



# The unsustainability of obesity: metabolic food waste

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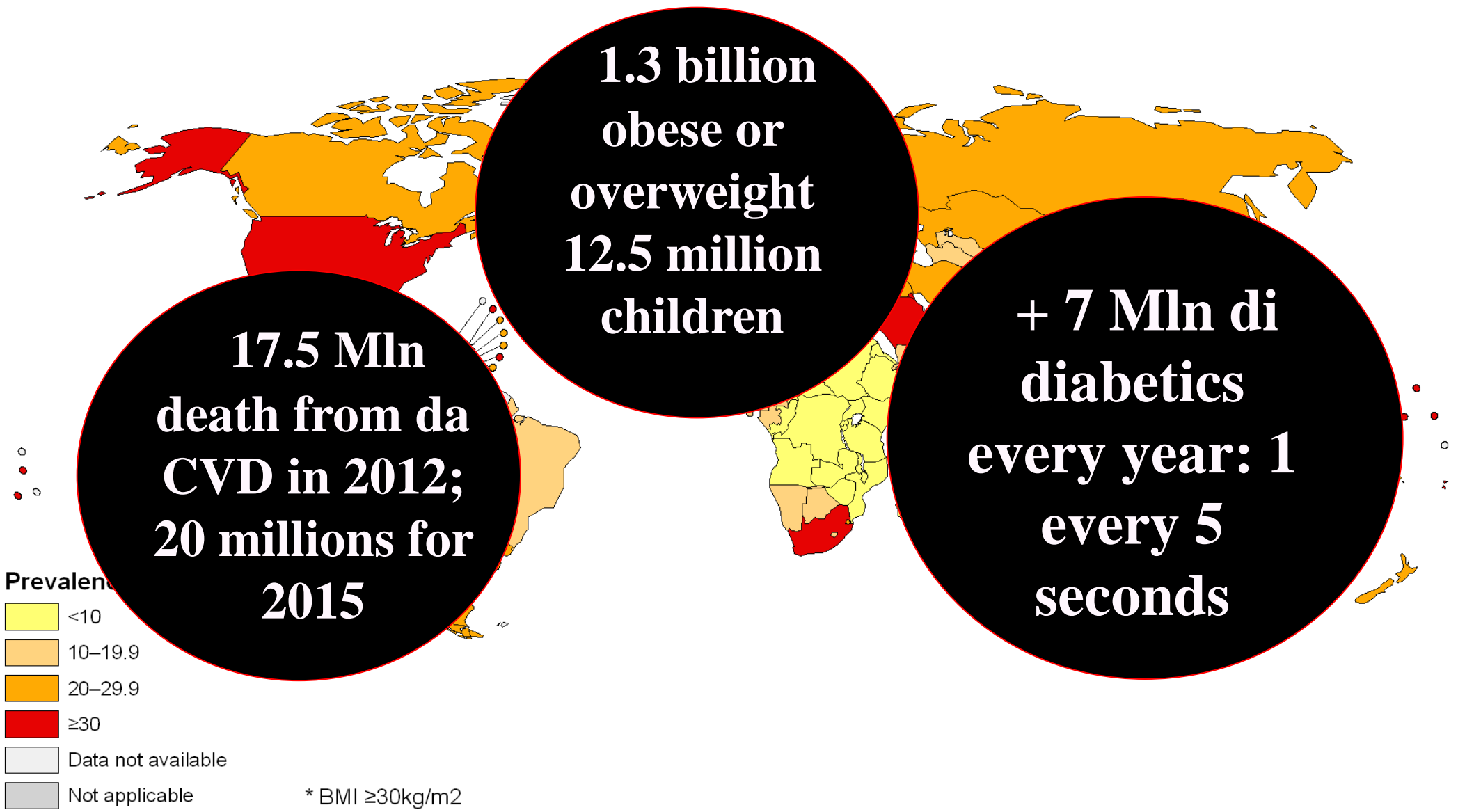
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- ✓ Obesity and postprandial metabolic stress in humans.
- ✓ Impact of sustainable and high stressor diets on ecological footprints.
- ✓ Metabolic Food Waste levels in different countries and FAO areas.

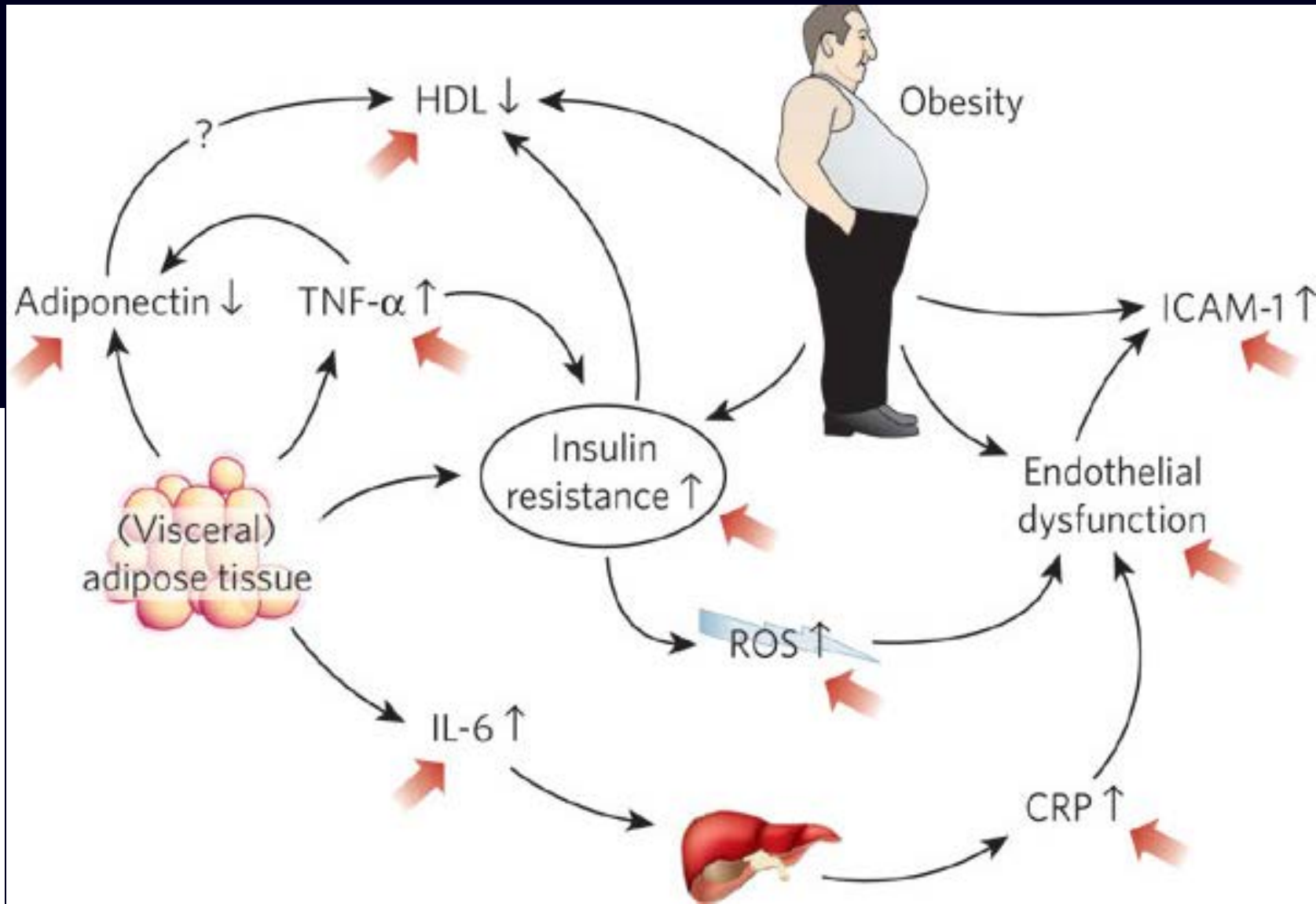
# Prevalence of obesity age standardized



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which

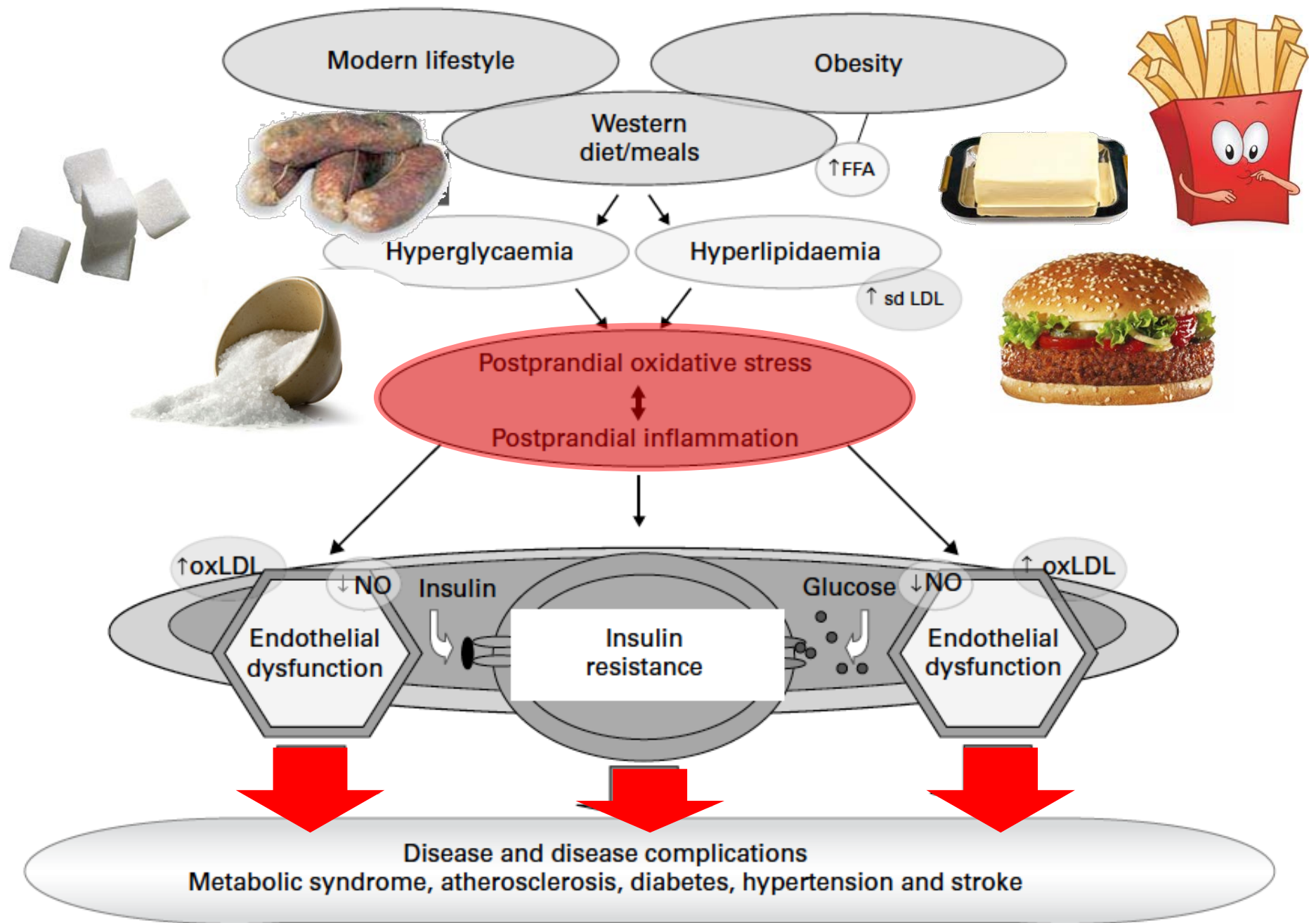
Data Source: World Health Organization  
Map Production: Public Health Information and Geographic Information Systems (GIS)

# THE "PLAGUE" OF OBESITY



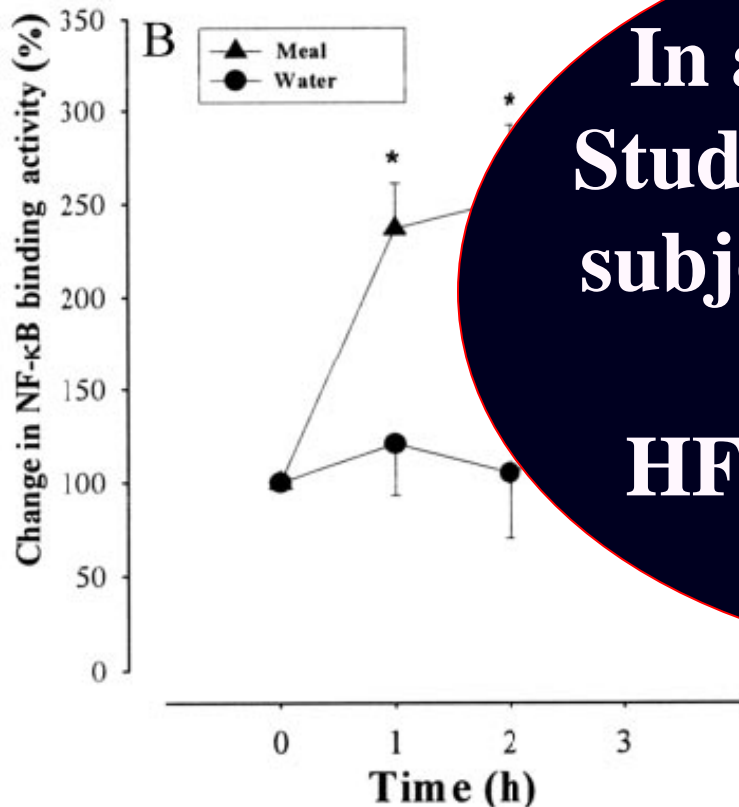
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"If more than 50% of the population is obese, then I'm not overweight, I'm average!"

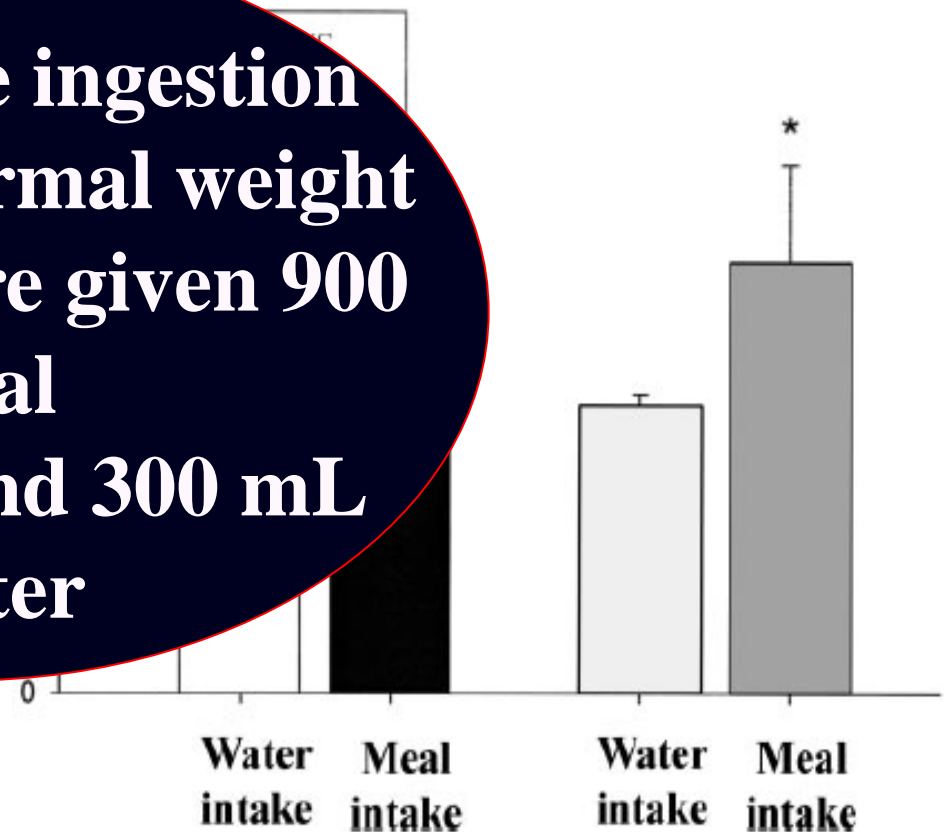


Increase in intranuclear nuclear factor  $\kappa$ B and decrease in inhibitor  $\kappa$ B in mononuclear cells after a mixed meal: evidence for a proinflammatory effect<sup>1-3</sup>

Ahmad Aljada, Priya Mohanty, Husam Ghanim, Toufic Abdo, Devjit Tripathy, Ajay Chaudhuri, and Paresh Dandona



**In an acute ingestion  
Study 15 normal weight  
subjects were given 900  
kcal  
HF meal and 300 mL  
water**



# **SUBJECTS**

✓ **Fifteen Healthy Overweight (13M, 2W)**

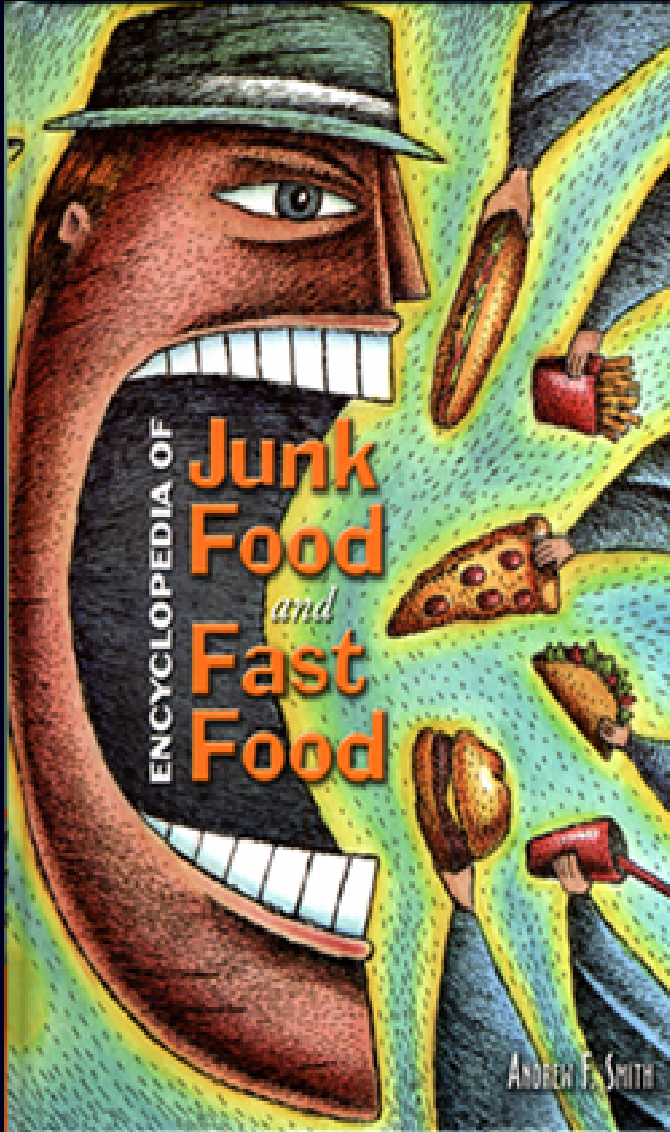
**BMI 25-30 Kg/m<sup>2</sup>**

**Age 30-55 years**

✓ **Non-smokers**

✓ **No drug or vitamin supplements**

# STRESSOR MEAL



**Total Energy: 1351 kcal**

**Fat : ~ 55 % E°**

**Protein : ~ 29 % E°**

**Carbohydrates : ~ 15 % E°**

- ✓ **Cheese (90g)**
- ✓ **Bread (90g)**
- ✓ **Potatoes (212g)**
- ✓ **Sunflower oil (32g)**
- ✓ **Whole eggs (108g)**



# STUDY DESIGN

2 Days wash-out

HFM p

Group A (n = 8)

HFM 2.4.5

Group B (n = 8)



Blood sampling (0, 0.5, 1, 2, 4, 6 and 8 h)  
Urine sampling (0-8, 8-12 and 12-24 h)

10 Days wash-out

Phases 2

# FJ

## 63% Juice

### blend:

Pineapple

Blackcurrant

Plum

### Extracts:

Pineapple

flavour

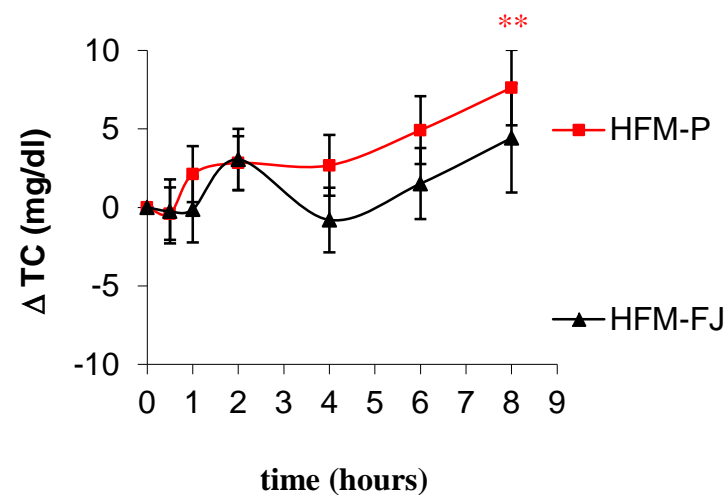
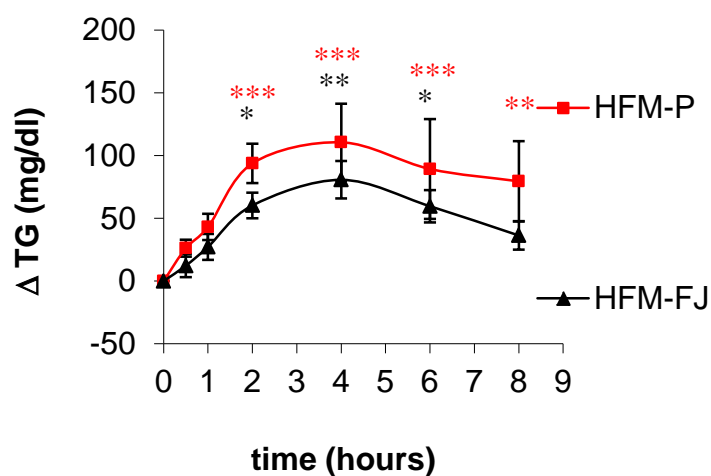
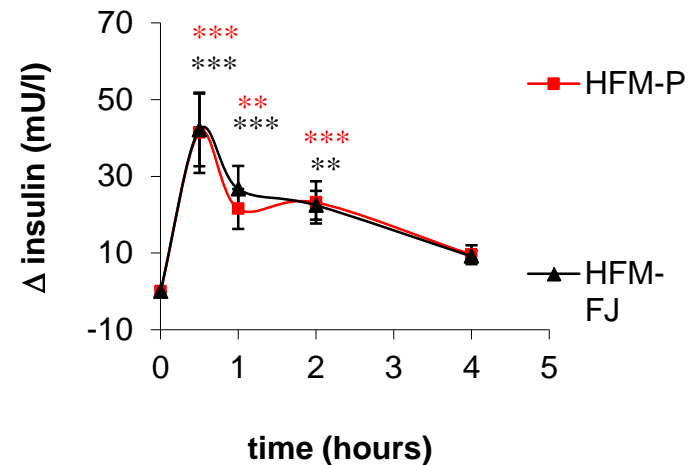
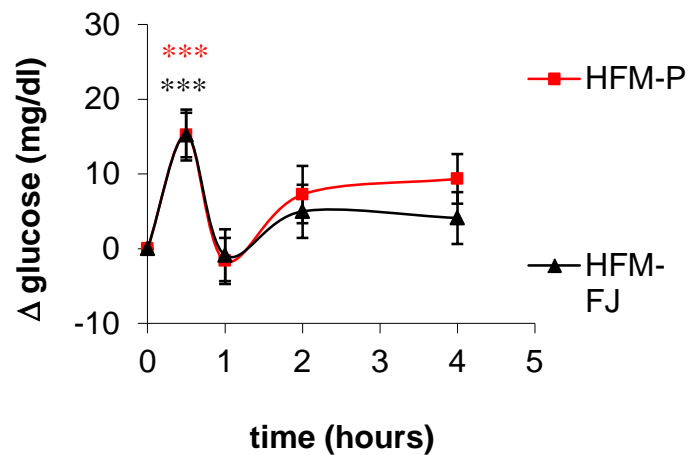
Plum flavour

Compound	mg/L
Anthocyanins	32.0
Hydroxycinnamates	0.5
Flavan-3-ols	2.5
Flavonols	20.0
Total Flavonols	795



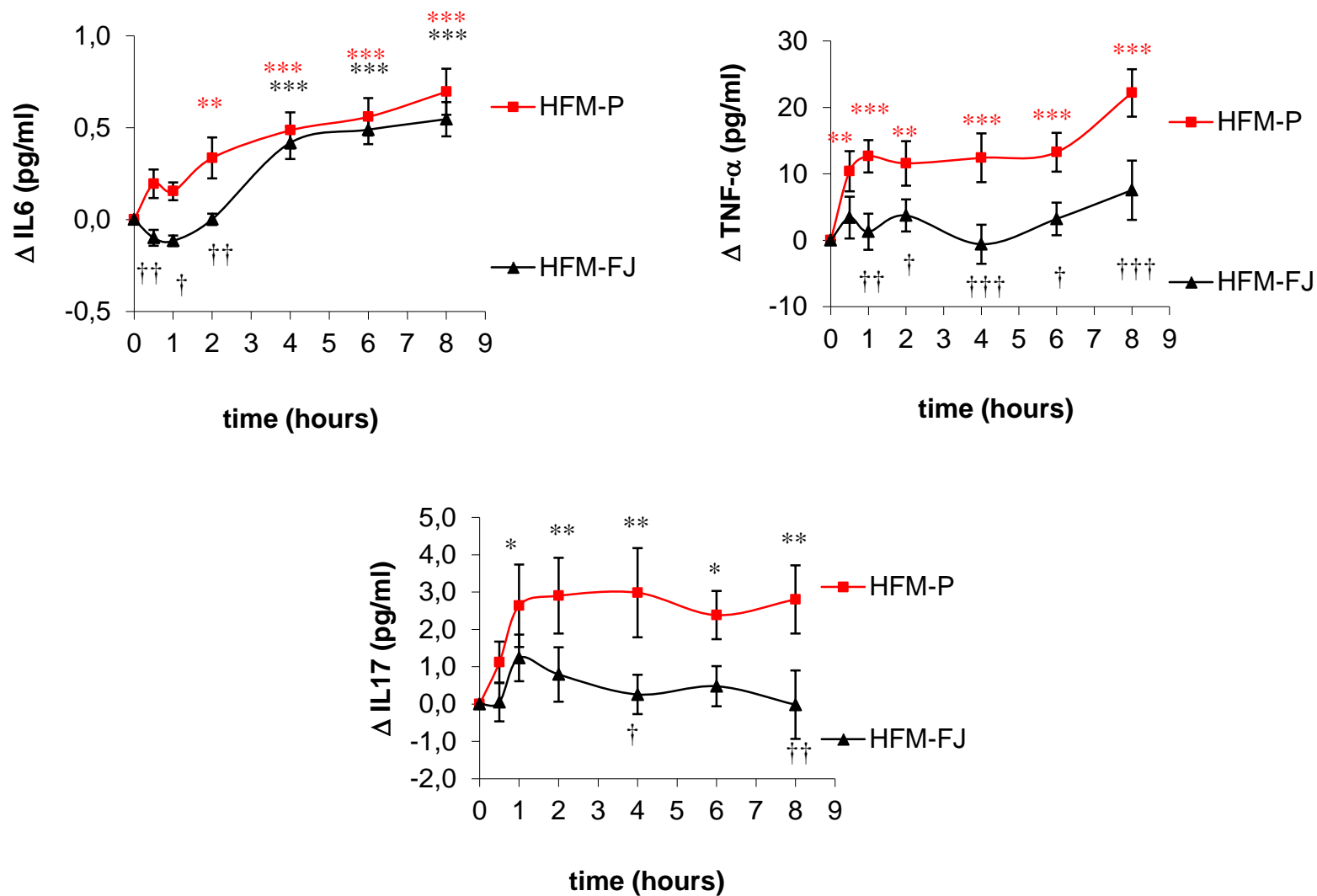
# High Fat Meal Increase of IL-17 is Prevented by Ingestion of Fruit Juice Drink in Healthy Overweight Subjects

Ilaria Peluso<sup>1</sup>, Anna Raguzzini<sup>1</sup>, Debora V Villano<sup>2</sup>, Eleonora Cesqui<sup>1</sup>, Elisabetta Toti<sup>1</sup>, Giovina Catasta<sup>1</sup> and Mauro Serafini<sup>1,\*</sup>



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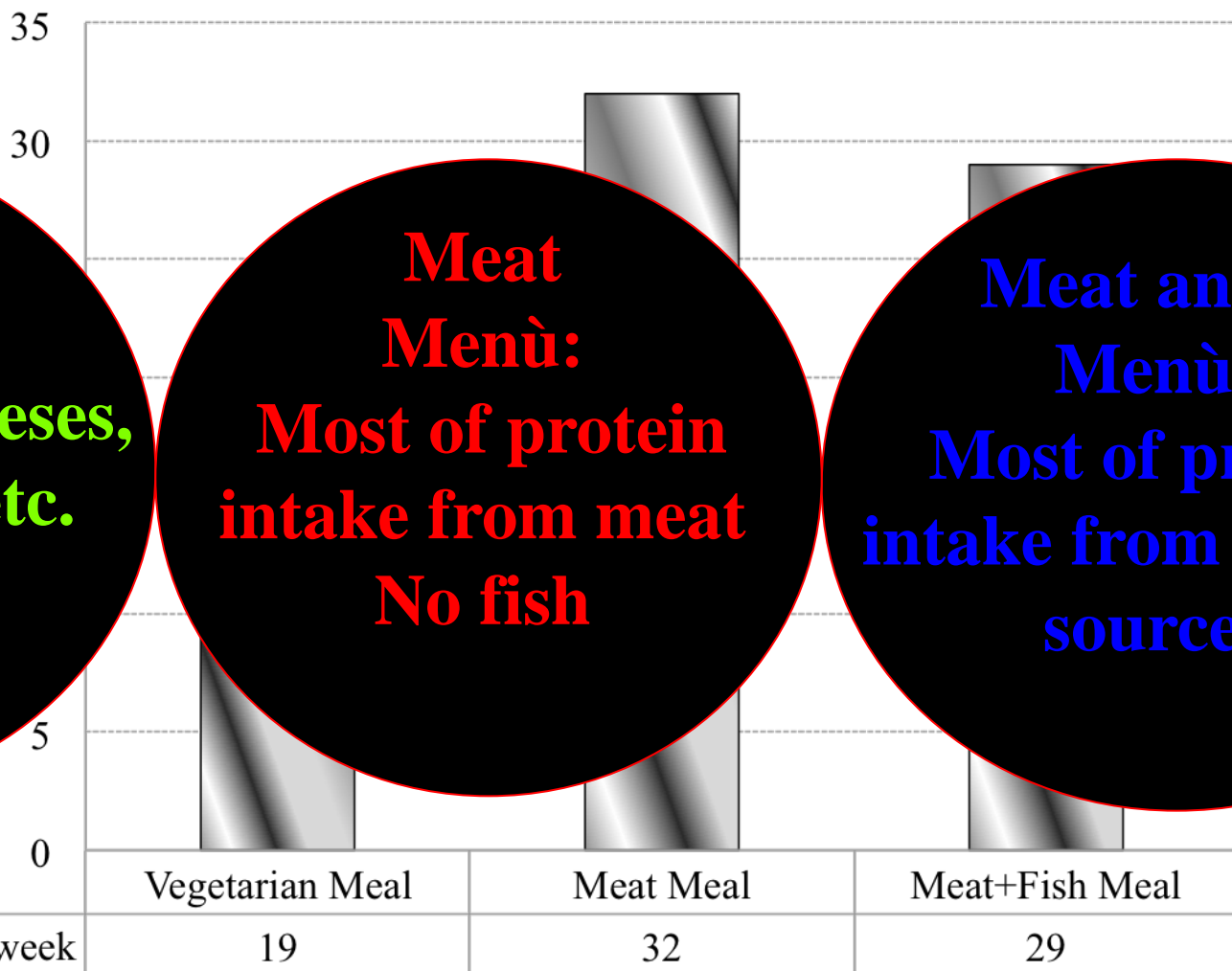
# "Double Pyramid"



Figure 2. The Environmental and Food Double Pyramid (Poli, 2010)

- ✓ Obesity and postprandial metabolic stress in humans.
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- ✓ Metabolic Food Waste levels in different countries and FAO areas.

# Carbon Footprint of three different nutritionally balanced meals



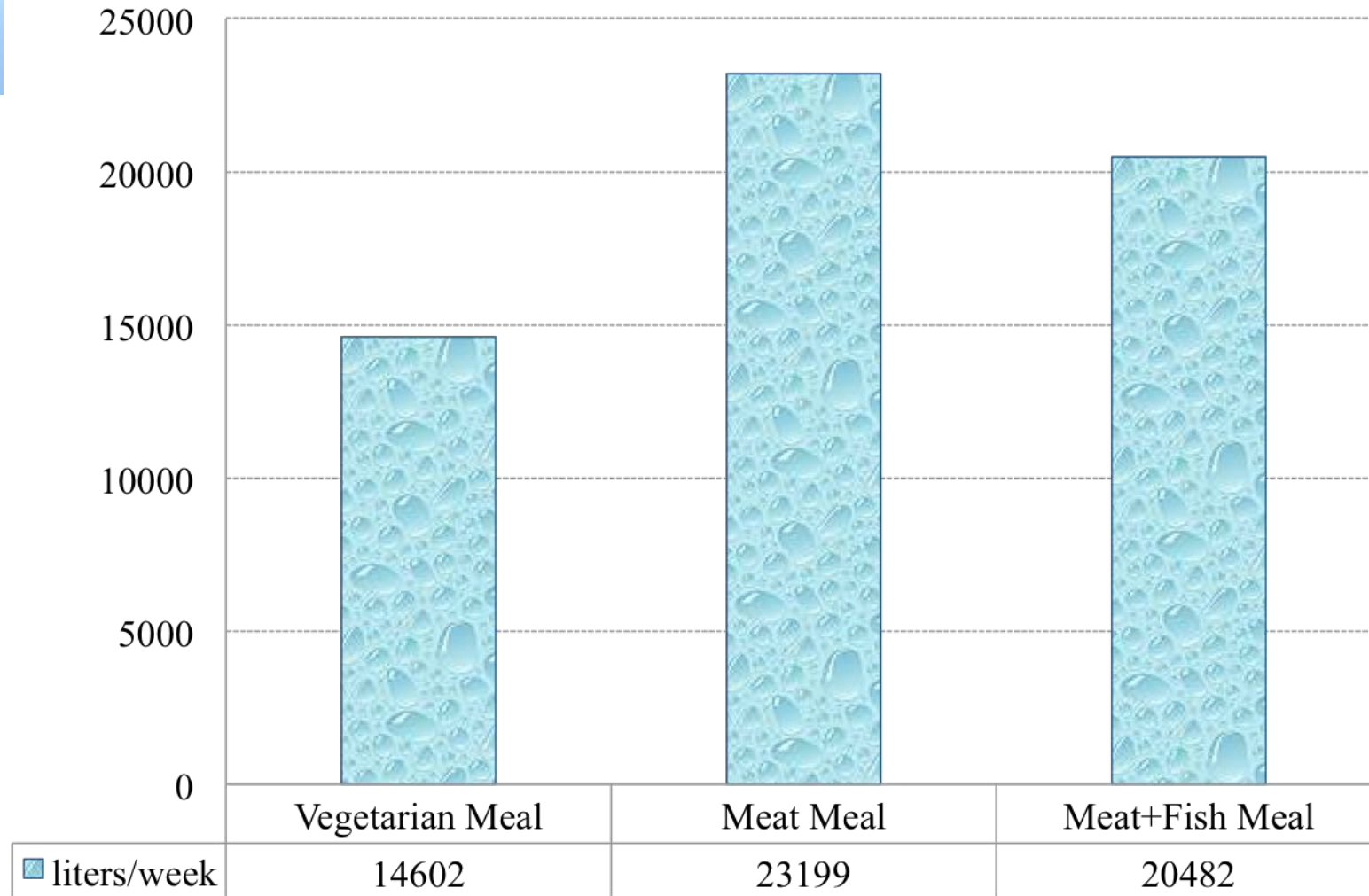
**Vegetarian Menu:**  
Protein from cheeses, legumes, eggs etc.  
No meat and fish

**Meat Menu:**  
Most of protein intake from meat  
No fish

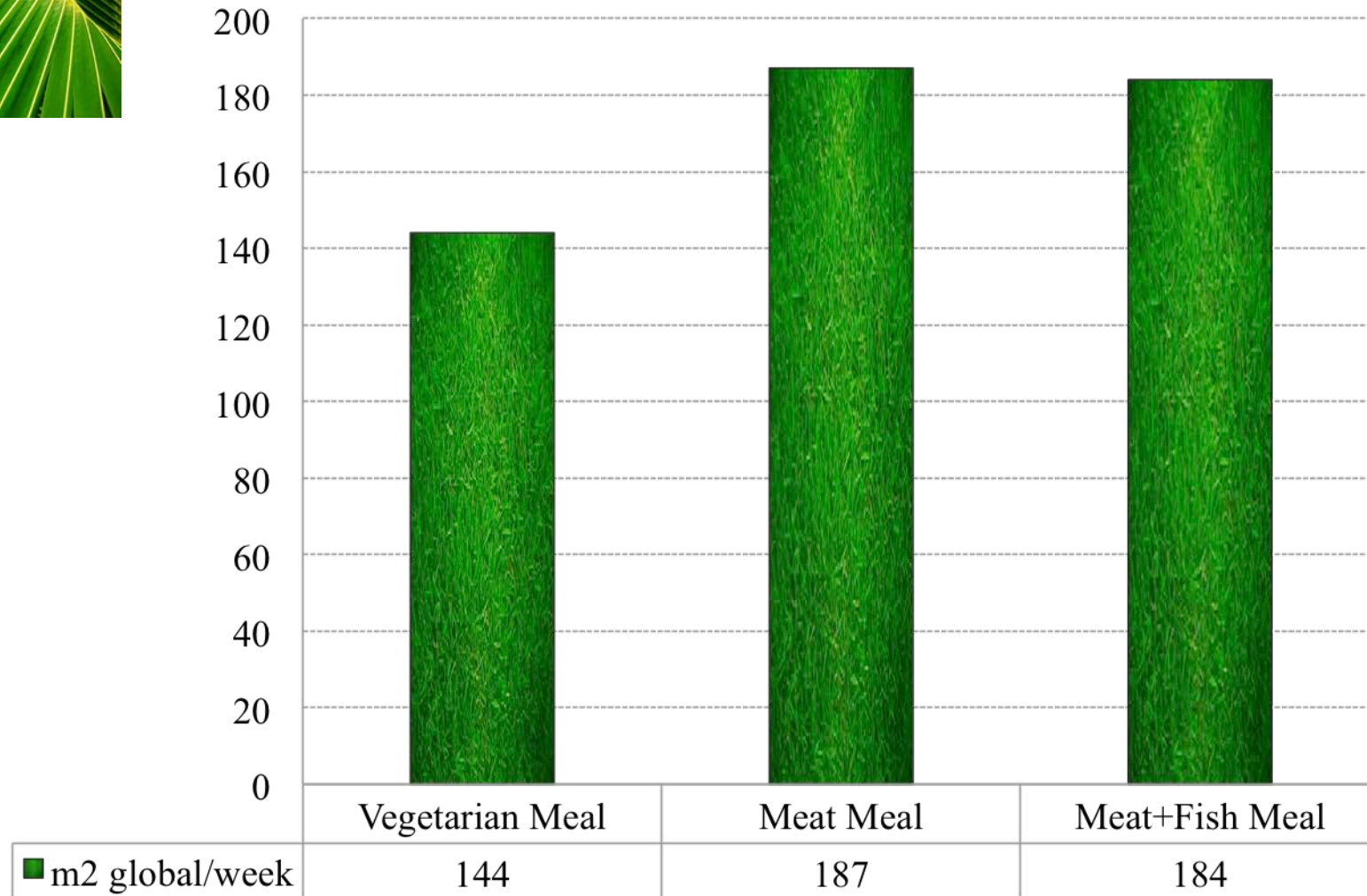
**Meat and Fish Menu:**  
Most of protein intake from animal sources



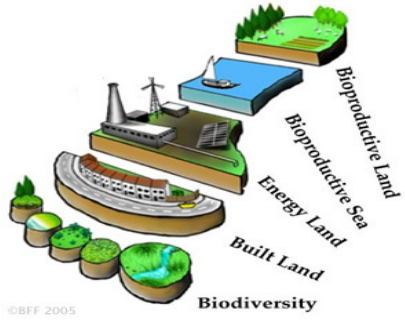
# Water Footprint of three different nutritionally balanced meals



# Ecological Footprint of three different nutritionally balanced meals



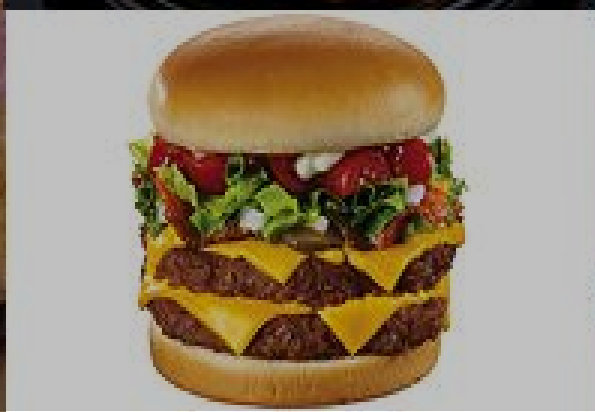
# Ecological Footprints by caloric intake

 <p>©BFF 2005 Biodiversity</p>	YEARLY IMPACT		
	Carbon Footprint (gCO <sub>2</sub> -eq)	Water Footprint (l)	Ecological Footprint (glob.m <sup>2</sup> )
<p><b>Normo caloric diet including meat (2140 kcal/day)</b></p>	1664	1206348	9724
<p><b>High caloric diet including meat (3048 kcal/day)</b></p>	2080	1525680	12324

**Food eaten above nutritional requirements and physiological needs leading to overweight and obesity represents an un-necessary cost for Health and Environment**



**METABOLIC FOOD WASTE**



- ✓ Obesity and postprandial metabolic stress in humans.
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# METHODS

36 countries included in 7 world regions (divided by FAO)

1. **Europe** (Austria, Belgium, Croatia, Italy, Norway, United Kingdom)
2. **Industrialized Asia** (China, Japan, South Korea)
3. **North America & Oceania** (USA, New Zealand, Australia, Canada)
4. **Latina America** (Argentina, Brazil, Colombia, Cuba, Haiti, Mexico)
5. **North Africa, West & Central Asia** (Egypt, Kuwait, Mongolia, Morocco, Saudi Arabia, United Arab Emirates)
6. **Subsaharan Africa** (Ethiopia, Mali, Nigeria, South Africa, Uganda, Zimbabwe)
7. **South & Southeast Asia** (India, Iran, Pakistan, Philippines, Viet Nam)

## Sets of data:

### FAOSTAT

- Population data
- Food Balance Sheet  
(food item: WHEAT)

### WHO-Global database on BMI

- BMI values

### DHS

- Body height



# METHODS

Mean BMI was utilized to calculate the average kilogram excess body fat (**EBF**) of the overweight and obese population.

Energy content of EBF was transformed in the amount of **wheat (Tons)** needed to provide that energy.

To express MFW in overweight and obese population three different markers were used:

- 1) The **amount** of wheat corresponding to EBF
- 2) The **amount** of wheat corresponding to EBF standardized for **100 000 inhabitants**
- 3) Percentage of wheat corresponding to EBF calculated on wheat **domestic supply (availability)**

# METABOLIC FOOD WASTE (MFW) LEVELS IN SINGLE COUNTRIES

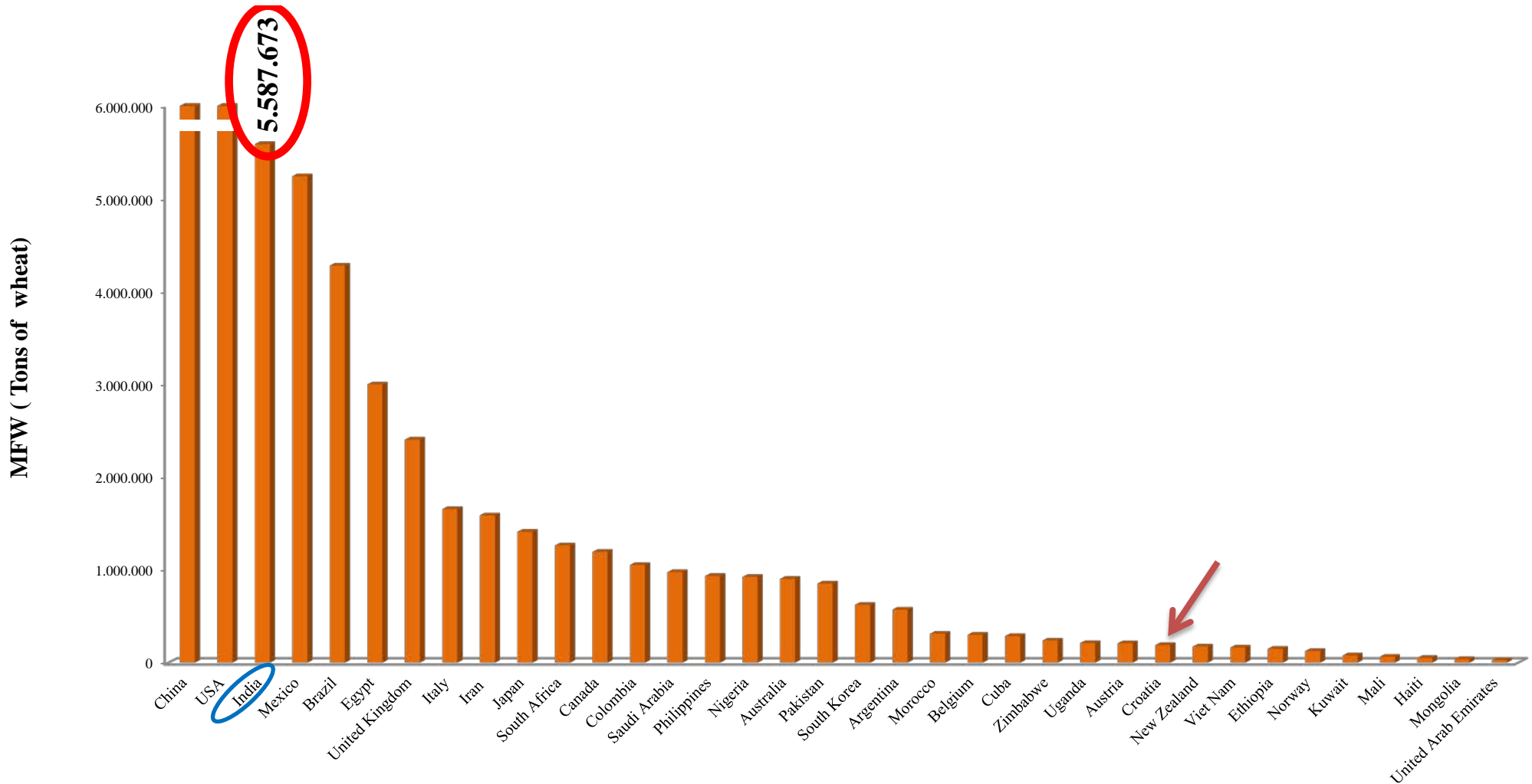


Figure 5. MFW levels expressed as tons of wheat in overweight and obese men and women in single countries



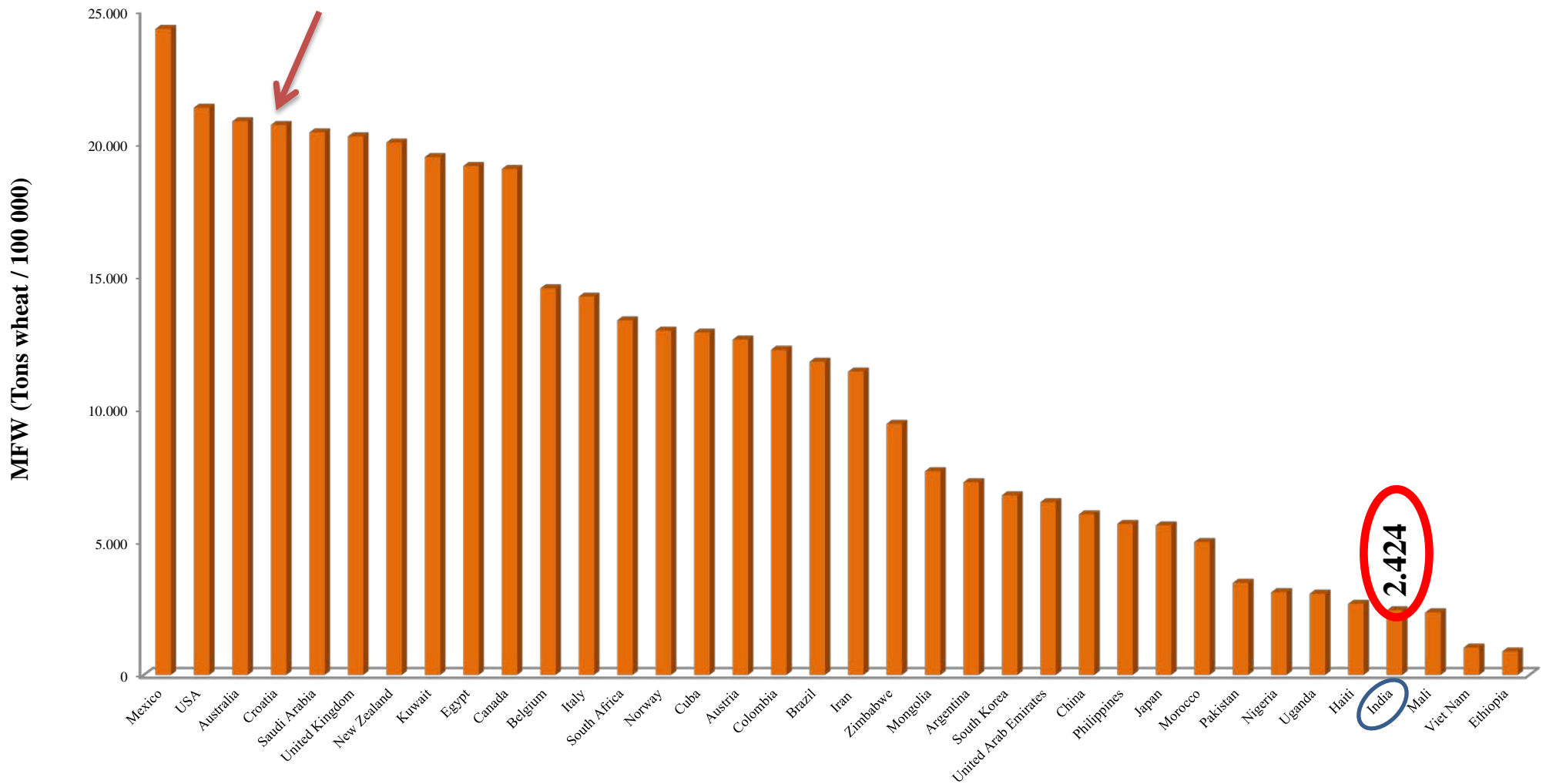


Figure 7. MFW levels expressed as tons of wheat for 100 000 overweight and obese men and women in single countries

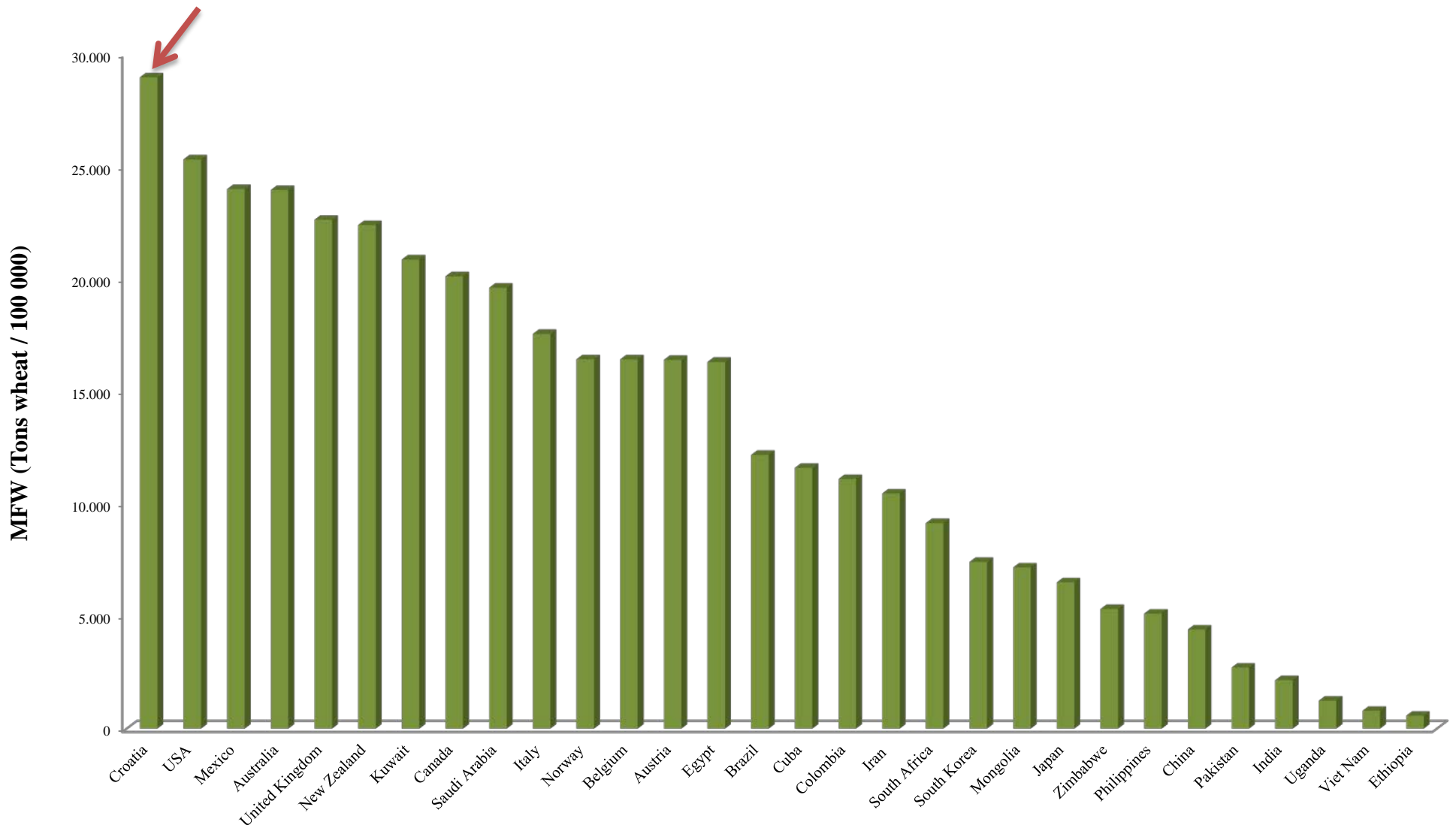


Figure 8. MFW levels expressed as tons of wheat in 100 000 overweight and obese men in single countries



Figure 9. MFW levels expressed as tons of wheat in 100 000 overweight and obese women in single countries

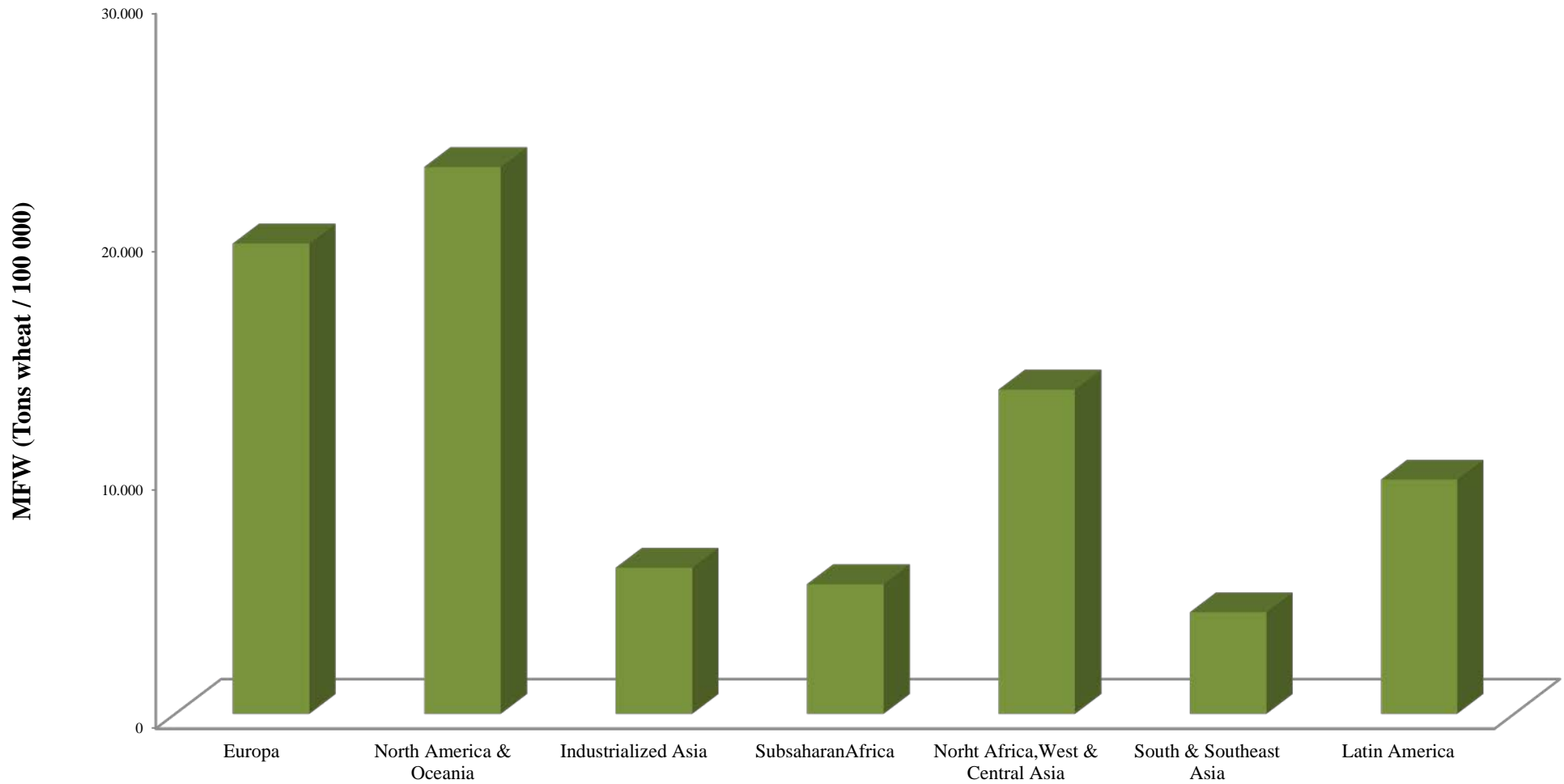


Figure 11. MFW levels expressed as tons of wheat in 100 000 overweight and obese men in different FAO region

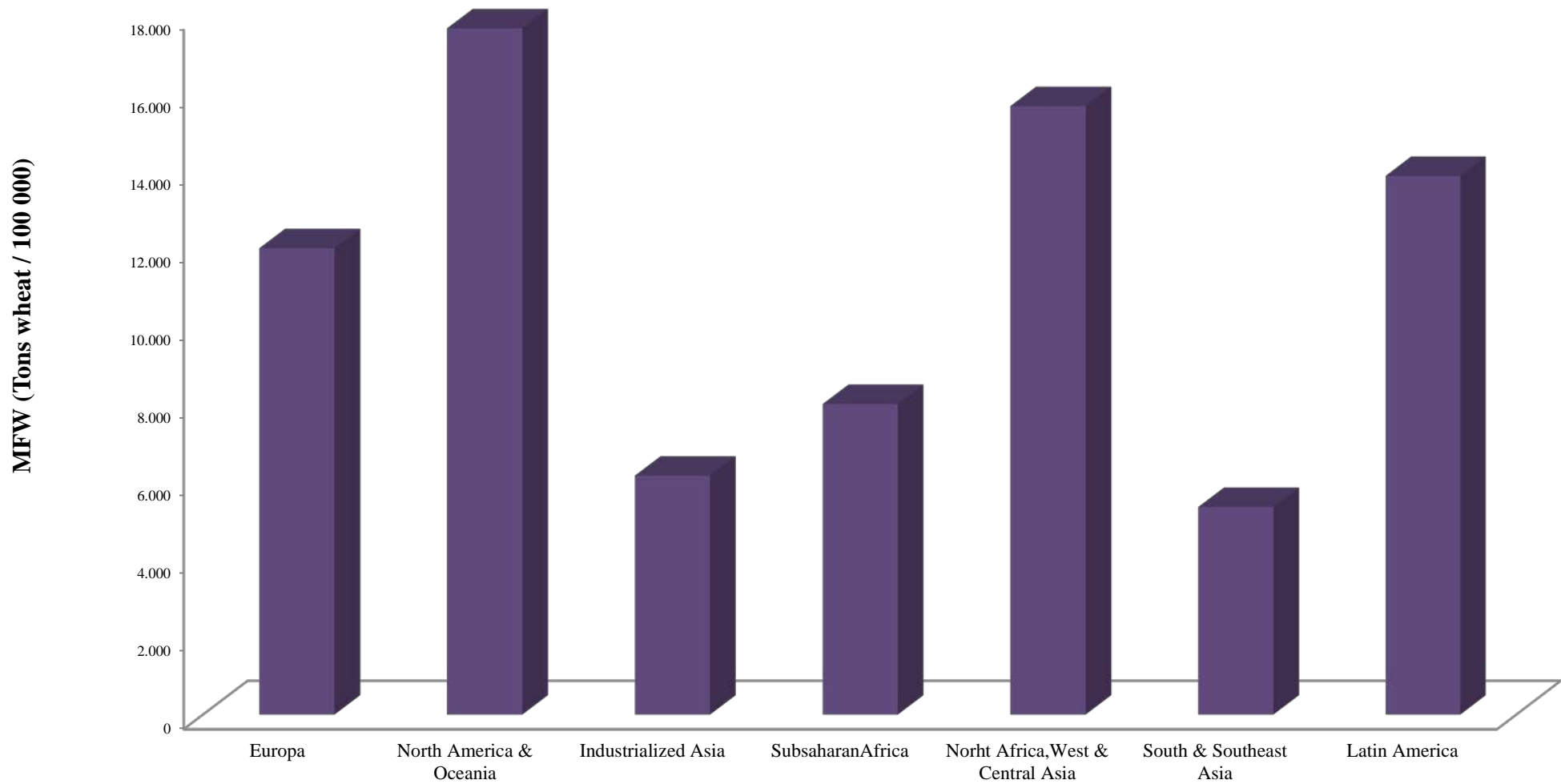


Figure 12. MFW levels expressed as tons of wheat in 100 000 overweight and obese women in different FAO region

# CONCLUSIONS

- ✓ Obesity burden represents a significant increment to the global statistics on food waste and an ecological cost for the Planet, characterizing obesity as an “unsustainable” condition.
- ✓ For the first time we present the position that food eaten above physiological needs, manifesting as overweight and obesity, should also be considered as food waste, Metabolic Food Waste.
- ✓ Our results shows that that MFW is higher in industrialized than non-industrialized regions where North America and Oceania showed the highest MFW level. Croatia, despite its Mediterranean roots, is represented in most of the figures as the European country with the highest MFW levels.
- ✓ Although further evidence is needed, MFW index might be a useful tool to plan strategies of intervention to reduce medical and ecological “unsustainable” costs associated to obesity.
- ✓ **The big challenge for next future relies on the increase of life quality with sustainable and functional foods for Human and Planet Health.**

