# به نام یگانه پروردگار

# COVID-19 & Endocrine

## Communicable & Non-Communicable Pandemic

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# Outlines

- NCDs in the world
- Addition of a Communicable Disease
- Association of COVID-19 and its severity with Obesity/Diabetes
- Metabolic Health in Iran
- COVID-19 in Iran

On Sept 19, 2011, global leaders met at the UN in New York, USA, to set an international agenda on non-communicable diseases (NCDs), which cause three-quarters of global deaths.

This was only the second time in history that the UN General Assembly had met to discuss a health issue (the first was for HIV/AIDS in 2001).

In 2015, Sustainable Development Goal 3.4 set the ambitious target for countries to reduce their risk of premature mortality from NCDs by a third relative to 2015 levels by 2030.

Among high-income countries, only Denmark, Luxembourg, New Zealand, Norway, Singapore, and South Korea are on track to meet this target.


*www.thelancet.com Vol 396 September 5, 2020*

A modelling study published in The Lancet Global Health suggests that, worldwide, **one in five people** are at an increased risk of severe COVID-19 should they become infected, mostly as a result of underlying NCDs.

The enormous efforts to deal with COVID-19 have also disrupted the regular care often required by patients with NCDs.

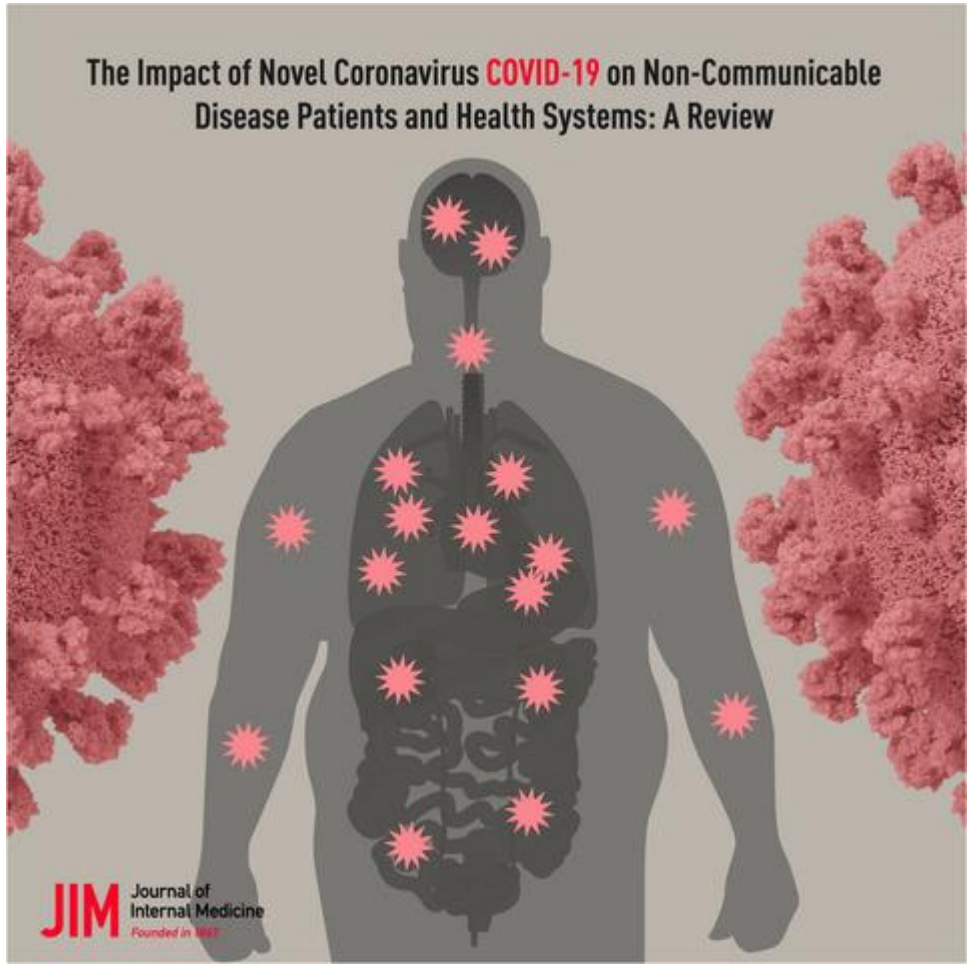
WHO completed a rapid assessment survey in May, 2020, and found that 75% of countries reported interruptions to NCD services.

*www.thelancet.com Vol 396 September 5, 2020*

**COVID-19** and **NCDs** form a dangerous relationship, experienced as **a syndemic** that is exacerbating social and economic inequalities.

***COVID-19 provides a new lens to view NCDs.***

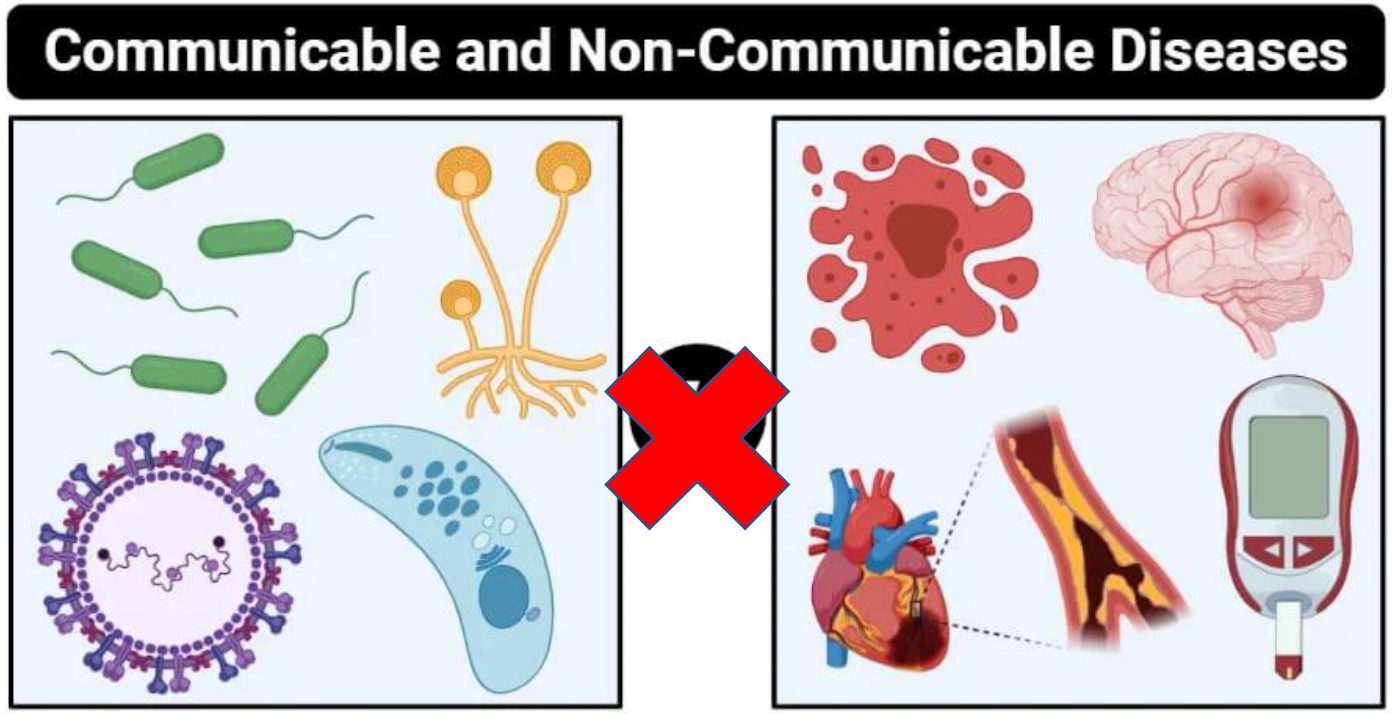
During the COVID-19 pandemic, many countries have seen the value of stronger tobacco and alcohol controls, an important step towards reducing NCDs. But others have struggled to balance public health measures against predatory commerce and economic recovery.




*www.thelancet.com Vol 396 September 5, 2020*

COVID-19 could provide new insights into interactions between the immune system and NCDs, potentially change the way we understand and treat these diseases.

2020-2021 has shown the crucial relation between communicable diseases and NCDs



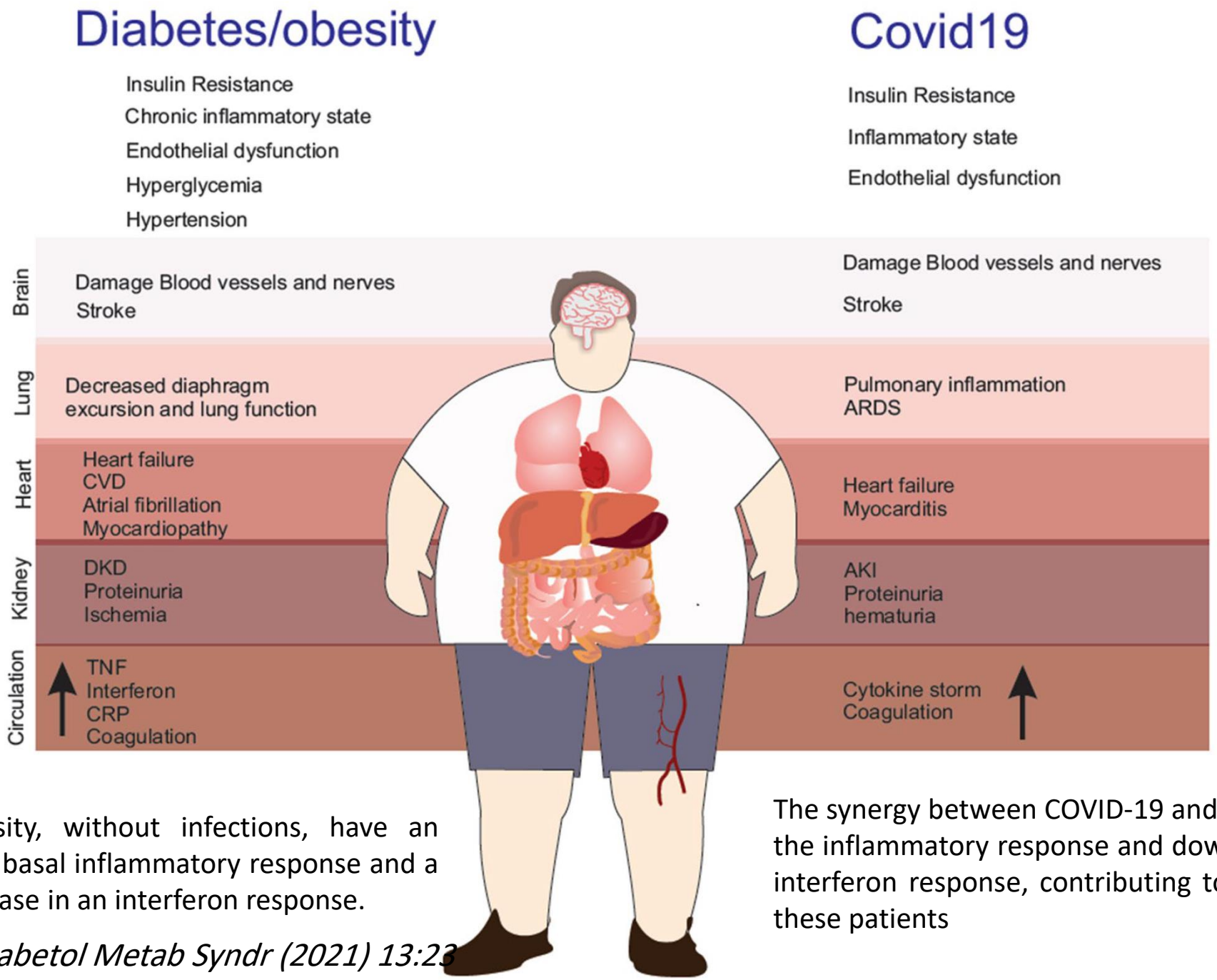

*www.thelancet.com Vol 396 September 5, 2020*

# Obesity, Diabetes and COVID-19:

# An Infectious Disease Spreading From the East

# Collides With

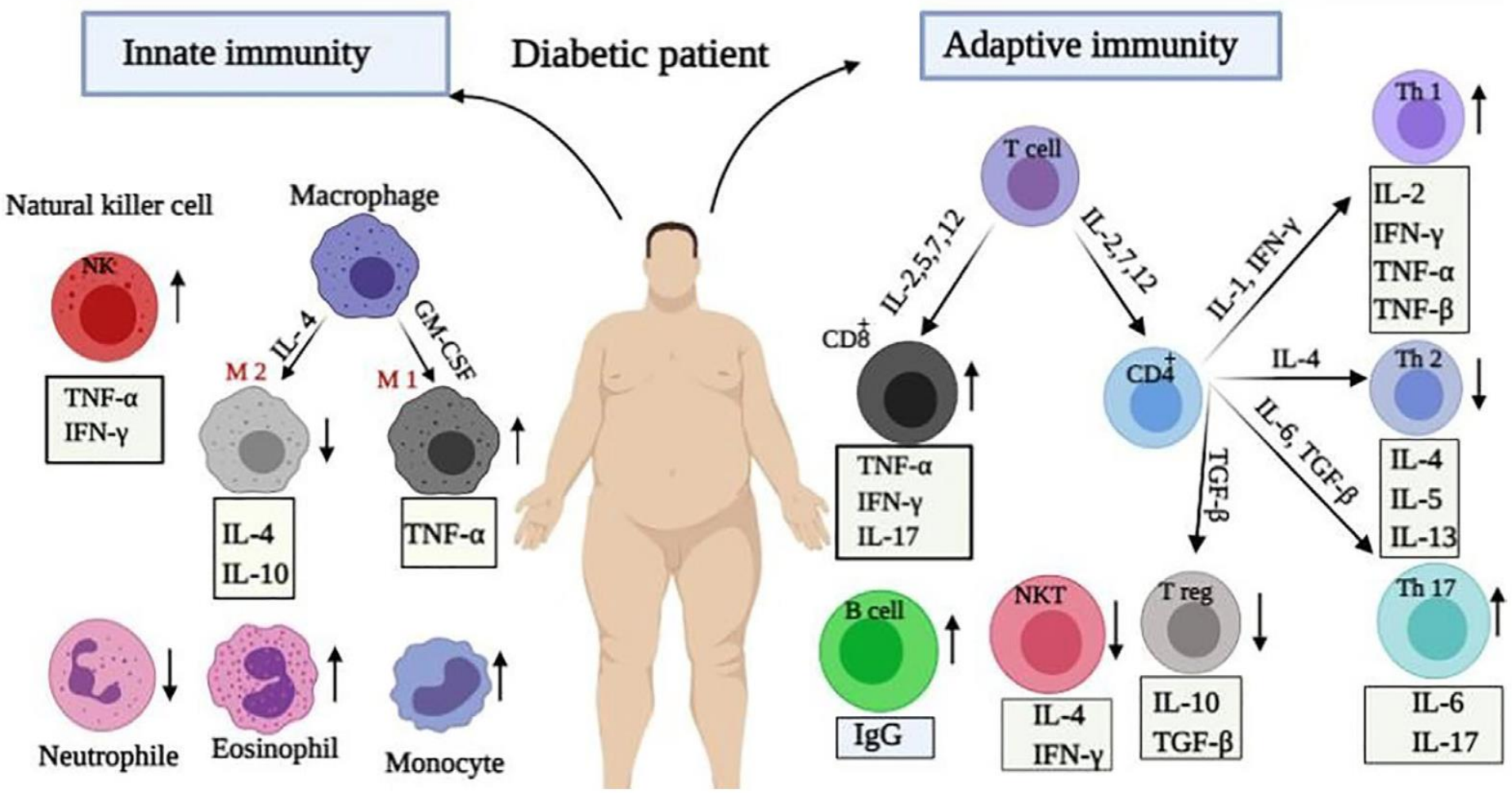
# the Consequences of an Unhealthy Western Lifestyle


T2D and obesity, without infections, have an increase in the basal inflammatory response and a potential decrease in an interferon response.

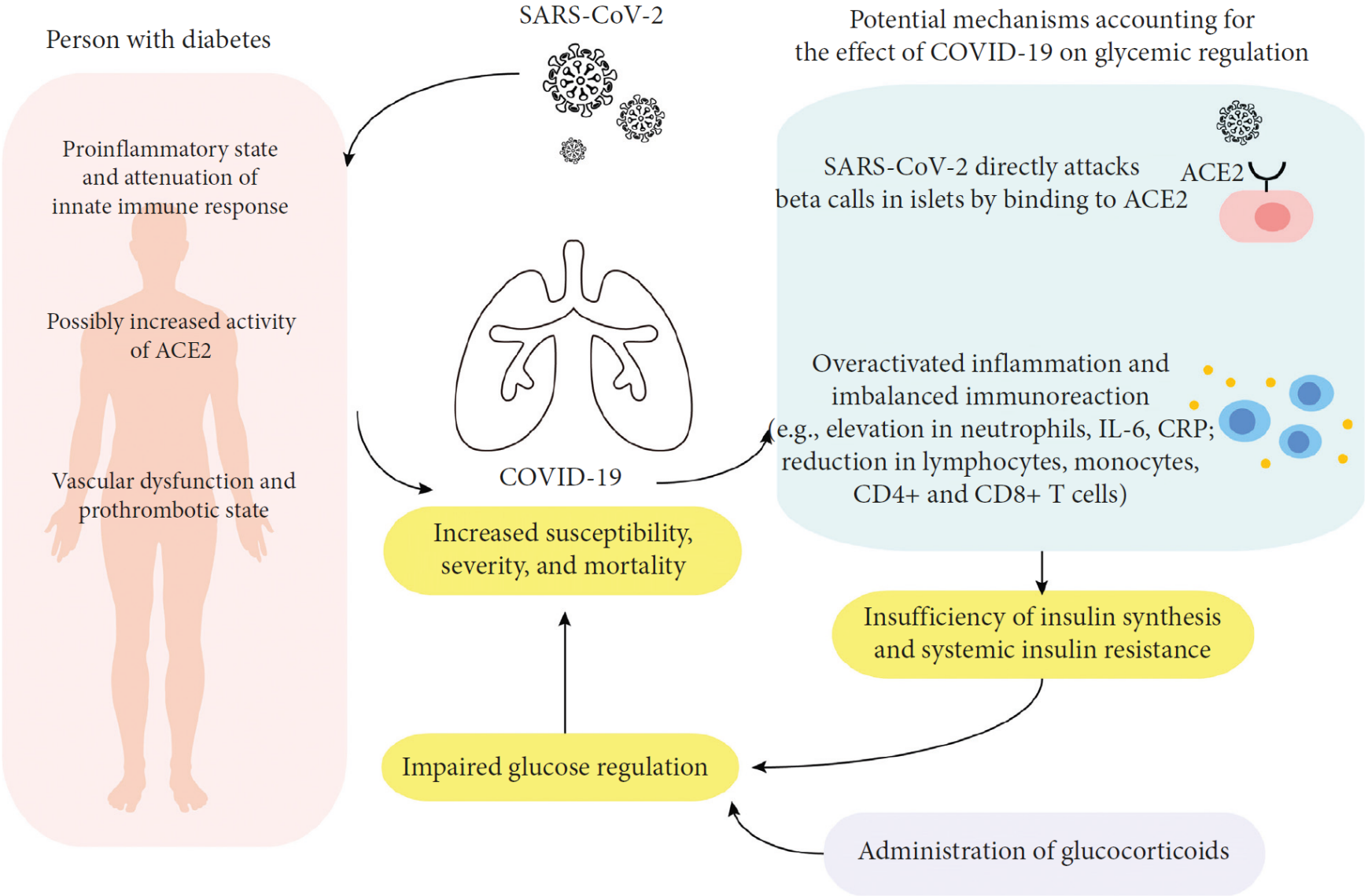
The synergy between COVID-19 and T2D/obesity may amplify the inflammatory response and downregulate even more the interferon response, contributing to more severe disease in these patients

*Santos et al. Diabetol Metab Syndr (2021) 13:23*




Innate immunity changes : increase in the plasma levels of macrophages, NK cells and eosinophils, as well as their secreted cytokines with a reduction in the number of neutrophils.
Adaptive immunity changes: enhancement in Th1, Th17, TCD8+ cells, and released cytokines whereas reduction in Th2, Treg, and NKT cells.

*Rahmani-Kukia N, Abbasi A. Frontiers in Endocrinology. 2021 Mar 4;12:84.*




Potential mechanisms for the interaction between COVID-19 and diabetes.

*Li, Gerui, et al. International Journal of Endocrinology 2021*

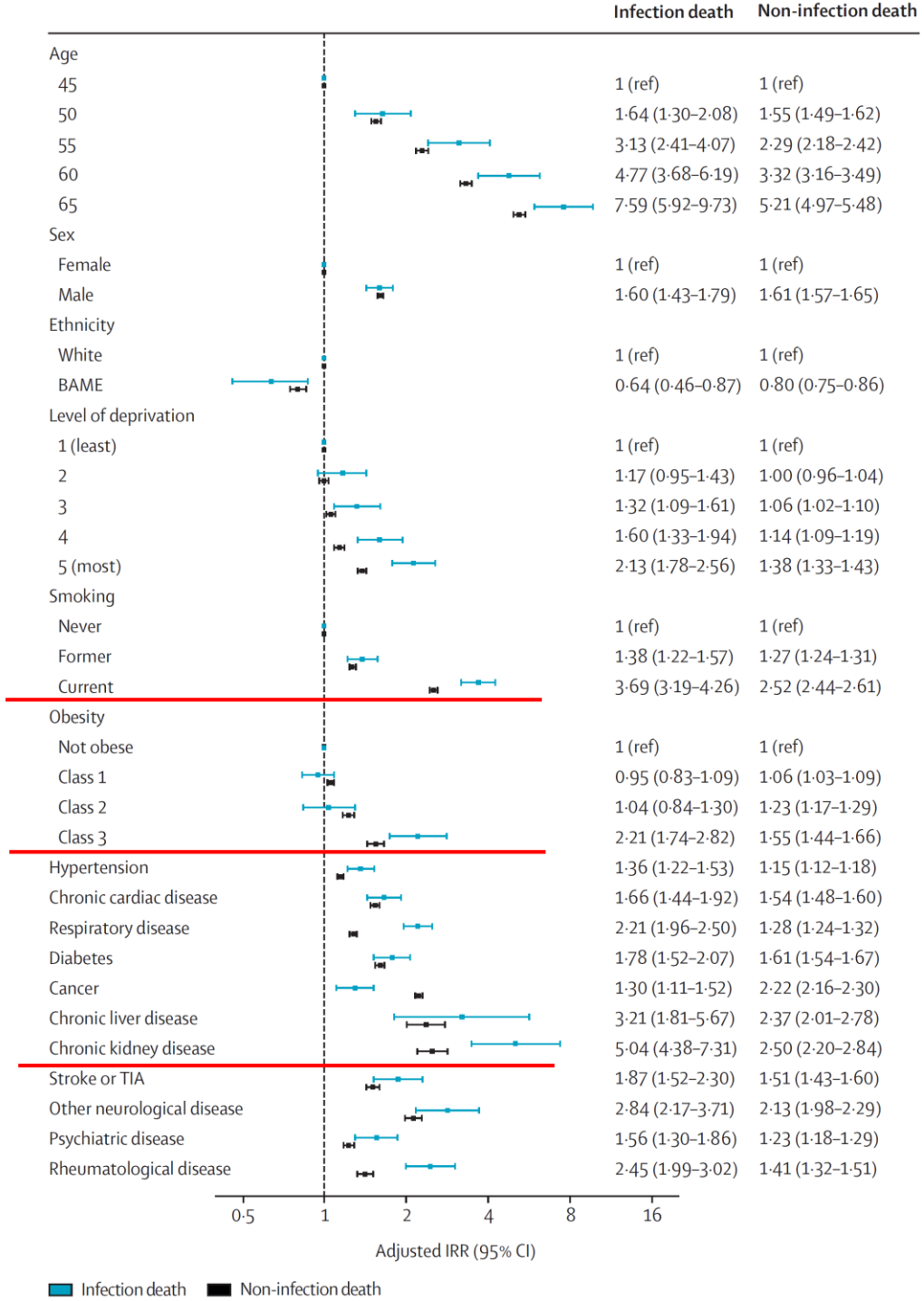
# Obesity/Diabetes and COVID-19:

# The Two Sides of the Coin

- **Obesity/Diabetes as a Risk Factor for COVID-19**
- **COVID-19 as a risk factor for Obesity/Diabetes and barrier to their treatment**

Dicker, et al. "Obesity and COVID-19: the two sides of the coin." Obesity Facts 13.4 (2020): 430-438.

## Association between participant characteristics and risk of infection death or non-infection death




*Drozd, Michael, et al. "Non-communicable disease, sociodemographic factors, and risk of death from infection: a UK Biobank observational cohort study." The Lancet Infectious Diseases (2021).*

## VIRUS INDUCED ALTERATIONS IN THE ENDOCRINE SYSTEM

Go to:

Virus induced changes of endocrine cells and organs can occur in several ways (11).

1. Activation of the hypothalamo-pituitary-adrenal (HPA) axis indirectly as a result of systemic viral infection and inflammation.
2. Damage to specific endocrine cells by direct viral infection of the cell (through stages of the viral cell cycle).
3. Damage to specific endocrine cells by viral proteins produced within the cell as a result of viral replication within the cell.
4. Damage of virus infected endocrine organs by inflammation through activation of an immune reaction (innate and cell mediated).
5. Damage of uninfected endocrine organs through the systemic immune response as a result of the immune reaction to the viral infection.
6. Damage of uninfected endocrine organs through autoimmune mechanisms/cross reaction of antibodies.
7. Viral gene products may induce an alteration of hormonal activity/ production by endocrine cells.

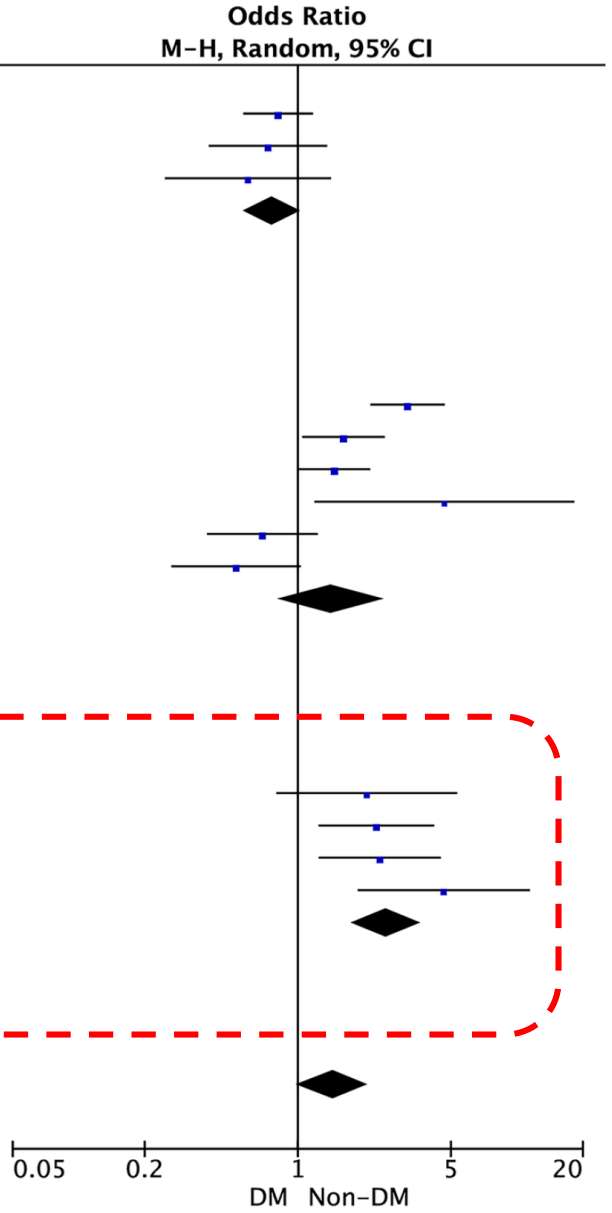
**Selected estimated and adjusted hazard ratios for risk factors for COVID-19 death in OpenSAFELY.**

Total n = 17 ,278,392

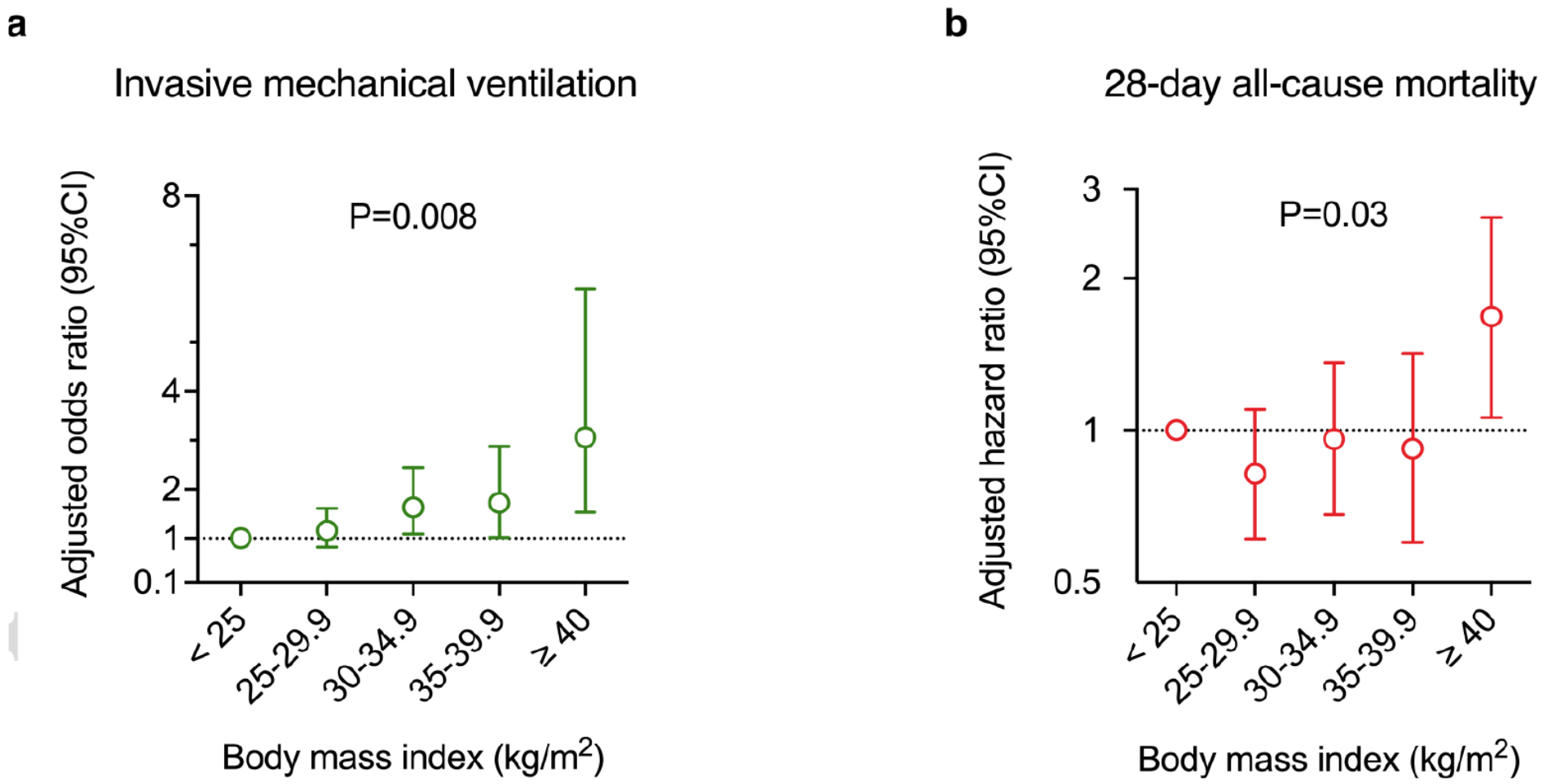

*Stefan N, et al. " Nature Reviews Endocrinology (2021)*

Forest plot of clinical conditions in DM versus non-DM group

| Study or Subgroup | DM Events | DM Total | Non-DM Events | Non-DM Total | Weight | Odds Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| **3.1.1 Mild to moderate** | | | | | | |
| Liu Z 2020 | 80 | 139 | 497 | 795 | 9.4% | 0.81 [0.56, 1.17] |
| Zhang Y 2020 (a) | 18 | 63 | 69 | 195 | 8.0% | 0.73 [0.39, 1.36] |
| Zhang Y 2020 (b) | 9 | 61 | 19 | 84 | 6.5% | 0.59 [0.25, 1.42] |
| **Subtotal (95% CI)** | | **263** | | **1074** | **23.9%** | **0.76 [0.57, 1.03]** |
| Total events | 107 | | 585 | | | |
| Heterogeneity: Tau² = 0.00; Chi² = 0.46, df = 2 (P = 0.79); I² = 0% | | | | | | |
| Test for overall effect: Z = 1.77 (P = 0.08) | | | | | | |
| **3.1.2 Severe** | | | | | | |
| Guan WJ 2020 | 45 | 130 | 209 | 1460 | 9.2% | 3.17 [2.15, 4.68] |
| Kim MK 2020 | 65 | 235 | 45 | 235 | 9.0% | 1.61 [1.05, 2.49] |
| Liu Z 2020 | 53 | 139 | 235 | 795 | 9.3% | 1.47 [1.01, 2.14] |
| Wu J 2020 | 7 | 22 | 4 | 44 | 4.3% | 4.67 [1.19, 18.26] |
| Zhang Y 2020 (a) | 24 | 63 | 92 | 195 | 8.2% | 0.69 [0.39, 1.23] |
| Zhang Y 2020 (b) | 32 | 61 | 57 | 84 | 7.6% | 0.52 [0.26, 1.03] |
| **Subtotal (95% CI)** | | **650** | | **2813** | **47.7%** | **1.43 [0.82, 2.50]** |
| Total events | 226 | | 642 | | | |
| Heterogeneity: Tau² = 0.38; Chi² = 33.02, df = 5 (P < 0.00001); I² = 85% | | | | | | |
| Test for overall effect: Z = 1.27 (P = 0.20) | | | | | | |
| **3.1.3 Critical** | | | | | | |
| Liu Z 2020 | 6 | 139 | 17 | 795 | 6.1% | 2.06 [0.80, 5.33] |
| Shang J 2020 | 17 | 84 | 50 | 500 | 8.1% | 2.28 [1.24, 4.19] |
| Zhang Y 2020 (a) | 21 | 63 | 34 | 195 | 7.9% | 2.37 [1.25, 4.50] |
| Zhang Y 2020 (b) | 20 | 61 | 8 | 84 | 6.4% | 4.63 [1.88, 11.44] |
| **Subtotal (95% CI)** | | **347** | | **1574** | **28.4%** | **2.56 [1.77, 3.68]** |
| Total events | 64 | | 109 | | | |
| Heterogeneity: Tau² = 0.00; Chi² = 2.06, df = 3 (P = 0.56); I² = 0% | | | | | | |
| Test for overall effect: Z = 5.03 (P < 0.00001) | | | | | | |
| **Total (95% CI)** | | **1260** | | **5461** | **100.0%** | **1.45 [1.00, 2.09]** |
| Total events | 397 | | 1336 | | | |
| Heterogeneity: Tau² = 0.35; Chi² = 63.22, df = 12 (P < 0.00001); I² = 81% | | | | | | |
| Test for overall effect: Z = 1.96 (P = 0.05) | | | | | | |
| Test for subgroup differences: Chi² = 25.48, df = 2 (P < 0.00001), I² = 92.2% | | | | | | |

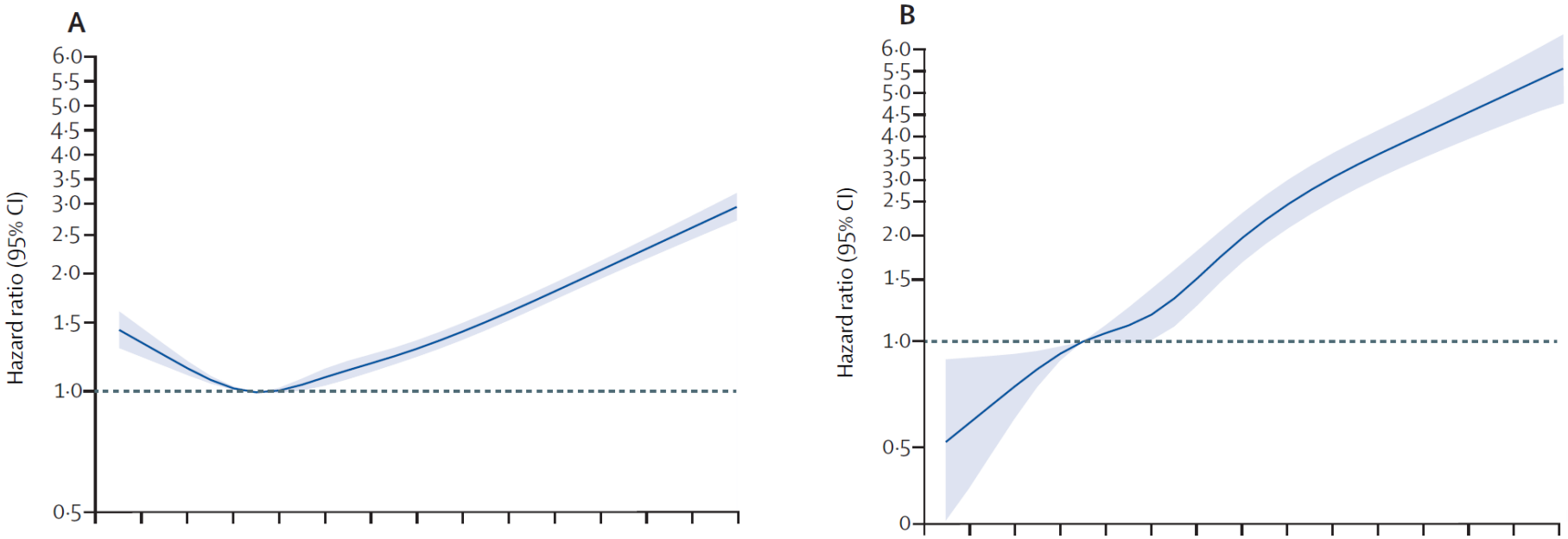



*Kaminska, Halla, et al. "Impact of diabetes mellitus on in-hospital mortality in adult patients with COVID-19: a systematic review and meta-analysis." Acta diabetologica (2021): 1-10.*

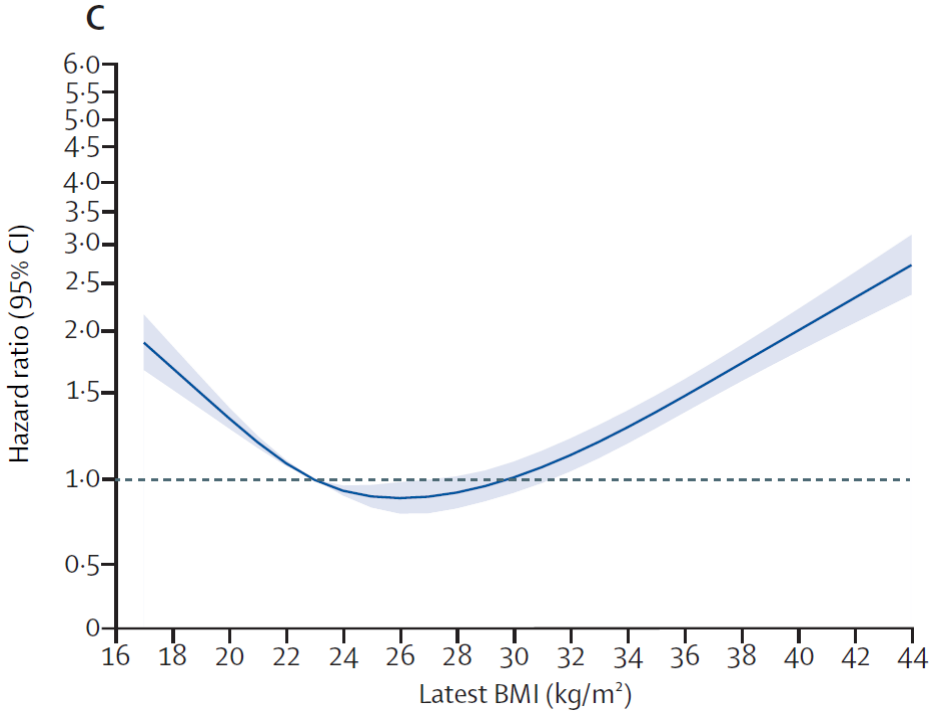



Linear association of BMI categories with the need of invasive mechanical ventilation requirement (Figure 1a) and non-linear association of BMI with 28-day all-cause mortality (Figure 1b)

*Chetboun, Mikael, et al. "BMI and pneumonia outcomes in critically ill COVID-19 patients: an international multicenter study." Obesity (2021).*




Associations between BMI and COVID-19-related admission to hospital (A), COVID-19-related admission to ICU (B), and death due to COVID-19 (C) in the total population with a BMI measurement (n=6 910 695)




*Gao, Min, et al. "Associations between body-mass index and COVID-19 severity in 6· 9 million people in England: a prospective, community-based, cohort study." The Lancet Diabetes & Endocrinology (2021).*

# A prediction model to estimate the risks of severe COVID-19 in people with diabetes

| | Odds ratio (95% CI) | p value |
|---|---|---|
| **Sociodemographic** | | |
| Age | 1·044 (1·036–1·051) | <0·0001 |
| Sex | .. | (global) <0·0001 |
| Male | 1 (ref) | .. |
| Female | 0·535 (0·470–0·608) | <0·0001 |
| Diabetes type | .. | (global) 0·62 |
| Type 2 | 1 (ref) | .. |
| Type 1 | 1·119 (0·806–1·553) | 0·50 |
| Other types | 0·866 (0·567–1·321) | 0·50 |
| Diabetes duration | 0·998 (0·990–1·006) | 0·59 |
| Care home resident | 10·828 (9·251–12·675) | <0·0001 |
| Deprivation index | .. | (global) <0·0001 |
| Quintile 1 (most deprived) | 1 (ref) | .. |
| Quintile 2 | 0·848 (0·718–1·002) | 0·052 |
| Quintile 3 | 0·619 (0·514–0·744) | <0·0001 |
| Quintile 4 | 0·656 (0·542–0·793) | <0·0001 |
| Quintile 5 (least deprived) | 0·484 (0·385–0·607) | <0·0001 |
| **Comorbidities** | | |
| log(number of other hospital admissions in past 5 years + 1) | 1·595 (1·481–1·717) | <0·0001 |
| Neurological and dementia (excluding epilepsy) | 1·273 (1·081–1·499) | 0·0038 |
| **Other clinical measures** | | |
| $HbA_{1c}$ | 1·005 (1·001–1·009) | 0·0084 |
| BMI | 1·091 (1·047–1·136) | <0·0001 |
| log(BMI) | 0·080 (0·022–0·291) | 0·0001 |
| Estimated glomerular filtration rate | 0·992 (0·989–0·995) | <0·0001 |
| Systolic blood pressure | 0·994 (0·990–0·998) | 0·0043 |
| **Drug exposures** | | |
| Any antihypertensive | 0·792 (0·687–0·913) | 0·0013 |
| Number of diabetes drug classes prescribed | 1·065 (1·004–1·129) | 0·036 |
| Number of ATC level 3 drug classes (excluding for diabetes) | 1·027 (1·013–1·041) | 0·0002 |

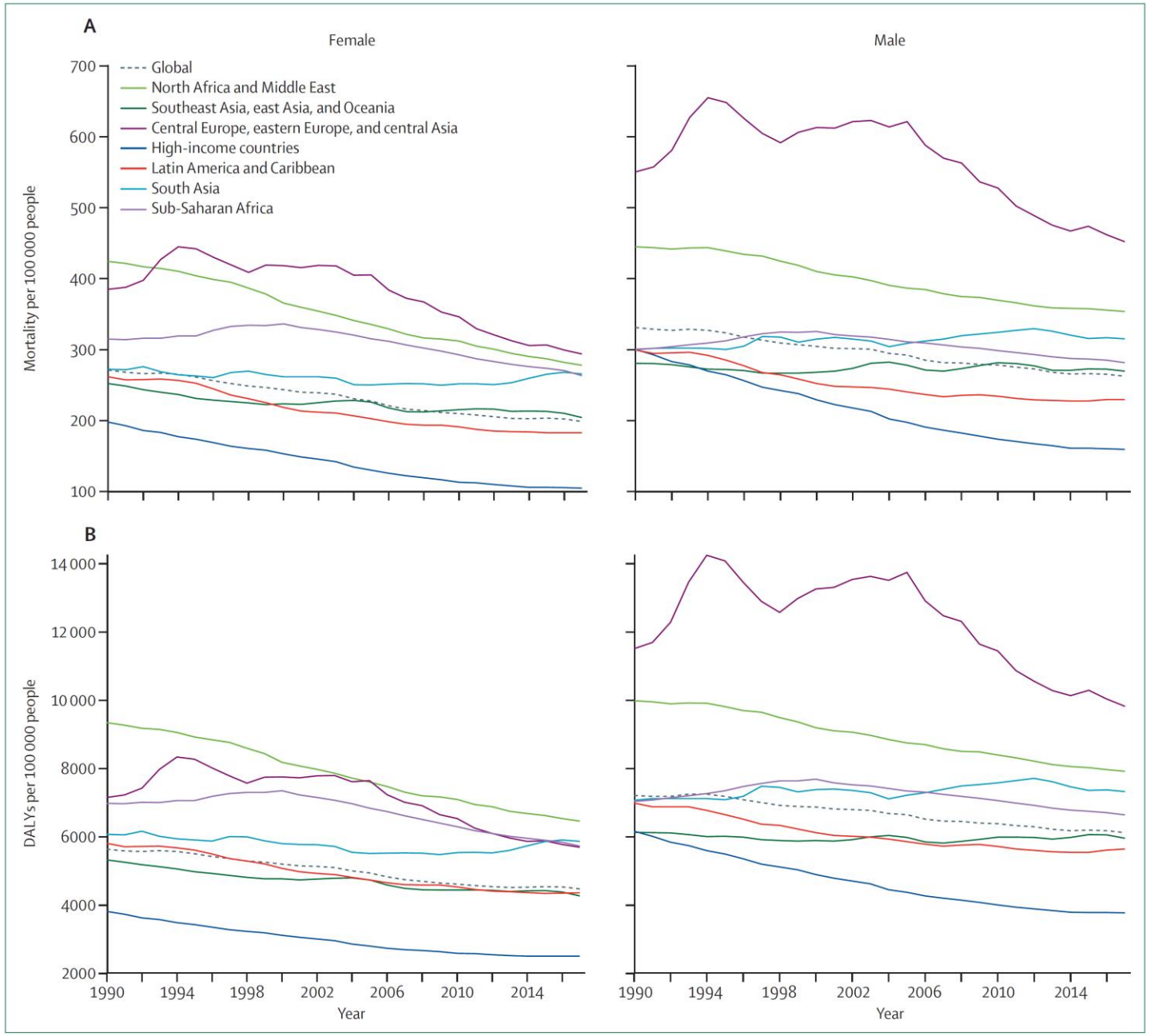
*McGurnaghan, Stuart J., et al. "Risks of and risk factors for COVID-19 disease in people with diabetes: a cohort study of the total population of Scotland." The Lancet Diabetes & Endocrinology 9.2 (2021): 82-93.*

The C-statistic for the full model was 0·85 (0·83–0·86).

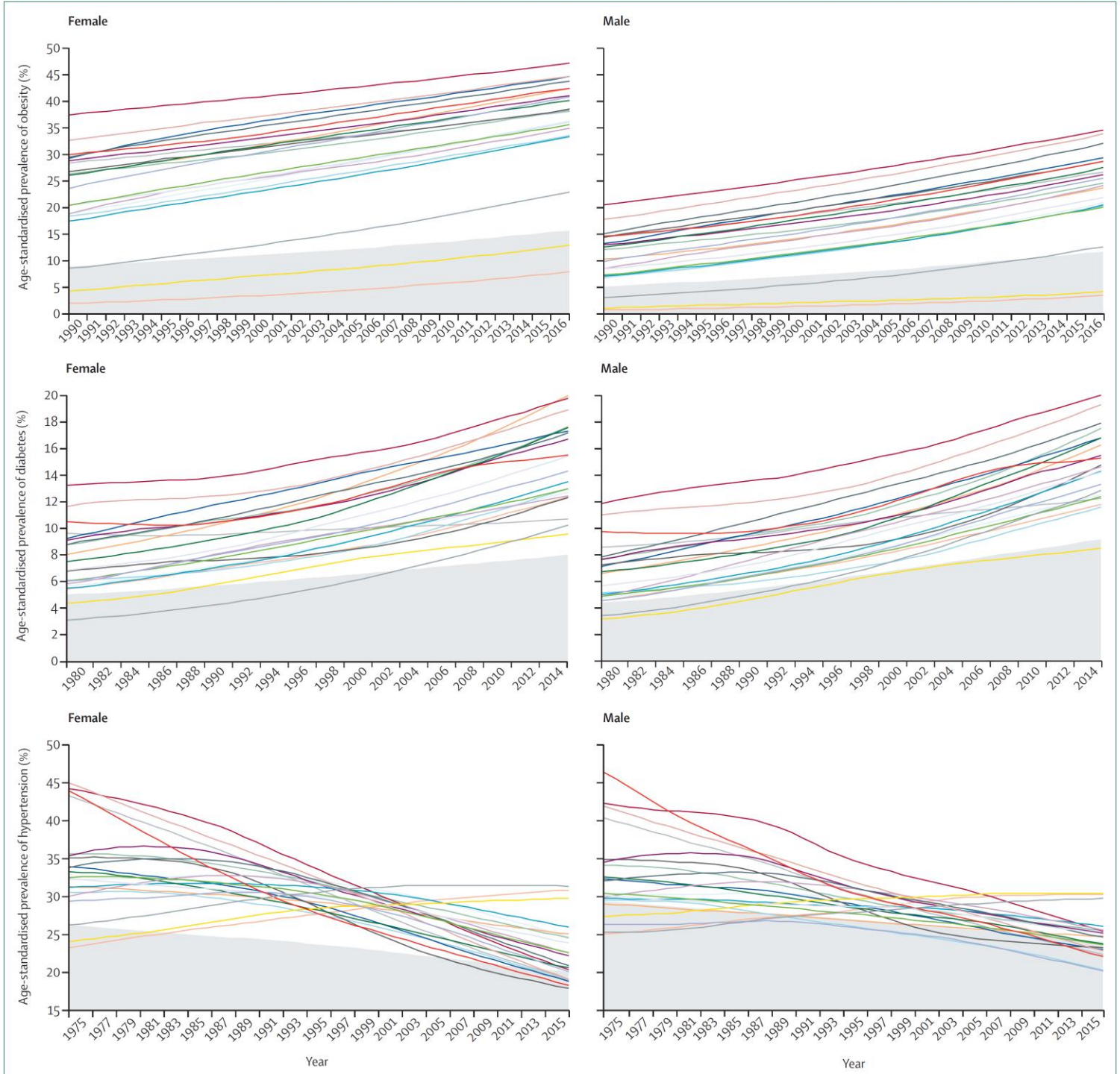
# Metabolic Health in the Middle East and Iran

**Middle East and north Africa have the highest risk of metabolic diseases of all women globally, whereas men rank second of all men in this respect.**

**Metabolic risk factors are responsible for more than 300 deaths per 100 000 individuals in this region, compared with a global mean of fewer than 250.**



Prevalence of obesity, diabetes, and hypertension since 1975 by countries in the Middle East and north Africa

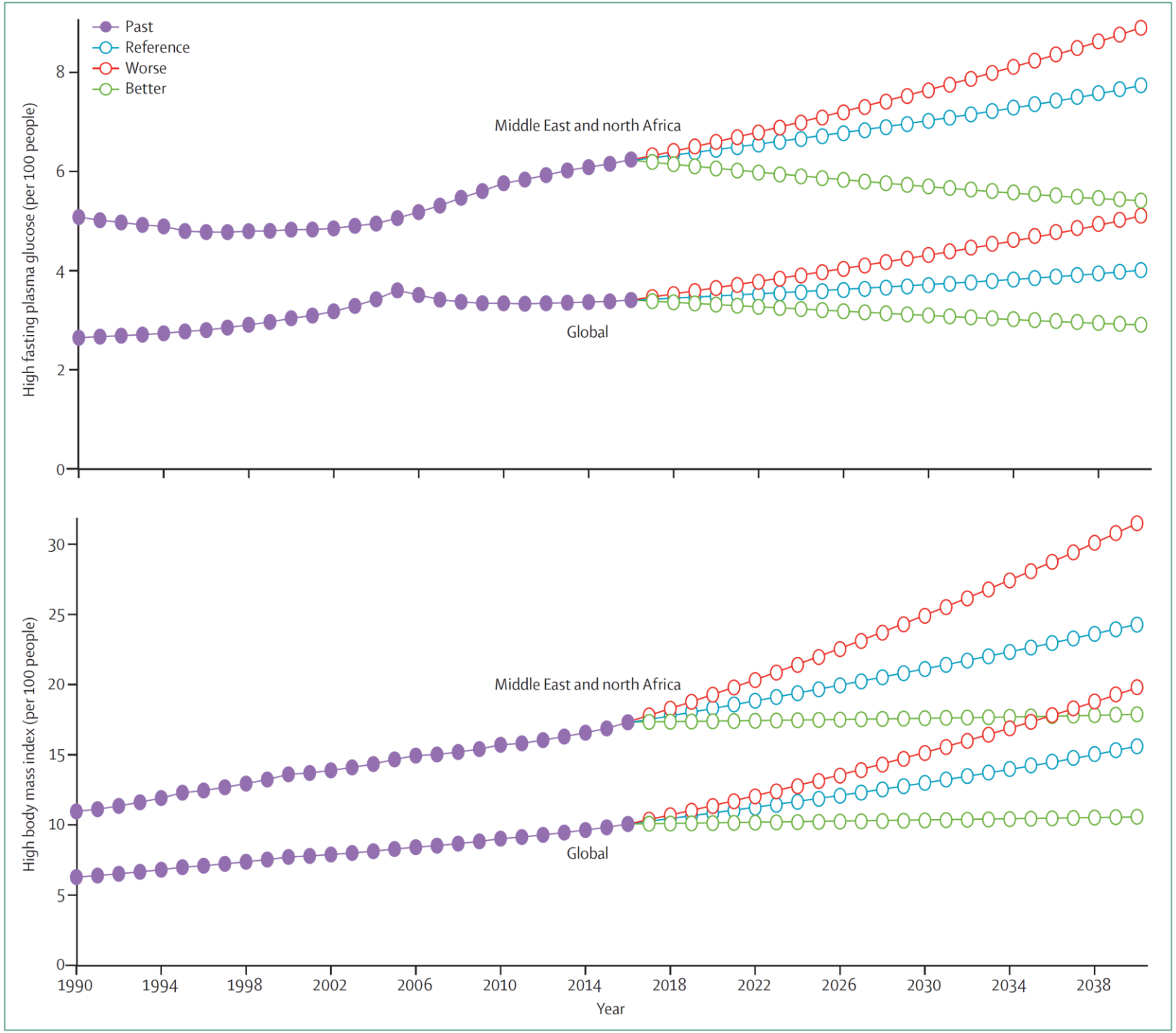


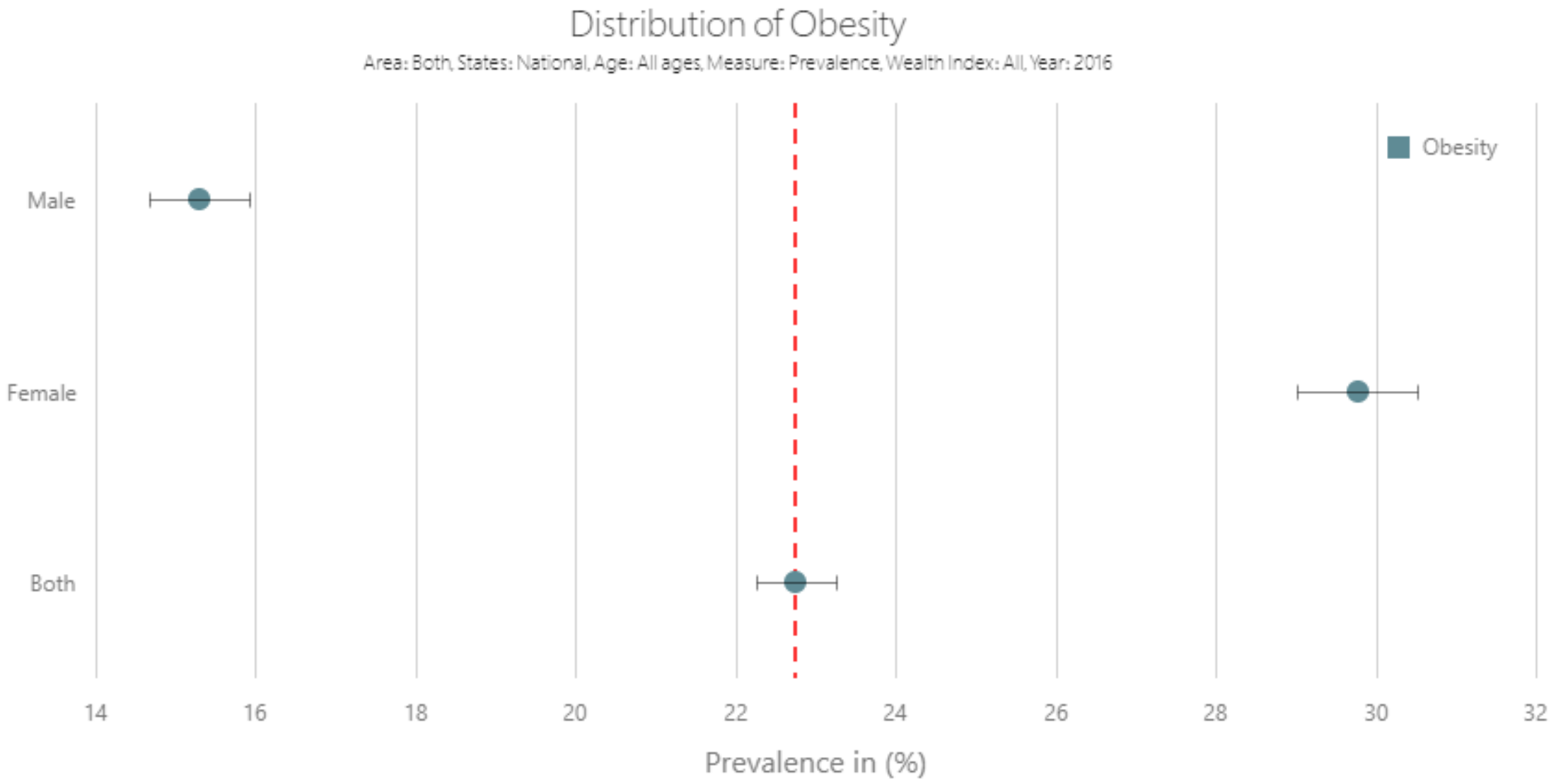

Global
Bahrain
Iraq
Lebanon
Occupied Palestinian territory
Saudi Arabia
Tunisia
Yemen
Afghanistan
Egypt
Jordan
Libya
Oman
Sudan
Turkey
Algeria
Iran
Kuwait
Morocco
Qatar
Syria
United Arab Emirates

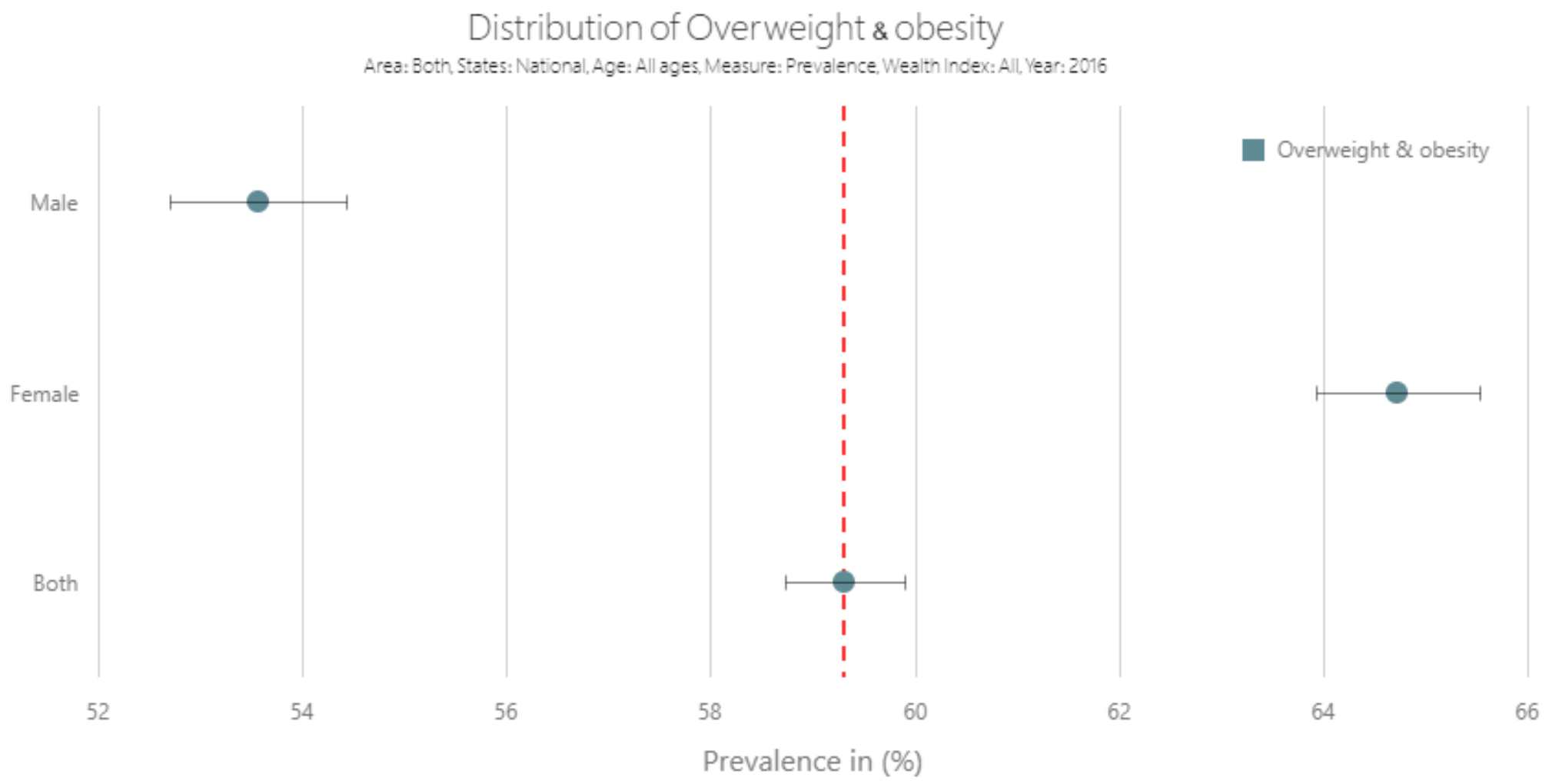
Observed/Expected of metabolic risk factors in the Middle East and north Africa by country.

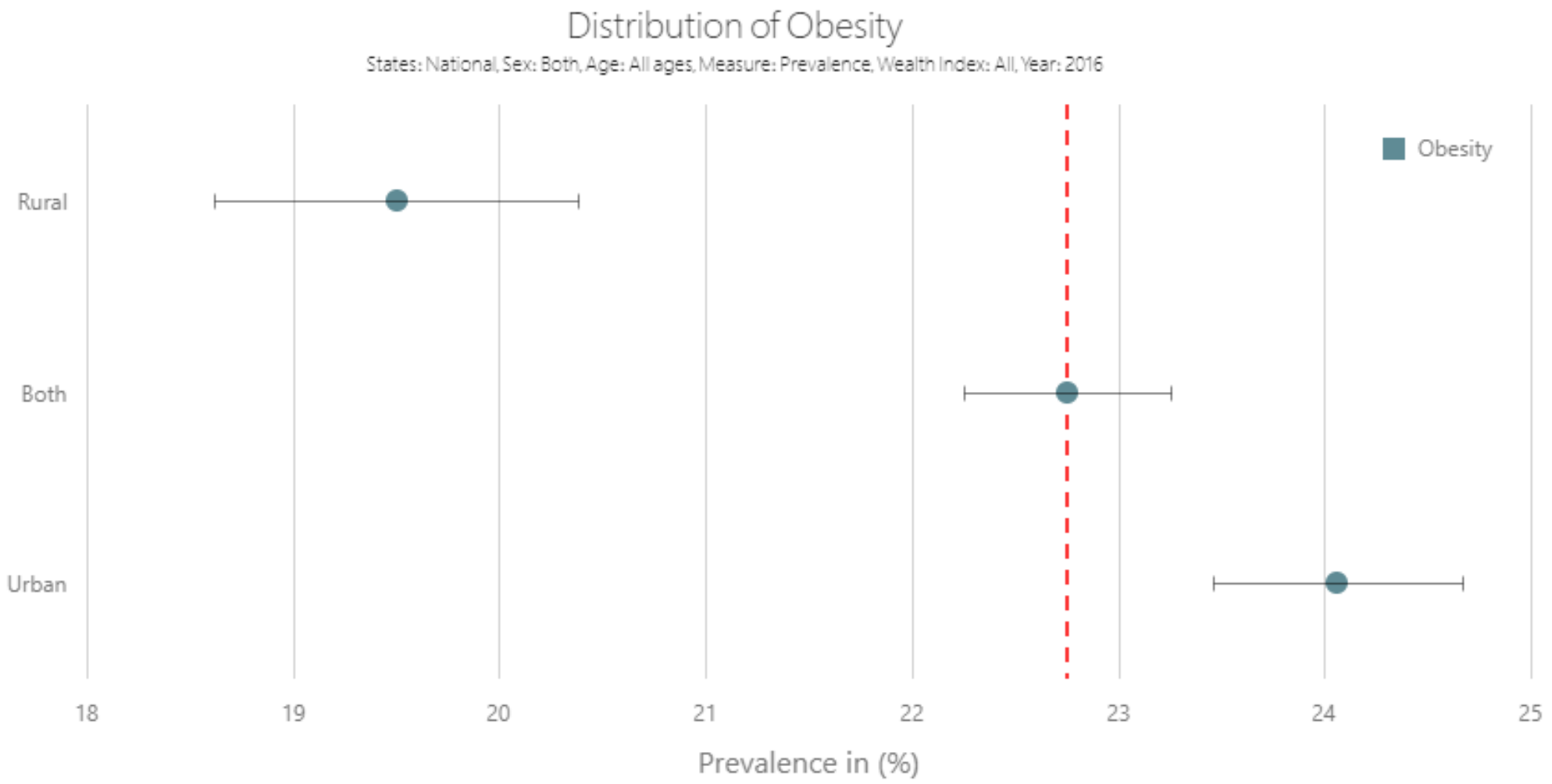
| | SDI | | High BMI | | High FPG | | High SBP | | High LDL cholesterol | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Index value | Regional rank | O/E | Rank | O/E | Rank | O/E | Rank | O/E | Rank |
| Kuwait | 0·79 | 1 | 2·03 | 21 | 1·45 | 11 | 0·88 | 6 | 1·07 | 11 |
| United Arab Emirates | 0·79 | 1 | 1·62 | 15 | 1·72 | 15 | 0·96 | 10 | 1·06 | 10 |
| Saudi Arabia | 0·78 | 3 | 1·85 | 19 | 1·81 | 20 | 0·9 | 7 | 0·86 | 4 |
| Qatar | 0·77 | 4 | 1·95 | 20 | 1·44 | 10 | 0·96 | 10 | 0·82 | 3 |
| Libya | 0·76 | 5 | 1·45 | 13 | 1·76 | 19 | 1·38 | 17 | 0·94 | 5 |
| Occupied Palestinian territory | 0·74 | 6 | 1·63 | 16 | 1·53 | 13 | 0·81 | 2 | 1·3 | 20 |
| Lebanon | 0·73 | 7 | 1·55 | 14 | 1·73 | 17 | 1·02 | 13 | 1·18 | 18 |
| Turkey | 0·73 | 7 | 1·42 | 7 | 0·78 | 1 | 0·9 | 7 | 0·78 | 1 |
| Bahrain | 0·71 | 9 | 1·66 | 17 | 1·72 | 15 | 1·05 | 14 | 1·12 | 16 |
| Algeria | 0·7 | 10 | 1·43 | 8 | 1·36 | 7 | 0·7 | 1 | 0·81 | 2 |
| Iran | 0·7 | 10 | 1·15 | 2 | 1·3 | 6 | 0·86 | 3 | 1 | 8 |
| Jordan | 0·7 | 10 | 1·34 | 5 | 1·42 | 9 | 0·91 | 9 | 1·11 | 14 |
| Tunisia | 0·68 | 13 | 1·33 | 4 | 1·17 | 4 | 0·86 | 3 | 0·98 | 6 |
| Syria | 0·61 | 14 | 1·43 | 8 | 1·08 | 2 | 1·06 | 15 | 1·09 | 13 |
| Egypt | 0·6 | 15 | 1·74 | 18 | 1·75 | 18 | 1·07 | 16 | 0·99 | 7 |
| Iraq | 0·58 | 16 | 1·4 | 6 | 1·4 | 8 | 1·38 | 17 | 1·07 | 11 |
| Morocco | 0·58 | 16 | 1·44 | 11 | 1·45 | 11 | 1·38 | 17 | 1·11 | 14 |
| Oman | 0·54 | 18 | 1·43 | 8 | 1·63 | 14 | 1·5 | 21 | 1·13 | 17 |
| Sudan | 0·48 | 19 | 1·44 | 11 | 1·18 | 5 | 1·38 | 17 | 1·05 | 9 |
| Yemen | 0·43 | 20 | 0·94 | 1 | 1·09 | 3 | 0·87 | 5 | 1·21 | 19 |
| Afghanistan | 0·29 | 21 | 1·22 | 3 | 2·2 | 21 | 0·96 | 10 | 1·36 | 21 |

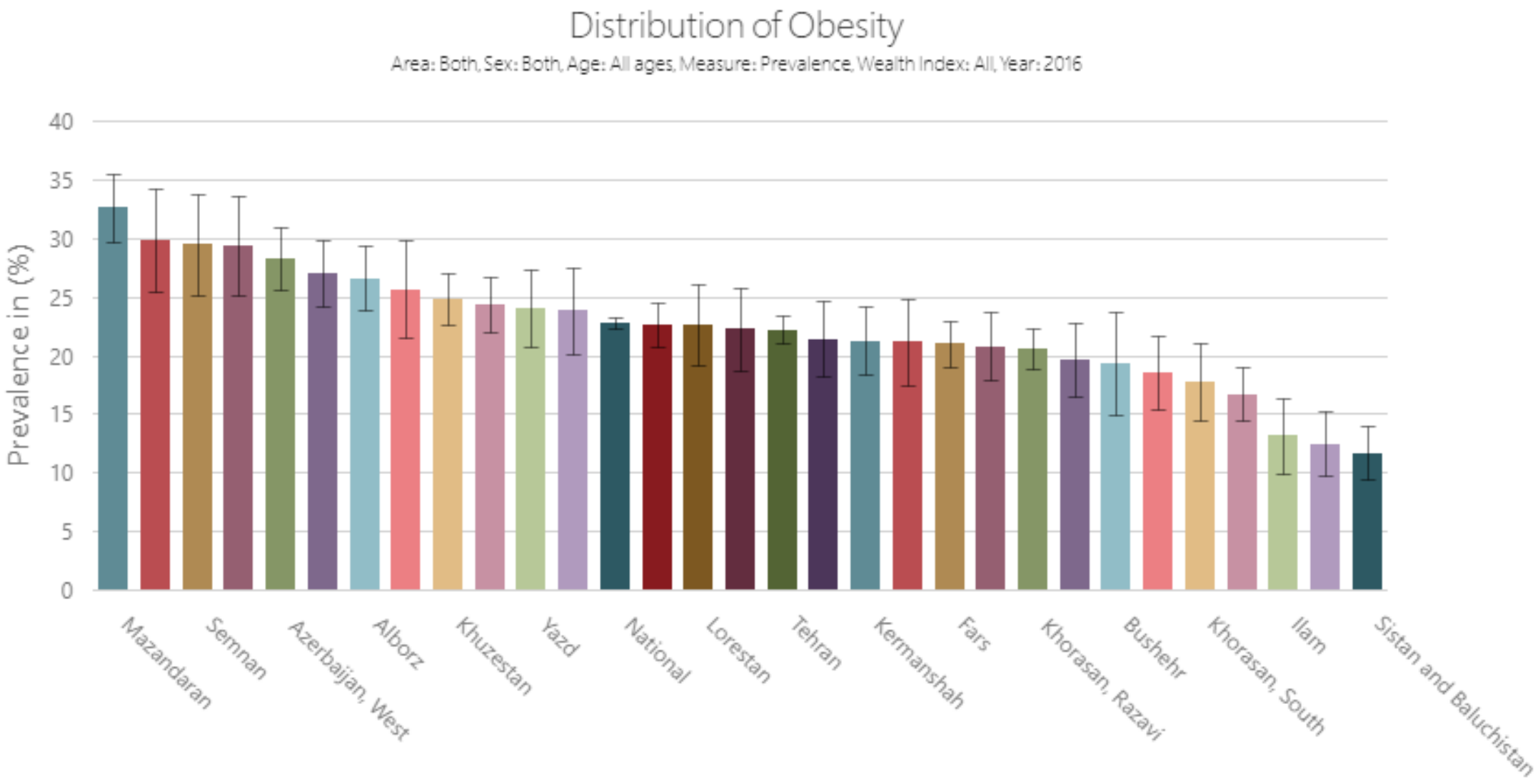
Projection for age-standardised prevalence of high BMI and high FPG

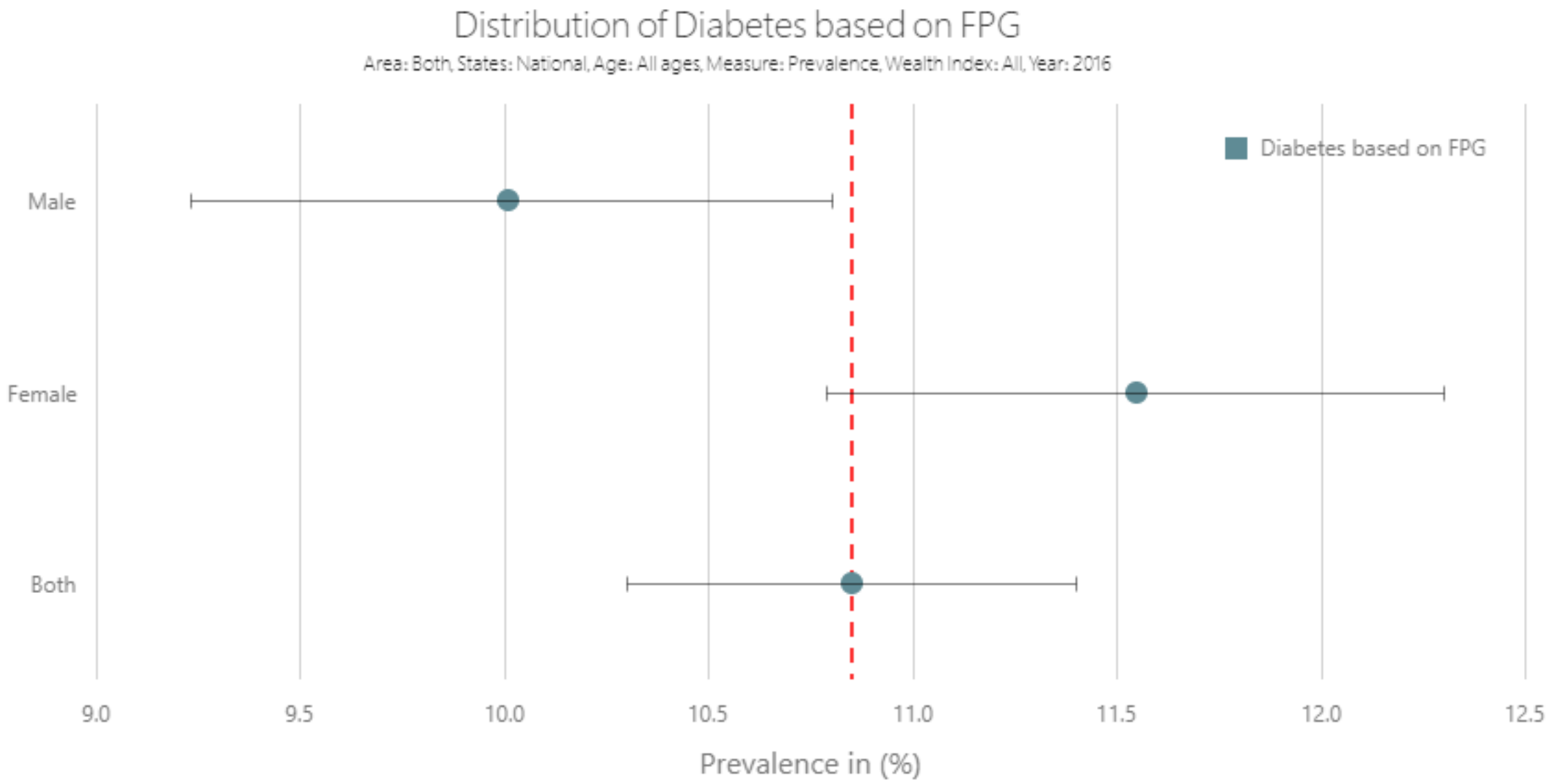


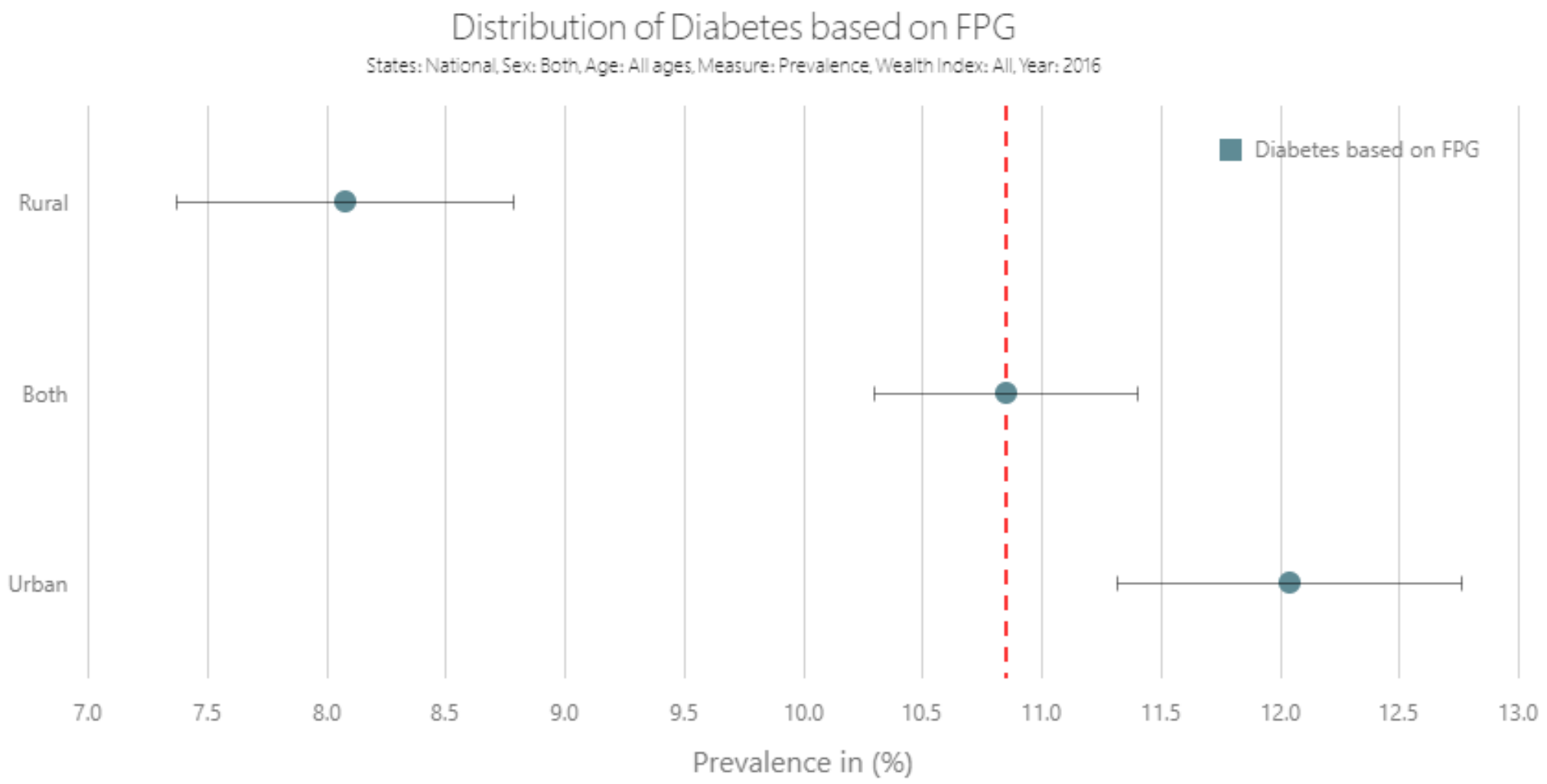

Distribution of Obesity
Area: Both, States: National, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Obesity
Male
Female
Both
14
16
18
20
22
24
26
28
30
32
Prevalence in (%)

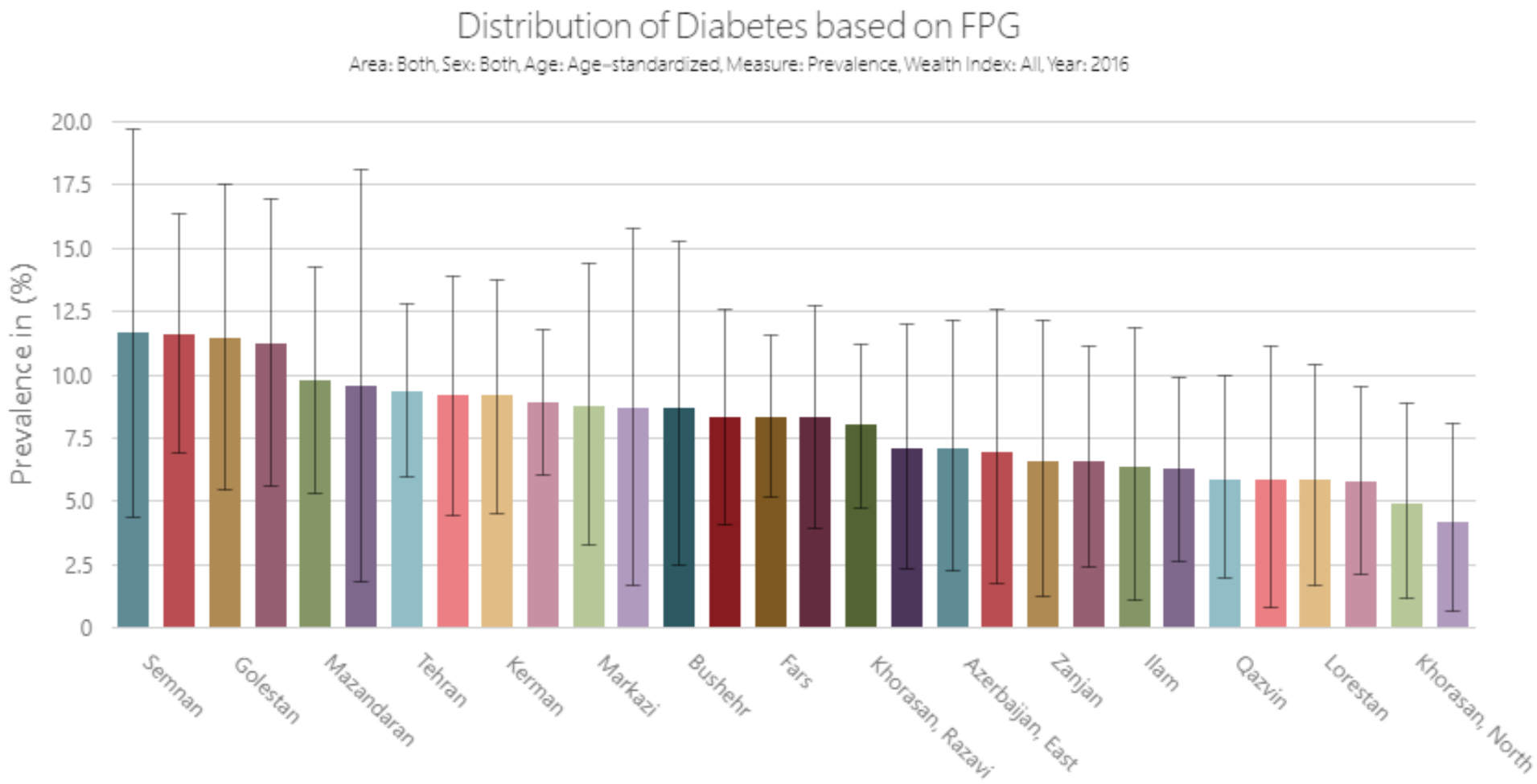

Distribution of Overweight & obesity
Area: Both, States: National, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Overweight & obesity
Male
Female
Both
52
54
56
58
60
62
64
66
Prevalence in (%)


Distribution of Obesity
States: National, Sex: Both, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Obesity
Rural
Both
Urban
18
19
20
21
22
23
24
25
Prevalence in (%)

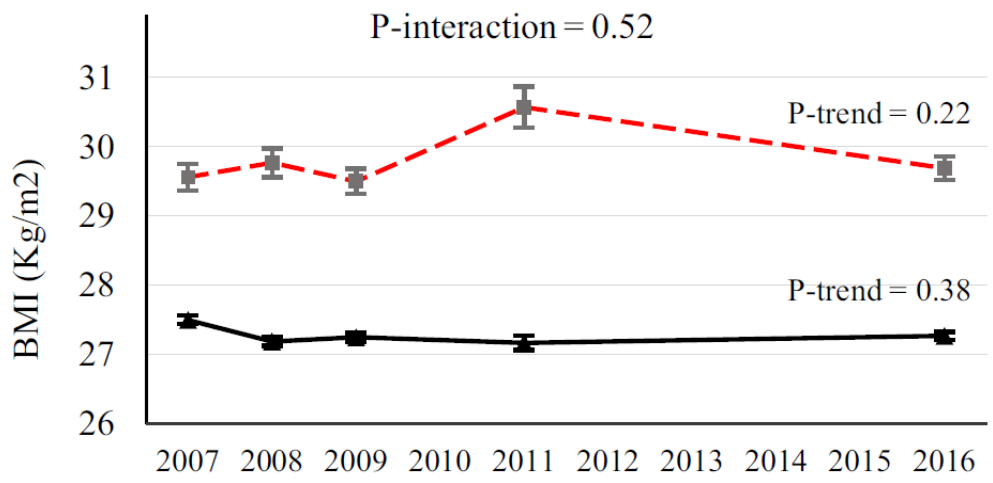

Distribution of Obesity
Area: Both, Sex: Both, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Prevalence in (%)
40
35
30
25
20
15
10
5
0
Mazandaran
Semnan
Azerbaijan, West
Alborz
Khuzestan
Yazd
National
Lorestan
Tehran
Kermanshah
Fars
Khorasan, Razavi
Bushehr
Khorasan, South
Ilam
Sistan and Baluchistan

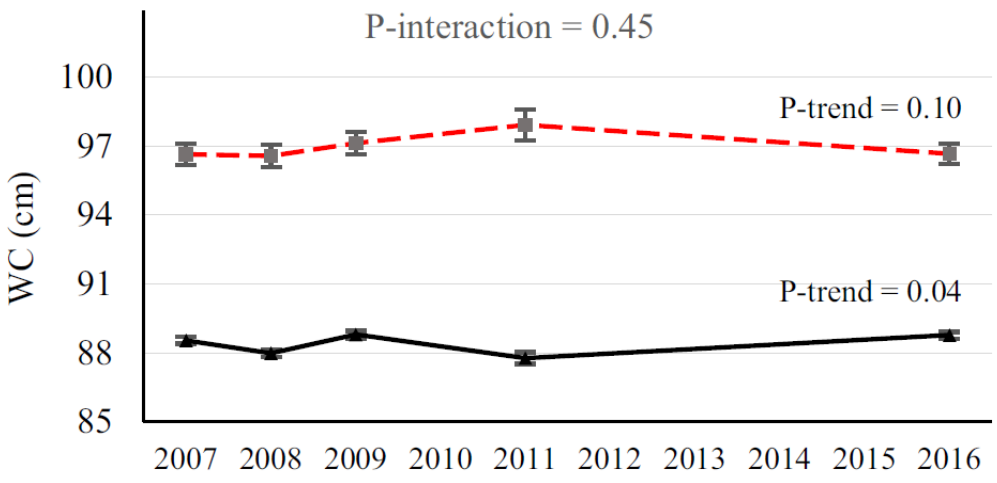

Distribution of Diabetes based on FPG
Area: Both, States: National, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Diabetes based on FPG
Male
Female
Both
9.0
9.5
10.0
10.5
11.0
11.5
12.0
12.5
Prevalence in (%)


Distribution of Diabetes based on FPG
States: National, Sex: Both, Age: All ages, Measure: Prevalence, Wealth Index: All, Year: 2016
Diabetes based on FPG
Rural
Both
Urban
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0
11.5
12.0
12.5
13.0
Prevalence in (%)

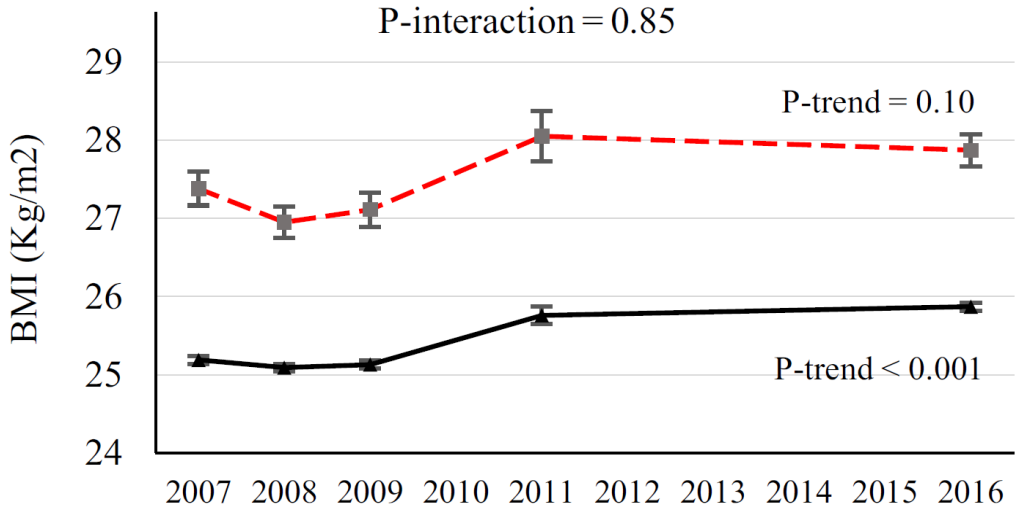

Distribution of Diabetes based on FPG
Area: Both, Sex: Both, Age: Age-standardized, Measure: Prevalence, Wealth Index: All, Year: 2016
Prevalence in (%)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
Semnan
Golestan
Mazandaran
Tehran
Kerman
Markazi
Bushehr
Fars
Khorasan, Razavi
Azerbaijan, East
Zanjan
Ilam
Qazvin
Lorestan
Khorasan, North

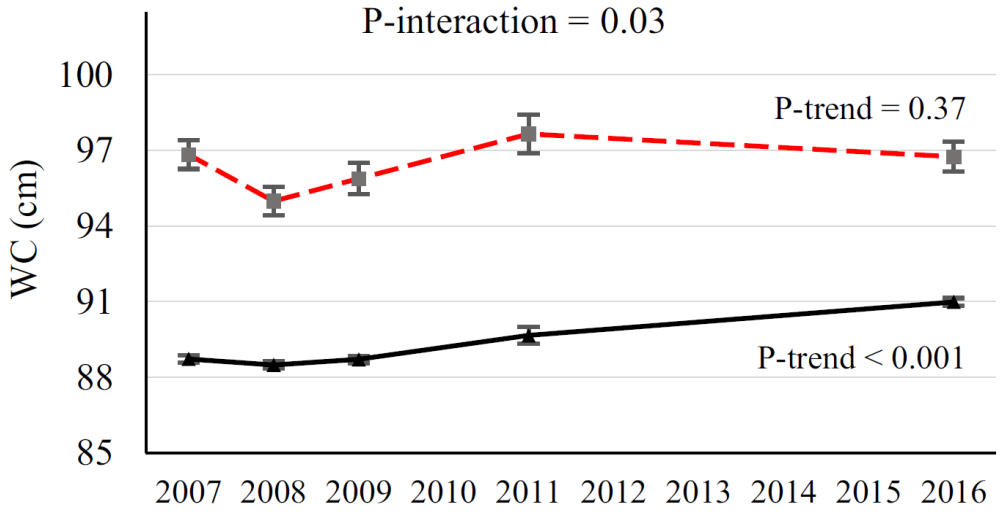
Women



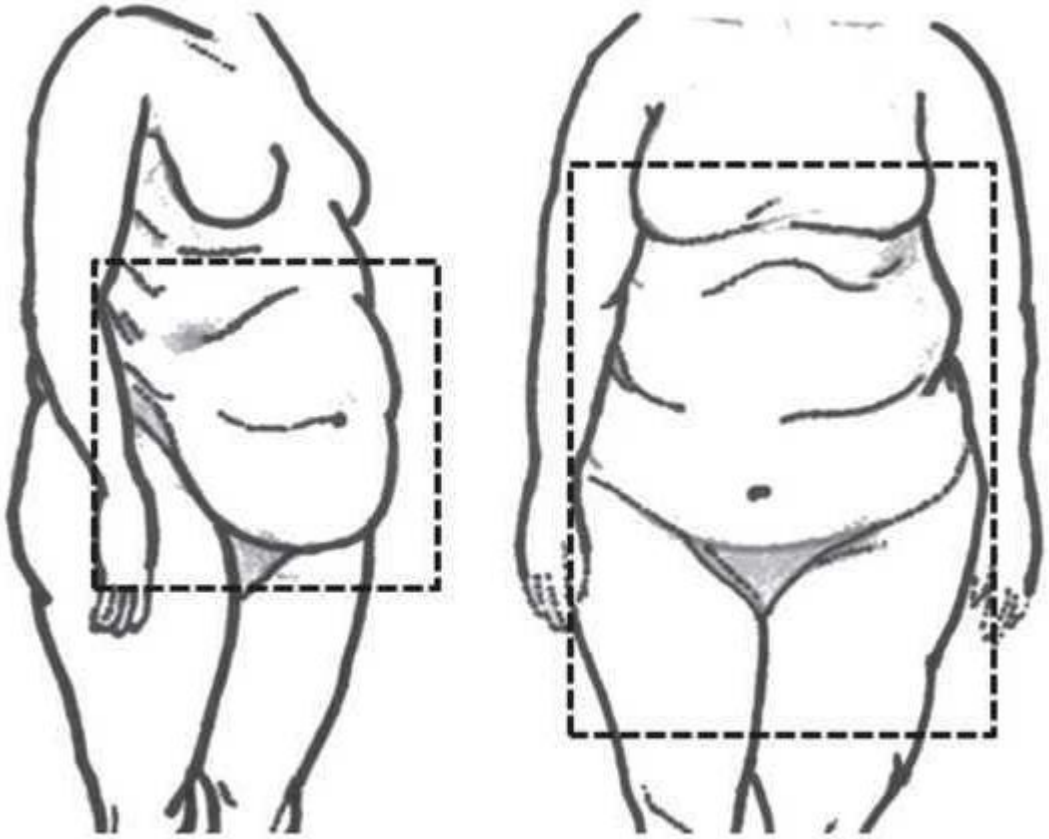

Men




Trends of BMI and Waist Circumference (WC) levels among Iranian women and men with (red line) and without (black line) diabetes through 2007–2016.

Particularly increased central obesity strongly and independently predict an increased risk of cardiometabolic diseases.



Waist circumference (WC) cut-off points of **94 and 80** Cm to define overweight BMI (25 kg/m2) and **102 and 88** Cm for obese BMI (30 kg/m2) for men and women, respectively, have been recommended.

# Appropriate Waist Circumference Cut-off Points among Iranian Adults: The First Report of the Iranian National Committee of Obesity

Fereidoun Azizi MD[1], Davood Khalili MD[2,9], Hassan Aghajani MD[3], Alireza Esteghamati MD[4], Farhad Hosseinpanah MD[5], Alireza Delavari MD[6], Bagher Larijani MD[6], Parvin Mirmiran PhD[5], Yadollah Mehrabi PhD[2,7], Roya Kelishadi MD[8], Farzad Hadaegh MD[•9]

It is concluded that anthropometric cut-offs, based on European populations are not appropriate for Iranians and that WC cut-off points, based on both cross-sectional and longitudinal outcome based studies, are equal in both genders in Iran.

a. WC of ≥90 cm in both genders: at risk for CVD risk factors requiring life style change.

b. WC of ≥95 cm in both genders: high risk for CVD events requiring immediate preventive interventions.

# COVID-19 in Iran

# COVID-19 CORONAVIRUS PANDEMIC

Last updated: May 20, 2021, 01:53 GMT

## ACTIVE CASES

**17,543,055**

Currently Infected Patients

**17,442,937** (99.4%) in Mild Condition

**100,118** (0.6%) Serious or Critical

Show Graph

## CLOSED CASES

**148,000,553**

Cases which had an outcome:

**144,569,322** (98%) Recovered / Discharged

**3,431,231** (2%) Deaths

Show Graph

https://www.worldometers.info/coronavirus/

# COVID-19 CORONAVIRUS PANDEMIC

Last updated: May 20, 2021, 01:53 GMT

## Iran

### ACTIVE CASES

**441,720**

Currently Infected Patients

**436,562** (99%)
in Mild Condition

**5,158** (1%)
Serious or Critical

Show Graph

### CLOSED CASES

**2,350,484**

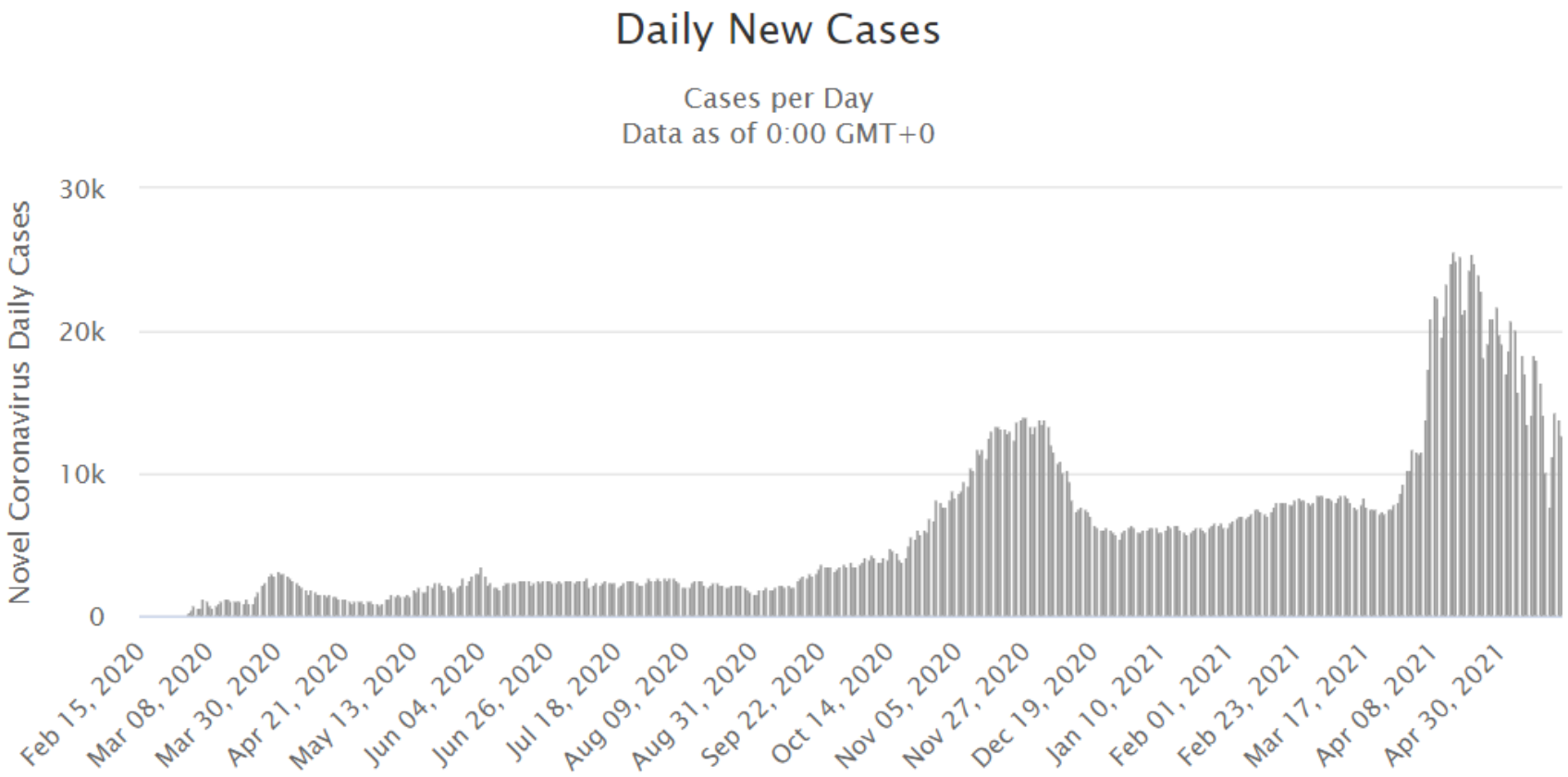
Cases which had an outcome:

**2,272,719** (97%)
Recovered / Discharged

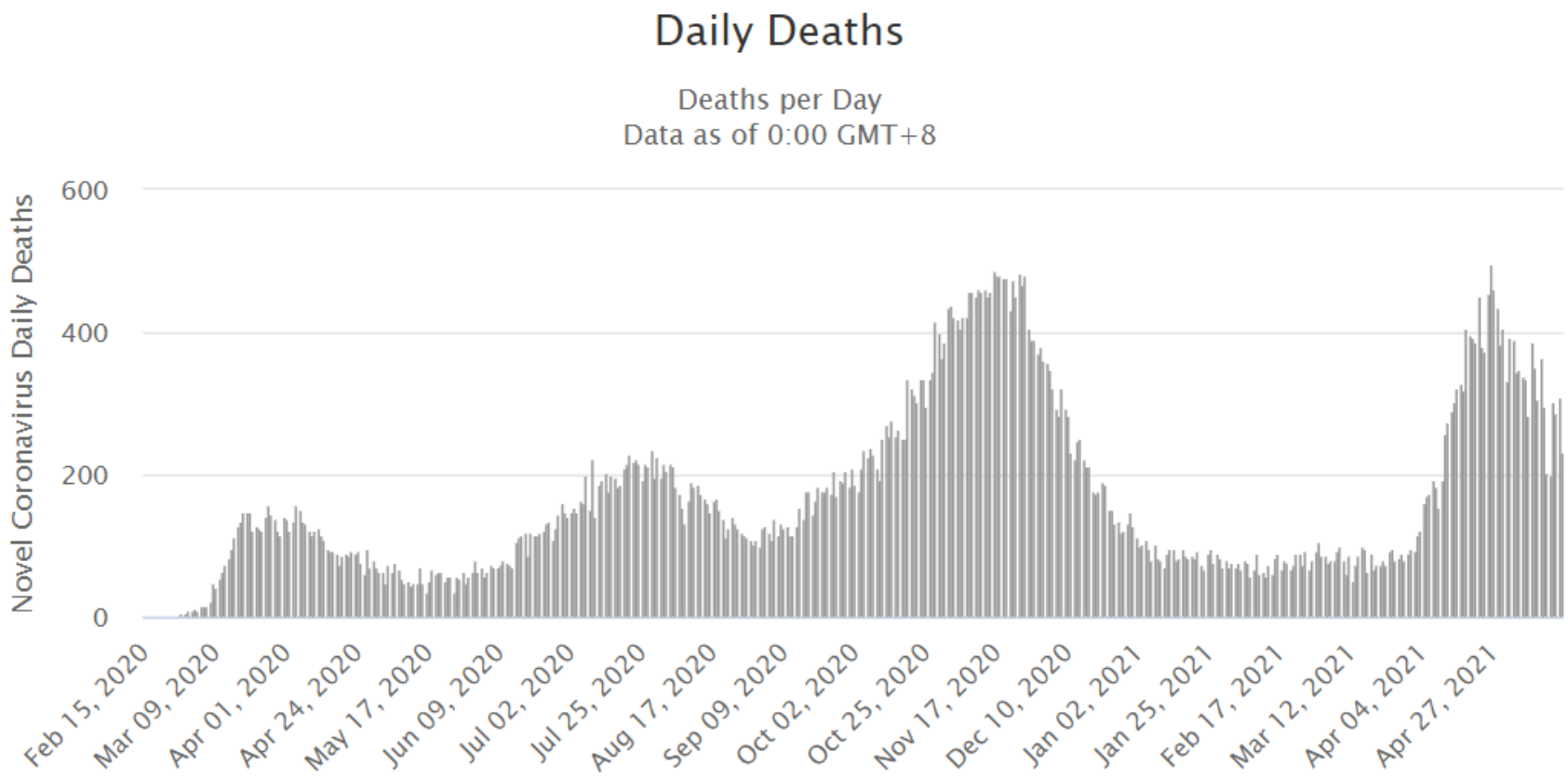
**77,765** (3%)
Deaths

Show Graph

# Daily New Cases in Iran



# Daily New Deaths in Iran



با تشکر از توجه شما