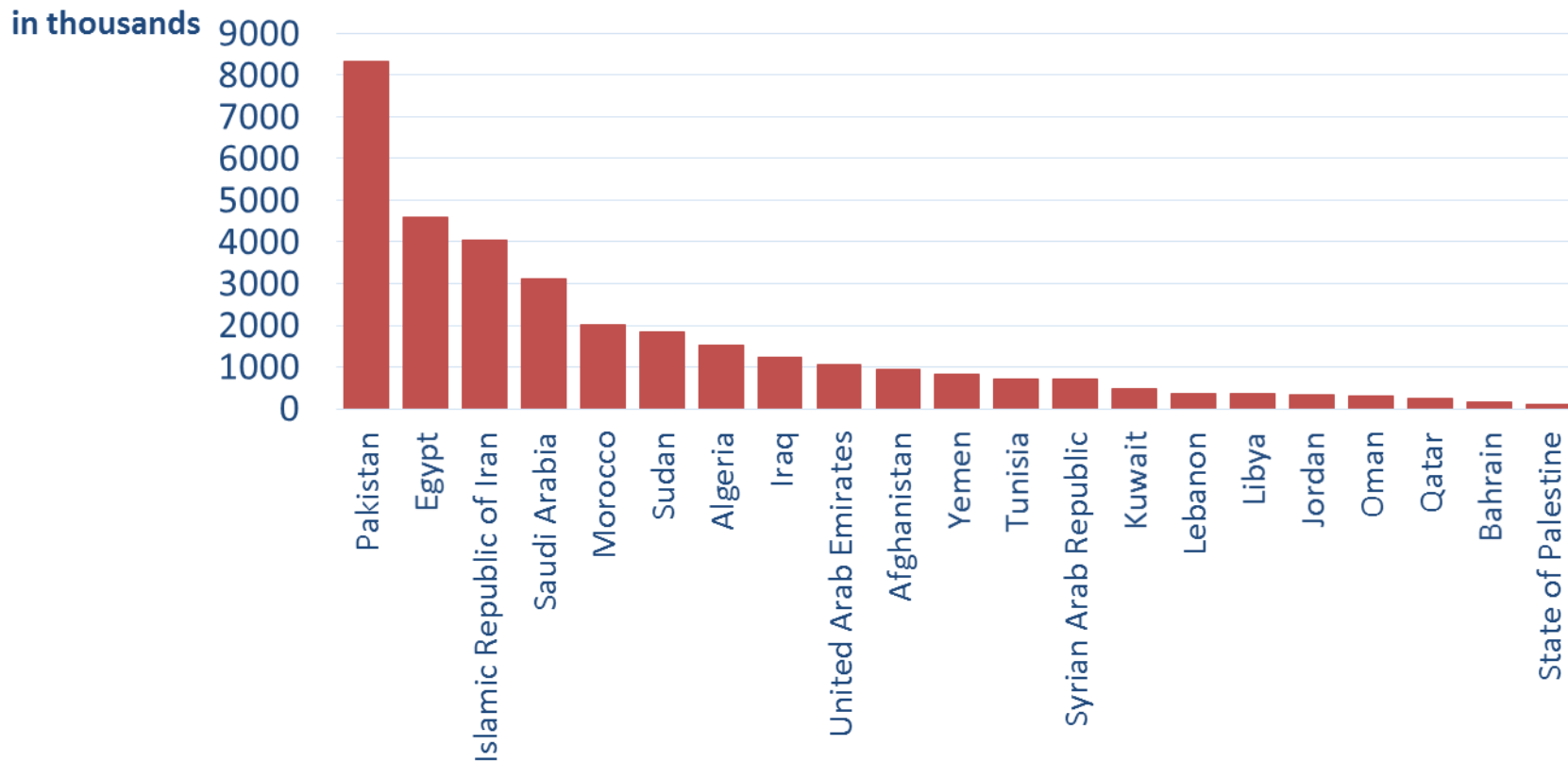|	
1.Egypt	8,222,641
2.Pakistan	7,474,031
3.Islamic Republic of Iran	4,985,530
4.Saudi Arabia	3,851,988
5.Sudan	2,247,049

Undiagnosed Diabetes

Undiagnosed cases of diabetes (20-79 years) in the MENA region

Impaired Glucose Tolerance

Number of adults (20-79 years) with IGT in the MENA region, 2017
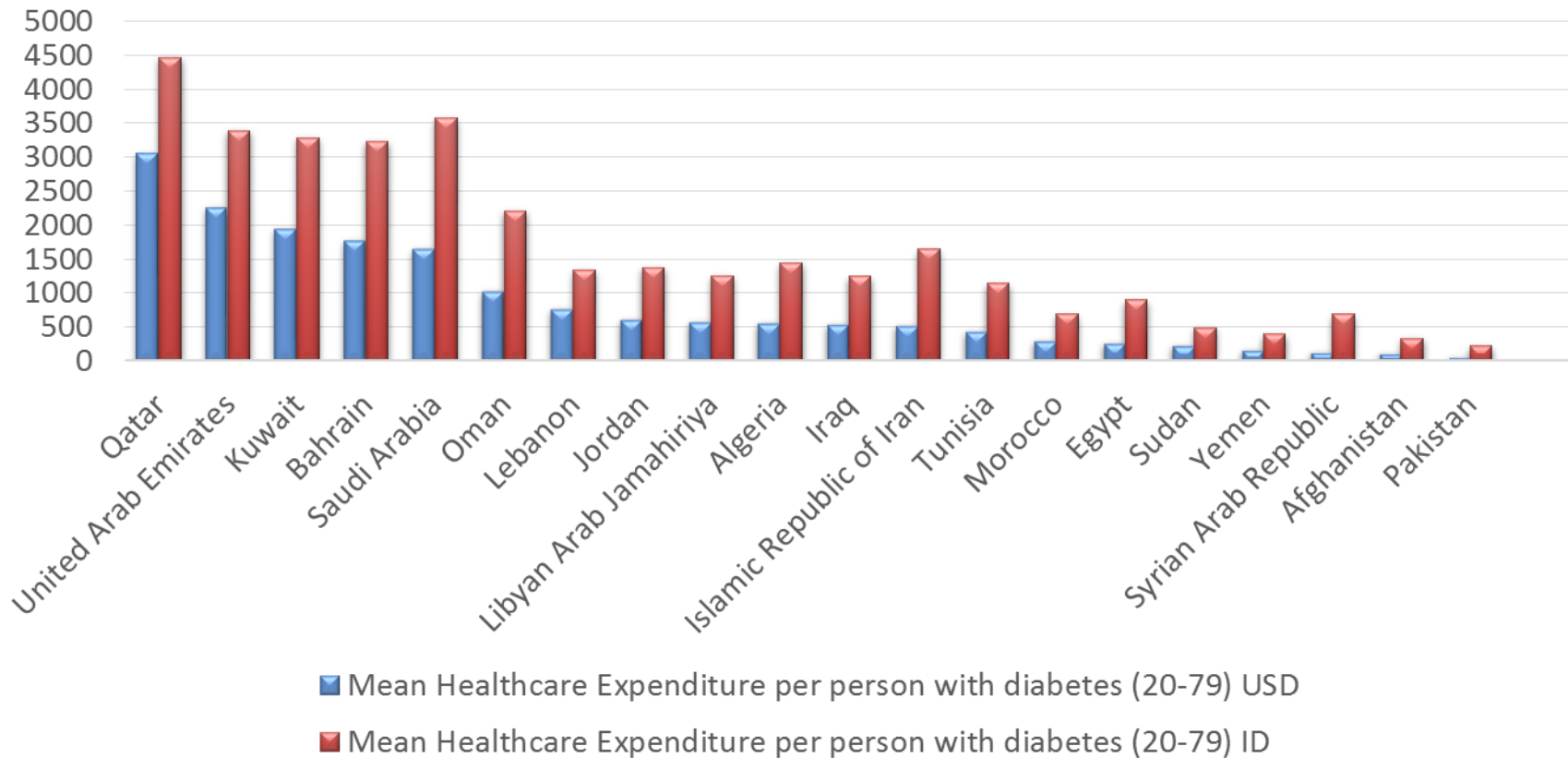

in thousands

Diabetes Mortality

Figure 4.3.2 Mortality due to diabetes by age and sex, Middle East and North Africa Region, 2017
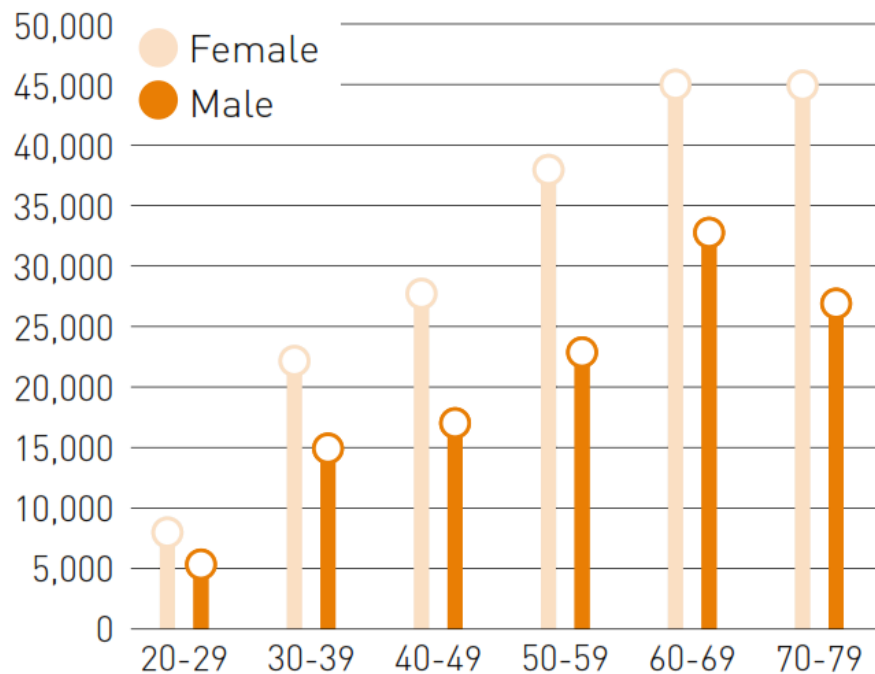
Healthcare Expenditure

Healthcare Expenditure per person with diabetes (20-79 years)

Mean Healthcare Expenditure per person with diabetes (20-79) USD

Mean Healthcare Expenditure per person with diabetes (20-79) ID

Prevalence of Diabetes and Impaired Fasting Glucose in the Adult Population of Iran

National Survey of Risk Factors for Non-Communicable Diseases of Iran

ALIREZA ESTEGHAMATI, MD[1]
MOHAMAD M. GOUYA, MD, MPH[2]
MEHRSHAD ABBASI, MD[1]
ALIREZA DELAVARI, MD[2]
SIAMAK ALIKHANI, MD, MPH[2]

FARISHID ALAEDINI, MD, PHD[2]
AFSHIN SAFAIE, DMSC, MPH[2]
MEHRDAD FOROUZANFAR, MD, PHD[3,4]
EDWARD W. GREGG, PHD[5]

OBJECTIVE — Despite concerns regarding a diabetes epidemic in the Middle East, internationally published data on national estimates of prevalent type 2 diabetes in Iran do not exist. With this article, we document a dramatically high prevalence of diabetes in Iran.

RESEARCH DESIGN AND METHODS — Our data are based on the results of the first Survey of Risk Factors of Non-Communicable Diseases of Iran, 2005. In this national cross-sectional survey, 70,981 Iranian citizens aged 25–64 years were recruited.

RESULTS — We found that 7.7% of adults aged 25–64 years, or 2 million adults, have diabetes, among whom one-half are undiagnosed. An additional 16.8%, or 4.4 million, of Iranian adults have impaired fasting glucose.

CONCLUSIONS — The high prevalence of diabetes in working-age adults is an ominous sign for this developing nation. As the relatively young Iranian population ages in the future and urbanization continues or accelerates, the prevalence of diabetes will likely escalate.

Prevalence of Diabetes in Iranian population aged 25-64 years   2005 data

Table 1—*Estimates of prevalence and burden of newly diagnosed and known diabetes and IFG in the Iranian population aged 25–64 years*

	IFG*		Known diabetes		Newly diagnosed diabetes*		New and known diabetes*	
	Burden	Prevalence % (95% CI)	Burden	Prevalence % (95% CI)	Burden	Prevalence % (95% CI)	Burden	Prevalence % (95% CI)
Age (years)†								
25–34	1,217,452	11.9 (11.2–12.5)	102,657	1.0 (0.8–1.1)	201,649	2.0 (1.7–2.2)	311,983	3.0 (2.7–3.4)
35–44	1,336,701	17.3 (16.6–18.1)	248,560	3.2 (3.0–3.5)	269,739	3.5 (3.2–3.8)	519,117	6.8 (6.3–7.3)
45–54	1,070,898	21.4 (20.6–22.2)	368,966	7.4 (7.0–7.8)	294,260	5.9 (5.5–6.3)	629,209	12.9 (12.3–13.5)
55–64	791,266	24.3 (23.4–25.1)	329,850	10.1 (9.7–10.6)	235,564	7.2 (6.7–7.7)	531,580	16.8 (16.1–17.4)
Sex‡								
Men	2,321,870	17.4 (16.8–17.9)	428,275	3.2 (3.0–3.4)	518,094	3.9 (3.6–4.1)	933,799	7.1 (6.7–7.4)
Women	2,094,447	16.3 (15.8–16.8)	621,759	4.8 (4.6–5.0)	483,118	3.8 (3.5–4.0)	1,058,090	8.3 (8.0–8.7)
Residential area§								
Rural	1,143,041	14.6 (14.0–15.1)	217,785	2.8 (2.6–3.0)	237,312	3.0 (2.8–3.3)	442,107	5.7 (5.3–6.0)
Urban	3,273,276	17.8 (17.3–18.3)	832,249	4.5 (4.3–4.7)	763,900	4.2 (3.9–4.4)	1,549,782	8.6 (8.3–8.9)
Total national estimation¶	4,416,317	16.8 (16.4–17.2)	1,050,033	4.0 (3.9–4.1)	1,001,212	3.8 (3.6–4.0)	1,991,889	7.7 (7.5–7.9)

Data are n unless otherwise indicated. *Based on participants' laboratory results. †Standardized for sex and residential area. ‡Standardized for age and residential area. §Adjusted for age and sex. ¶Weighted and standardized for age, sex, and residential area on the basis of the 2004 Iranian population.

SuRFNCD 2007

- Third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007) in Iran

- Prevalence of DM, HTN, obesity, central obesity, and dyslipidemia were reported

Alireza Esteghamati, Alipasha Meysamie, Omid Khalilzadeh, et al; *BMC Public Health 2009, 9:167*

Results: The prevalence of diabetes, hypertension, obesity, and central obesity was 8.7 % (95%CI=7.4-10.2%), 26.6 % (95%CI=24.4-28.9%), 22.3% (95%CI=20.2-24.5%), and 53.6% (95%CI=50.4-56.8%), respectively. The prevalence of hypertriglyceridemia and hypercholesterolemia was 36.4% (95%CI=34.1-38.9%) and 42.9% (95%CI=40.4-45.4%), respectively. All of the mentioned prevalence rates were higher among females (except hypertriglyceridemia) and urban residents.

DM & IFG in Iranian adults   SuRFNCD 2007

Table 1: Estimates of prevalence of newly diagnosed diabetes, known diabetes and IFG among Iranian adults 25–64 years old

	Impaired Fasting Glucose[ab]		Known DM		New DM[a]		New and Known DM[a]	
	National estimate[c]	Prevalence (95% CI)	National estimate[c]	Prevalence (95% CI)	National estimate[c]	Prevalence (95% CI)	National estimate[c]	Prevalence (95% CI)
Age								
25–34 (n = 843)	0.6	5.1 (3.4–7.6)	0.1	0.7 (0.3–1.5)	0.3	2.5 (1.4–4.4)	0.4	3.2 (2.0–5.0)
35–44 (n = 902)	0.9	10.0 (7.6–13.0)	0.4	4.9 (3.3–7.3)	0.4	4.3 (3.2–5.8)	0.8	9.2 (7.0–12.1)
45–54 (n = 869)	0.9	13.6 (11.5–16.1)	0.5	8.4 (6.7–10.4)	0.4	5.6 (3.5–8.7)	0.9	14.0 (11.2–17.3)
55–64 (n = 783)	0.5	14.6 (11.9–17.9)	0.4	12.1 (8.2–17.4)	0.2	6.7 (4.9–9.1)	0.6	18.8 (14.7–23.6)
Sex								
Males (n = 1645)	1.5	9.3 (7.7–11.3)	0.7	4.4 (3.1–6.1)	0.6	4.0 (3.1–5.2)	1.3	8.4 (6.6–10.5)
Females (n = 1752)	1.4	9.0 (7.2–11.3)	0.8	4.9 (3.8–6.2)	0.7	4.2 (2.9–6.0)	1.4	9.1 (7.4–11.2)
Residential area								
Urban (n = 2175)	2.1	9.8 (8.3–11.4)	1.1	4.9 (3.9–6.2)	1.0	4.3 (3.4–5.4)	2.1	9.2 (7.8–10.9)
Rural (n = 1222)	0.7	7.8 (5.4–11.1)	0.3	3.9 (2.4–6.1)	0.3	3.7 (2.1–6.3)	0.7	7.5 (5.2–10.9)
Total national estimate (n = 3397)	2.9	9.2 (7.9–10.7)	1.5	4.6 (3.8–5.7)	1.3	4.1 (3.3–5.1)	2.7	8.7 (7.4–10.2)

SuRFNCD in Iran   From 2005 to 2011

- To provide a better understanding of the prevalence of non-communicable diseases and their associated risk factors, the Surveillance of Risk Factors of Non-communicable Diseases (SuRFNCD) was initiated in Iran, in 2005.

- In accordance with this data, we have reported a marked increase in the national prevalence of DM from 7.7% to 8.7% over a three year period (2005–2007).

Esteghamati A, Meysamie A, Khalilzadeh O, et al. Third national Surveillance of Risk Factors of Non-Communicable Diseases (SuRFNCD- 2007) in Iran: methods and results on prevalence of diabetes, hypertension, obesity, central obesity, and dyslipidemia. BMC Public Health 2009;9:167.

Trends in the prevalence of diabetes and impaired fasting glucose in association with obesity in Iran: 2005–2011

- Prevalence rates for 2011 and trends for 2005–2011 were determined by extrapolating survey results to Iran's adult population.

- Population attributable fraction (PAF) of obesity was also calculated

SuRFNCD 2011 Results

- IFG and total DM prevalence rates were **14.60%** (95%CI: 12.41–16.78) and **11.37%** (95%CI: 9.86–12.89) among 25–70 years, respectively.

- DM was more common in :
- o Older age ($p < 0.0001$)
- o Women ($p = 0.0216$)
- o Urban-dwellers ($p = 0.0001$)

Alireza Esteghamati , Koorosh Etemad, Jalil Koohpayehzadeh,, et al, Diabetes research and clinical practice 103 (2014) 319– 327

SuRFNCD 2011 Results

- In 2005–2011, trend analysis revealed a **35.1% increase in DM prevalence** (OR: 1.04, 95%CI: 1.01–1.07, p = 0.011)

- IFG prevalence remained relatively unchanged (OR: 0.98, 95%CI: 0.95–1.00, p = 0.167)

Alireza Esteghamati , Koorosh Etemad, Jalil Koohpayehzadeh,, et al,Diabetes research and clinical practice   103 (2014) 319– 327

SuRFNCD 2011 Results

- In this period, **DM awareness improved**

- Undiagnosed DM prevalence decreased from 45.7% to 24.7%
(p<0.001).

Alireza Esteghamati , Koorosh Etemad, Jalil Koohpayehzadeh, , et al,Diabetes research and clinical practice   103
    (2014) 319– 327

Results

- PAF analysis demonstrated that 33.78%, 9.25%, and 26.56% of the prevalent DM can be attributed to overweight (BMI>25 kg/m2), general obesity (BMI>30 kg/ m2), and central obesity (waist circumference>90 cm), respectively.

- Additionally, the DM increase rate in 2005–2011, was 20 times higher in morbidly obese compared with lean individuals.

Alireza Esteghamati , Koorosh Etemad, Jalil Koohpayehzadeh, , et al,Diabetes research and clinical practice 103 (2014) 319– 327

Prevalence of DM and IFG in IRAN

Table 1 – Prevalence of impaired fasting glucose, undiagnosed diabetes, known diabetes, and total diabetes in adult population of Iran, 2011.

	IFG			Undiagnosed diabetes			Known diabetes			Total diabetes		
	Pop. Est.	Prevalence % (95% CI)	p	Pop. Est.	Prevalence % (95% CI)	p	Pop. Est.	Prevalence % (95% CI)	p	Pop. Est.	Prevalence % (95% CI)	p
Age												
25–34	1.48	9.44 (7.21–11.67)	<0.0001	0.15	0.95 (0.42–1.47)	0.0470	0.36	2.32 (1.06–3.59)	0.0470	0.51	3.27 (1.92–4.61)	<0.0001
35–44	1.51	14.39 (11.37–17.41)		0.32	3.10 (1.43–4.77)		0.64	6.10 (4.24–7.95)		0.96	9.20 (6.54–11.85)	
45–54	1.53	20.20 (16.39–24.01)		0.28	3.66 (2.56–4.76)		1.16	15.39 (11.97–18.81)		1.44	19.05 (15.38–22.71)	
55–64	0.99	21.89 (18.60–25.18)		0.26	5.64 (4.40–6.88)		0.89	19.69 (17.18–22.20)		1.15	25.32 (22.74–27.91)	
65–70	0.30	19.28 (14.84–23.72)		0.07	4.69 (3.00–6.39)		0.39	24.48 (20.94–28.02)		0.46	29.18 (25.44–32.91)	
Sex												
Male	3.08	15.45 (12.71–18.18)	0.1485	0.56	2.80 (1.71–3.89)	0.1465	1.41	7.09 (5.22–8.96)	0.1465	1.97	9.90 (7.72–12.06)	0.0216
Female	2.72	13.74 (11.55–15.94)		0.52	2.63 (1.95–3.30)		2.03	10.23 (8.82–11.65)		2.55	12.86 (11.20–14.53)	
Residential area												
Urban	4.55	15.44 (13.00–17.89)	0.0580	0.87	2.97 (2.16–3.77)	0.4661	2.86	9.72 (8.32–11.13)	0.4661	3.73	12.69 (10.94–14.43)	0.0001
Rural	1.26	12.18 (9.16–15.20)		0.21	2.00 (1.24–2.75)		0.58	5.62 (4.20–7.04)		0.79	7.62 (5.73–9.50)	
Total	5.81	14.60 (12.41–16.78)		1.08	2.71 (2.05–3.38)		3.44	8.66 (7.47–9.84)		4.52	11.37 (9.86–12.89)	

Abbreviations: IFG, impaired fasting glucose; Pop. Est., population estimate rounded to the nearest million.
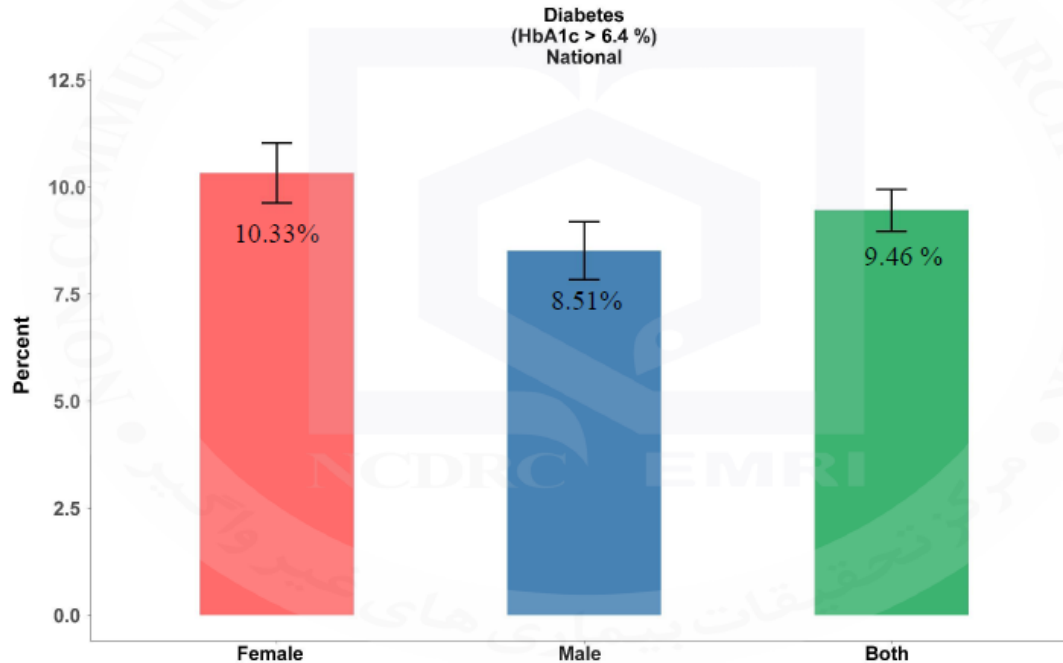
Population attributable fraction

Table 3 – Population attributable fraction of obesity for diabetes in Iranian adult population, 2005–2011.

	OR (95% CI)	p	PAF
Overweight/general obesity (BMI $\geq$ 25 kg/m^2)			
Male	2.11 (1.77–2.51)	<0.0001	27.14 (22.54–31.02)
Female	2.15 (1.88–2.47)	<0.0001	34.66 (30.27–38.50)
Total	2.13 (1.92–2.36)	<0.0001	30.82 (27.86–33.49)
General obesity (BMI $\geq$ 30 kg/m^2)			
Male	1.77 (1.40–2.25)	<0.0001	6.26 (4.09–7.97)
Female	1.75 (1.58–1.94)	<0.0001	12.51 (10.68–14.15)
Total	1.75 (1.57–1.94)	<0.0001	9.28 (7.78–10.54)
Central obesity (Waist circumference $\geq$ 90 cm)			
Male	2.21 (1.86–2.63)	<0.0001	27.09 (22.84–30.67)
Female	2.16 (1.90–2.46)	<0.0001	26.62 (23.51–29.39)
Total	2.17 (1.98–2.38)	<0.0001	26.71 (24.52–28.71)

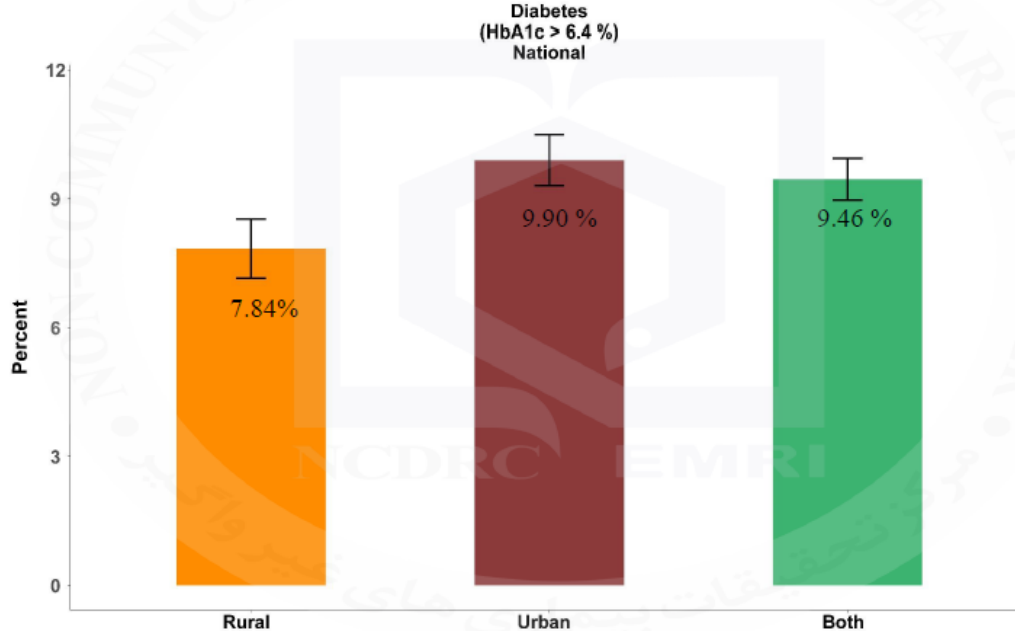Abbreviation: PAF, population attributable fraction.

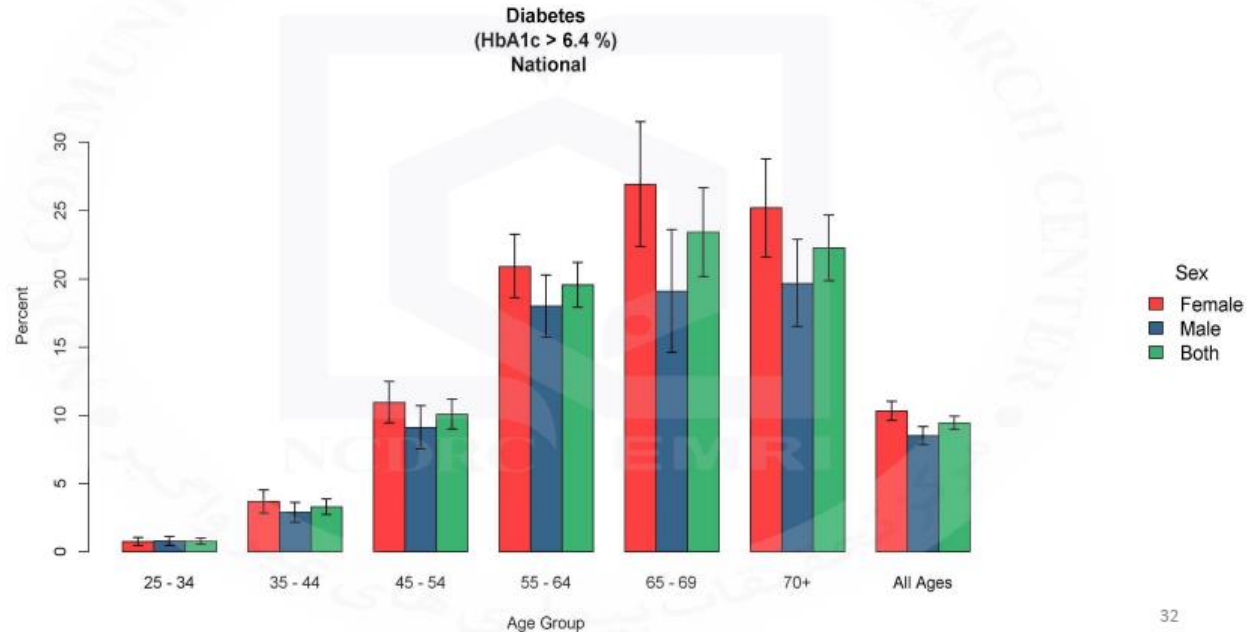# SuRFNCD 2016-DM

Diabetes Prevalence

Diabetes
(HbA1c > 6.4 %)
National

- Female: 10.33%
- Male: 8.51%
- Both: 9.46 %

SuRFNCD 2016-DM

Diabetes Prevalence — Diabetes (HbA1c > 6.4 %) National. Rural: 7.84%, Urban: 9.90 %, Both: 9.46 %

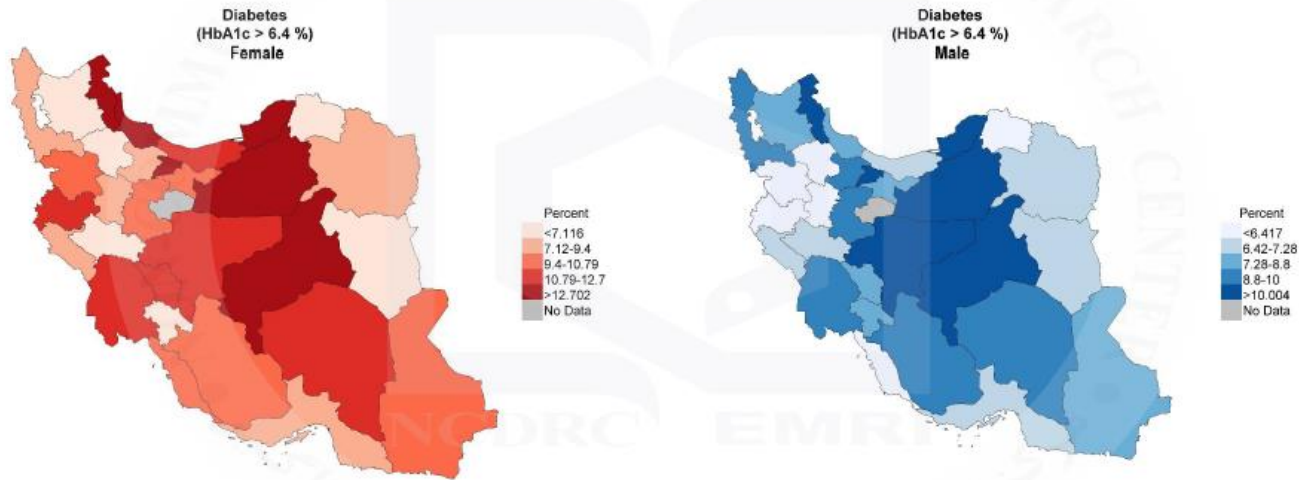# SuRFNCD 2016-DM

SuRFNCD 2016-DM Map

Diabetes Prevalence

Mortality in EMR

In 2015:

- 135,230 individuals died from diabetes

- 16,470 from CKD-DM in the EMR.

- These numbers represent **216 and 179% increases** in the number of deaths due to diabetes and CKD-DM, respectively, compared to 1990.

DALYs

- Total DALYs from diabetes were **6,708,539** in 2015 and **2,285,117** in 1990.

- For CKD-DM, total DALYs were **568,351** in 2015 and **234,194** in 1990.

- In 2015, the proportion of YLLs to DALYs was **45% for diabetes mellitus and 73% for CKD-DM.**

Burden of DM

- The burden of diabetes mellitus as a percentage of total DALYs **was 1.1% in 1990 and increased to 2.9% in 2015.**

- These percentage were 0.11% and 0.25% for CKD-DM in 1990 and 2015, respectively.

- The age-standardized observed DALY rate of diabetes in the EMR was higher than in all other WHO regions.

Observed DALY rates of diabetes in the EMR were higher than the expected (based on SDI) values

Fig. 3 Rates of disability-adjusted life years of diabetes mellitus per 100,000 population in the World Health Organization regions. *AFR* African region, *EMR* Eastern Mediterranean region, *EUR* European region, *AMR* Region of Americas, *SEAR* Southeast Asia region, *WPR* Western Pacific region. (Global Burden of Disease 2015 study, World Health Organization regions, 2015)
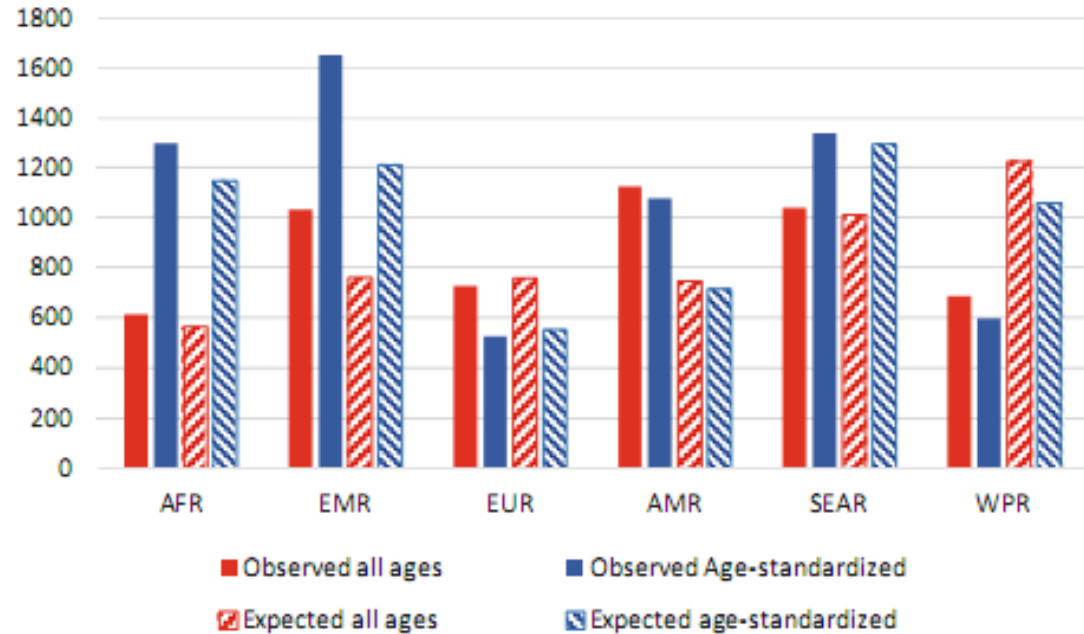
Observed DALY rates for CKD-DM were less than the expected rates

Fig. 4 Rates of disability-adjusted life years of chronic kidney disease due to diabetes mellitus per 100,000 population in the World Health Organization regions. *AFR* African region, *EMR* Eastern Mediterranean region, *EUR* European region, *AMR* Region of Americas, *SEAR* Southeast Asia region, *WPR* Western Pacific region. (Global Burden of Disease 2015 study, World Health Organization regions, 2015)
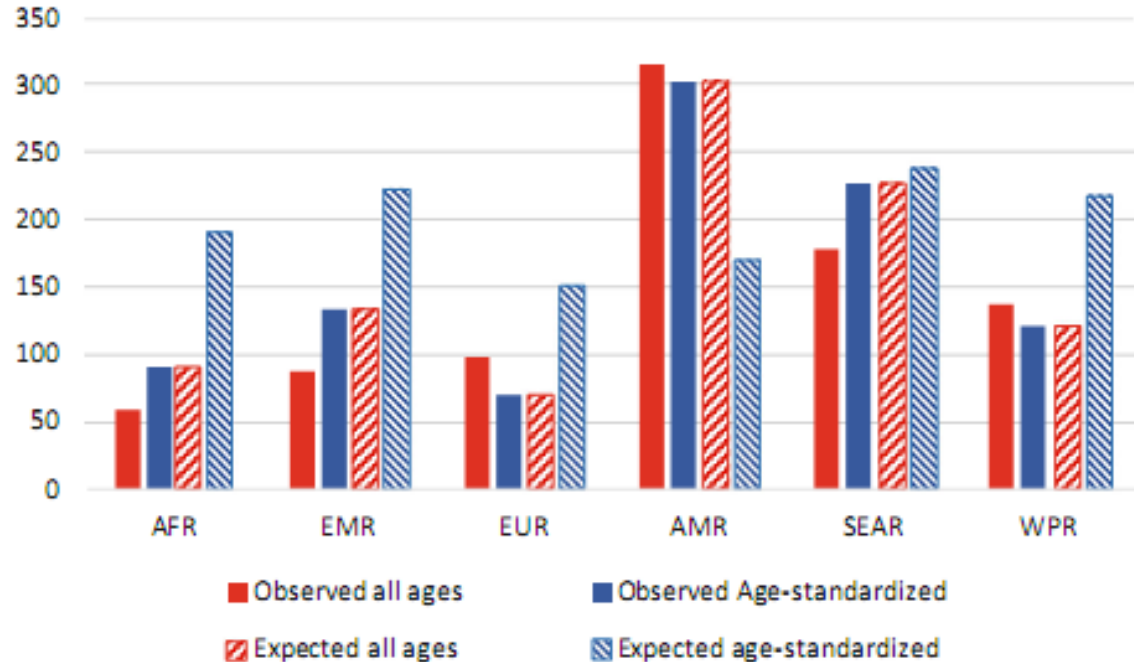
Burden of DM

Burden of diabetes has increased considerably during the last 25 years in the EMR.

This **burden is higher than expected** based on the demographic and social status of the countries in the region.

The **region's health systems have not performed at the expected level**, given their socio-demographic status, to control and prevent diabetes and CKD.

Burden of DM

- This is in contrast to the European region and Western Pacific region, where observed levels are lower than expected levels.

- There are several potential reasons for such differenced: people in the EMR have lower perceived risk, and **access to and quality of health care are lesser in this region**

- This results call for urgent efforts to address the burden of diabetes in the region.

Burden of DM

- Indeed, a multi-sectorial approach is needed to control and prevent diabetes in the region.

- WHO suggests the Package of Essential Non-communicable (PEN) Disease Interventions to be used in primary health care in low resource settings