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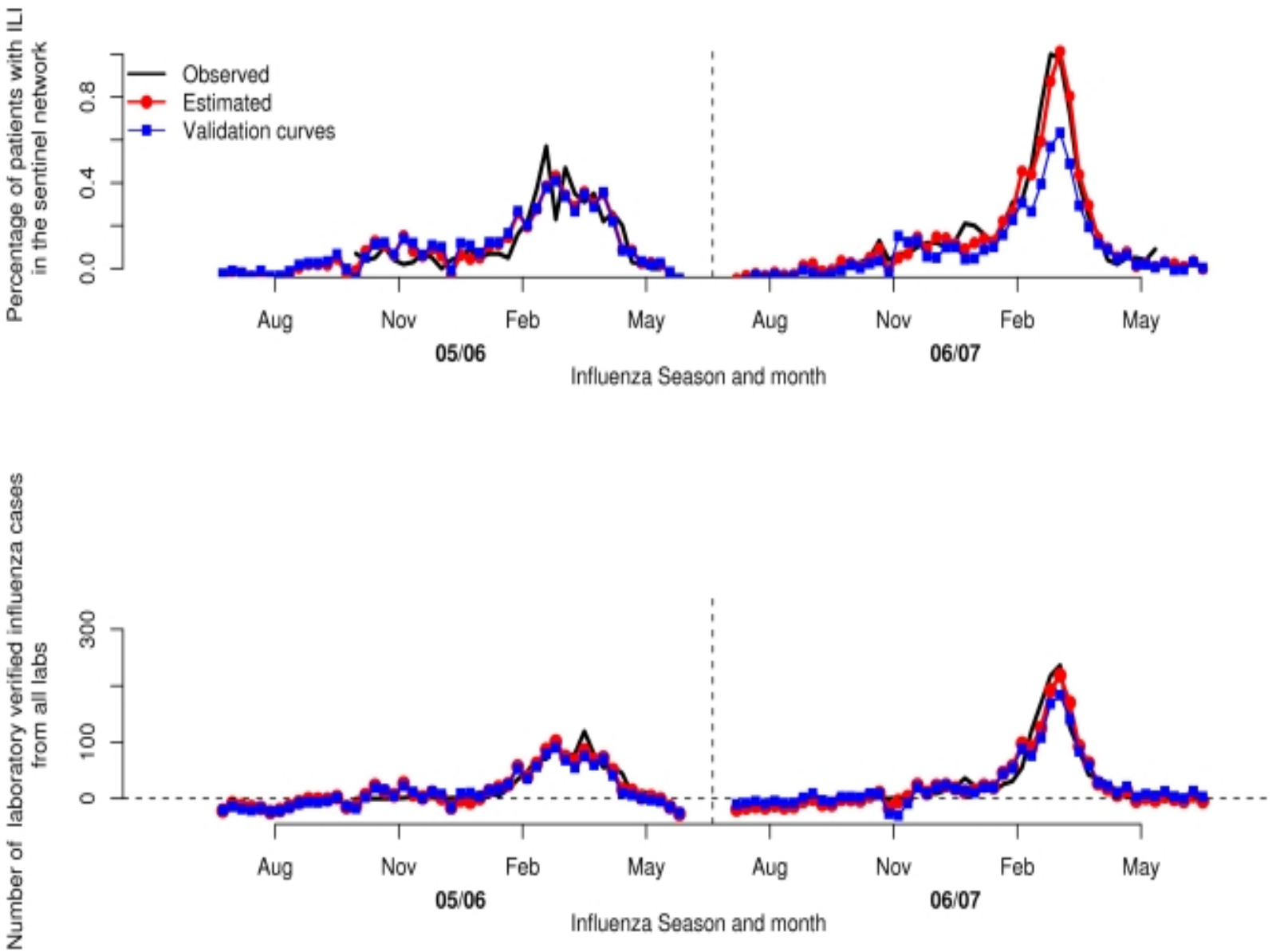
E’ possibile prevedere il futuro? Gli esempi dell’epidemiologia del cancro e del cambiamento climatico

Roma 10 dicembre 2012

In the field of syndromic surveillance, various sources are exploited for outbreak detection, monitoring and prediction. This paper describes a study on queries submitted to a medical web site, with influenza as a case study.

The hypothesis of the work was that queries on influenza and influenza-like illness would provide a basis for the estimation of the timing of the peak and the intensity of the yearly influenza outbreaks that would be as good as the existing laboratory and sentinel surveillance.

Hulth A, Rydevik G, Linde A. Web queries as a source for syndromic surveillance.
PLoS One. 2009;4(2):e4378. Epub 2009 Feb 6.


Percentage of patients with ILI in the sentinel network
0.0
0.4
0.8
Observed
Estimated
Validation curves
Aug
Nov
Feb
May
Aug
Nov
Feb
May
05/06
06/07
Influenza Season and month
Number of laboratory verified influenza cases from all labs
0
100
300
Aug
Nov
Feb
May
Aug
Nov
Feb
May
05/06
06/07
Influenza Season and month

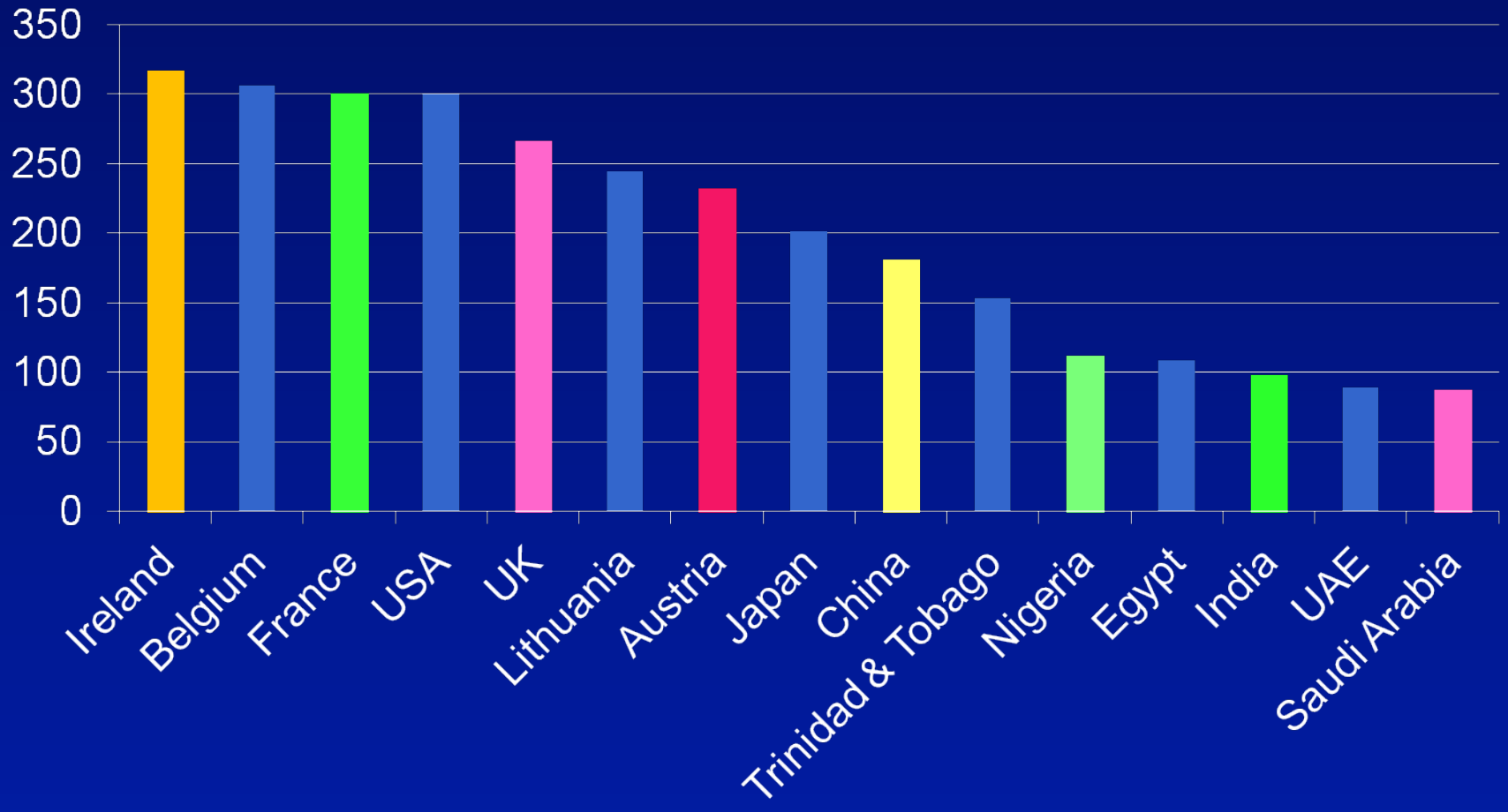
Previsioni sull'epidemiologia delle malattie croniche: tendenze temporali

CVD superate dai tumori

Differenze geografiche: come interpretarle

Diffusione dei tumori ai paesi a basso reddito

Cancer Incidence Rates in Selected Countries



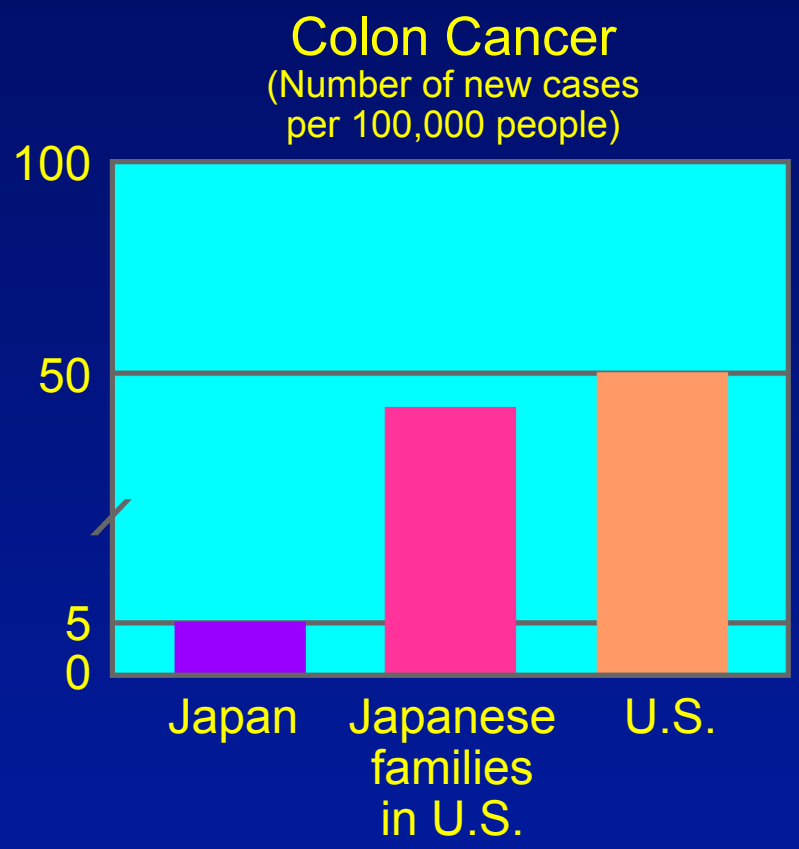
*Incidence Rates per 100,000 per Year

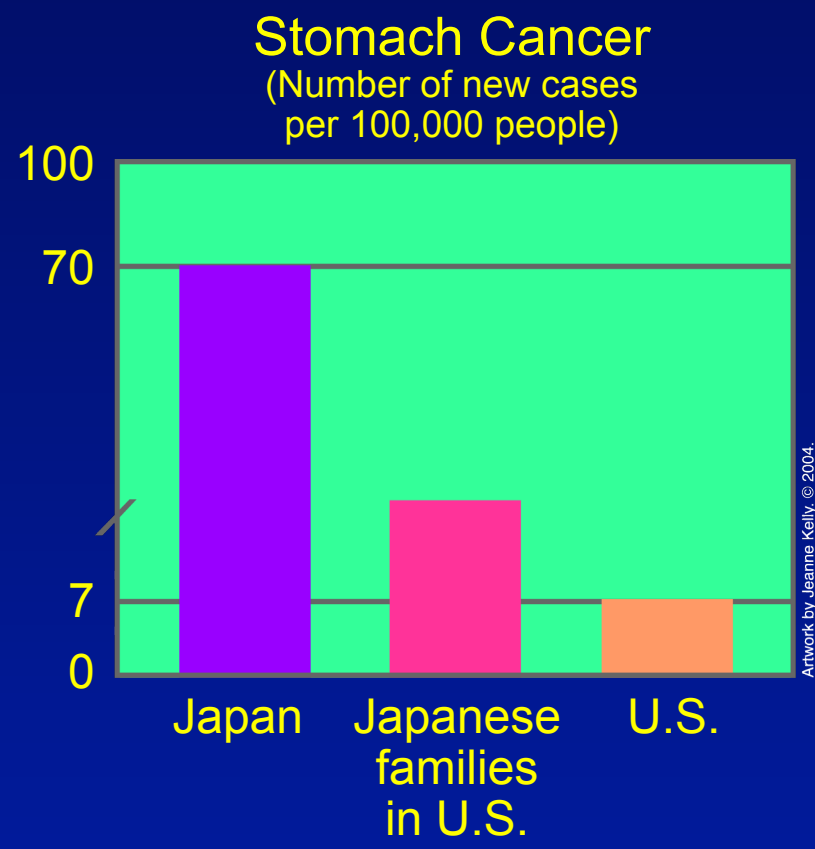
This suggests either genetic or environmental determinants

How can we disentangle nature and nurture?

Migrants

Migrants

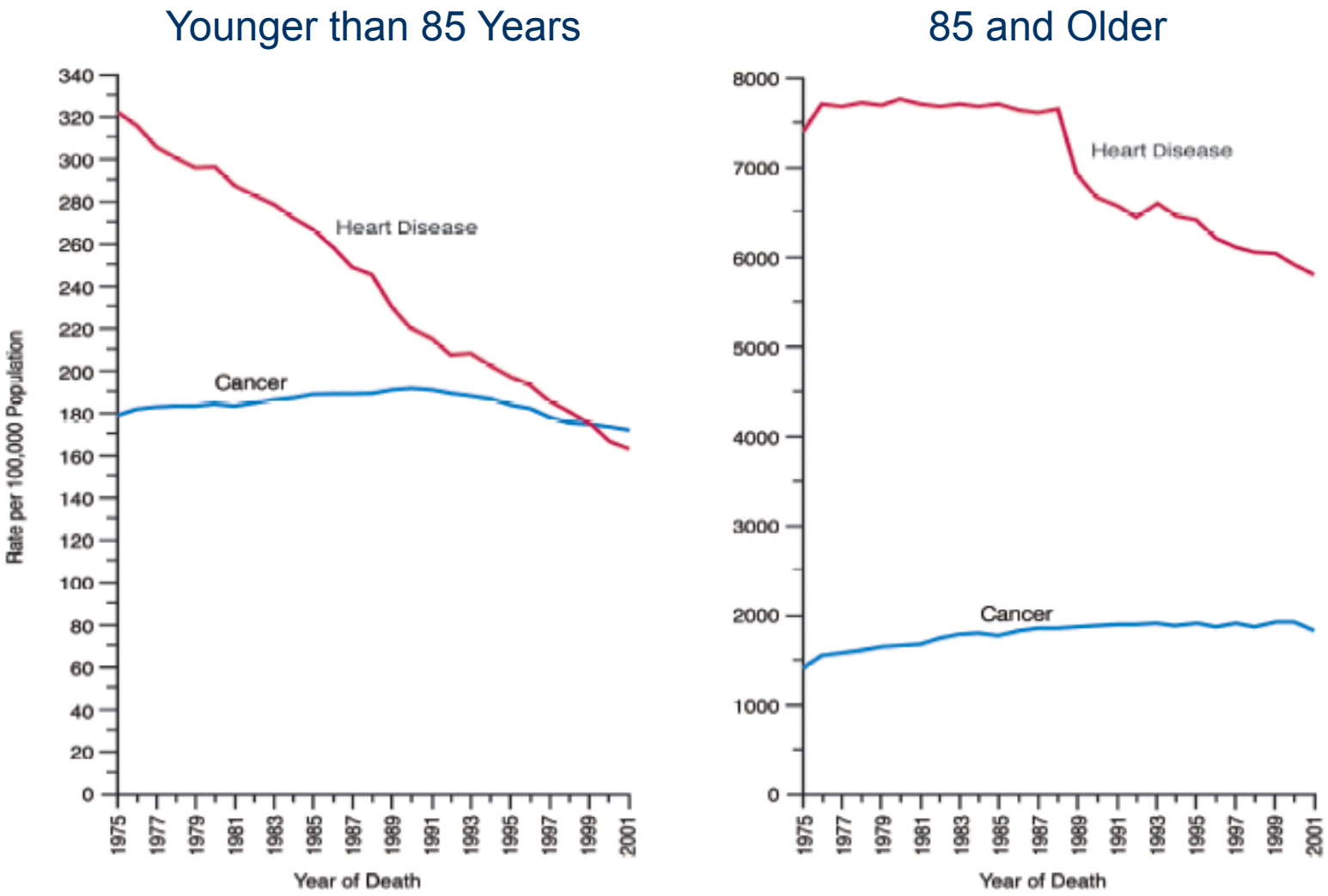

Colon Cancer
(Number of new cases
per 100,000 people)
100
50
5
0
Japan
Japanese
families
in U.S.
U.S.


Stomach Cancer
(Number of new cases
per 100,000 people)
100
70
7
0
Japan
Japanese
families
in U.S.
U.S.
Artwork by Jeanne Kelly. © 2004.

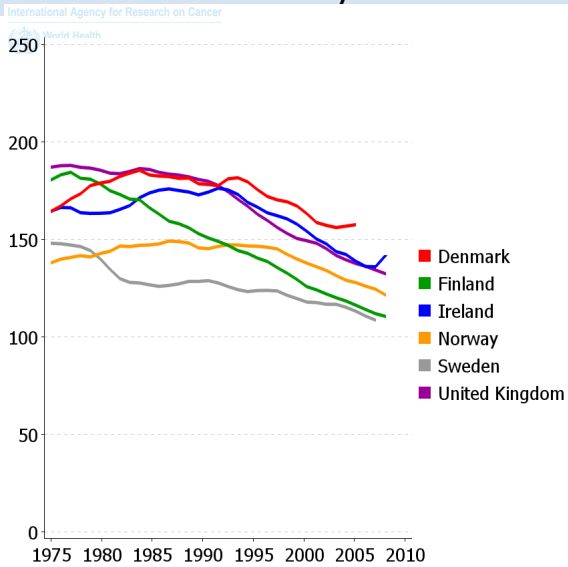
Previsioni diverse per paesi ricchi e paesi poveri

Epidemiologia del cancro in parte dominata dal fumo di sigaretta e dai test di screening (es PSA, mammografia)

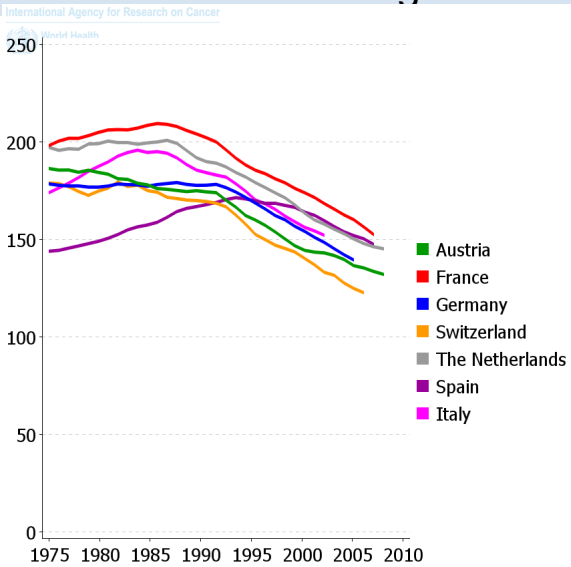
Death rates from cancer and heart disease (US)



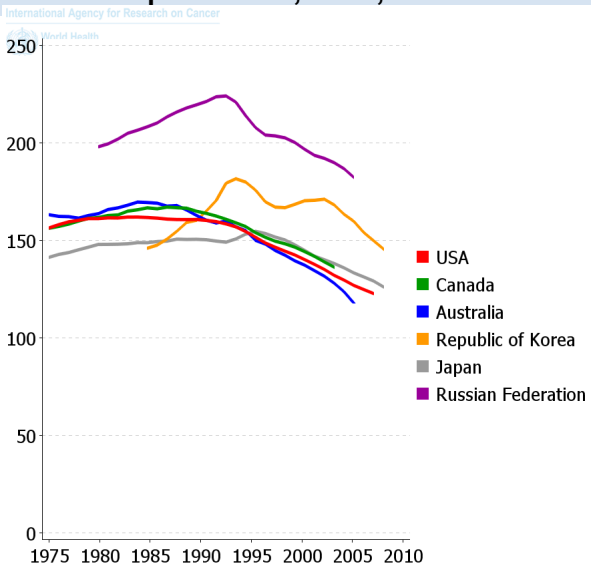
Trends in mortality from cancer in selected countries: age-standardised rate per 100,000, men



WHO (www.who.int/whosis)



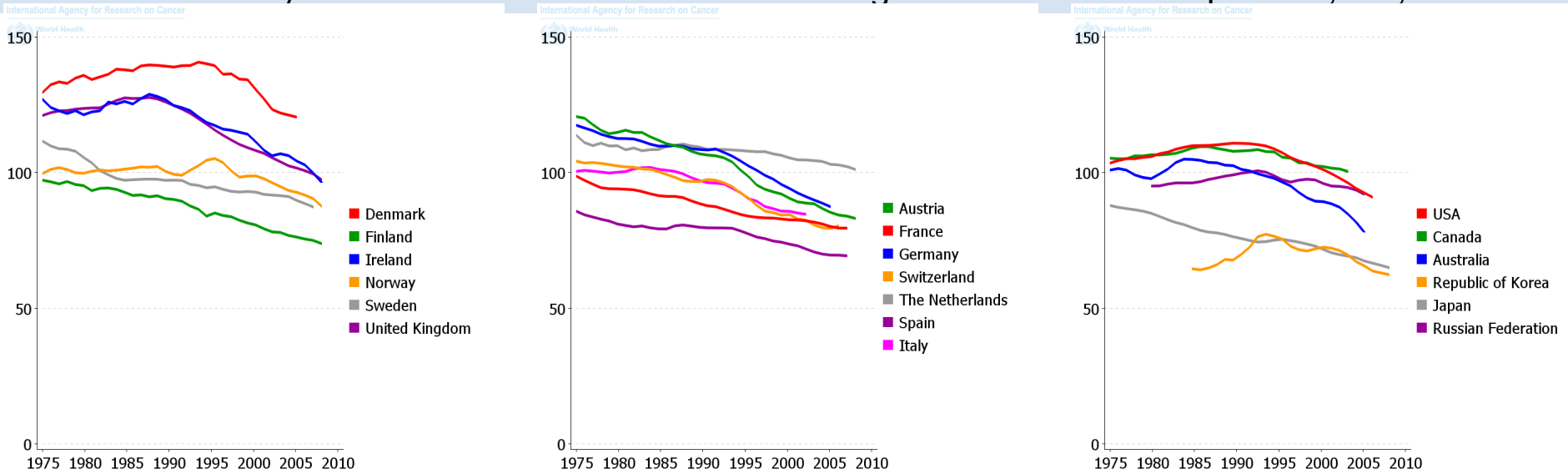
WHO (www.who.int/whosis)



WHO (www.who.int/whosis)

Cancer in 5 Continents, IARC

Trends in mortality from cancer in selected countries: age-standardised rate per 100,000, women



Cancer in 5 Continents, IARC

American Cancer Society Annual Report: More Than a Million Cancer Deaths Avoided in 2 Decades

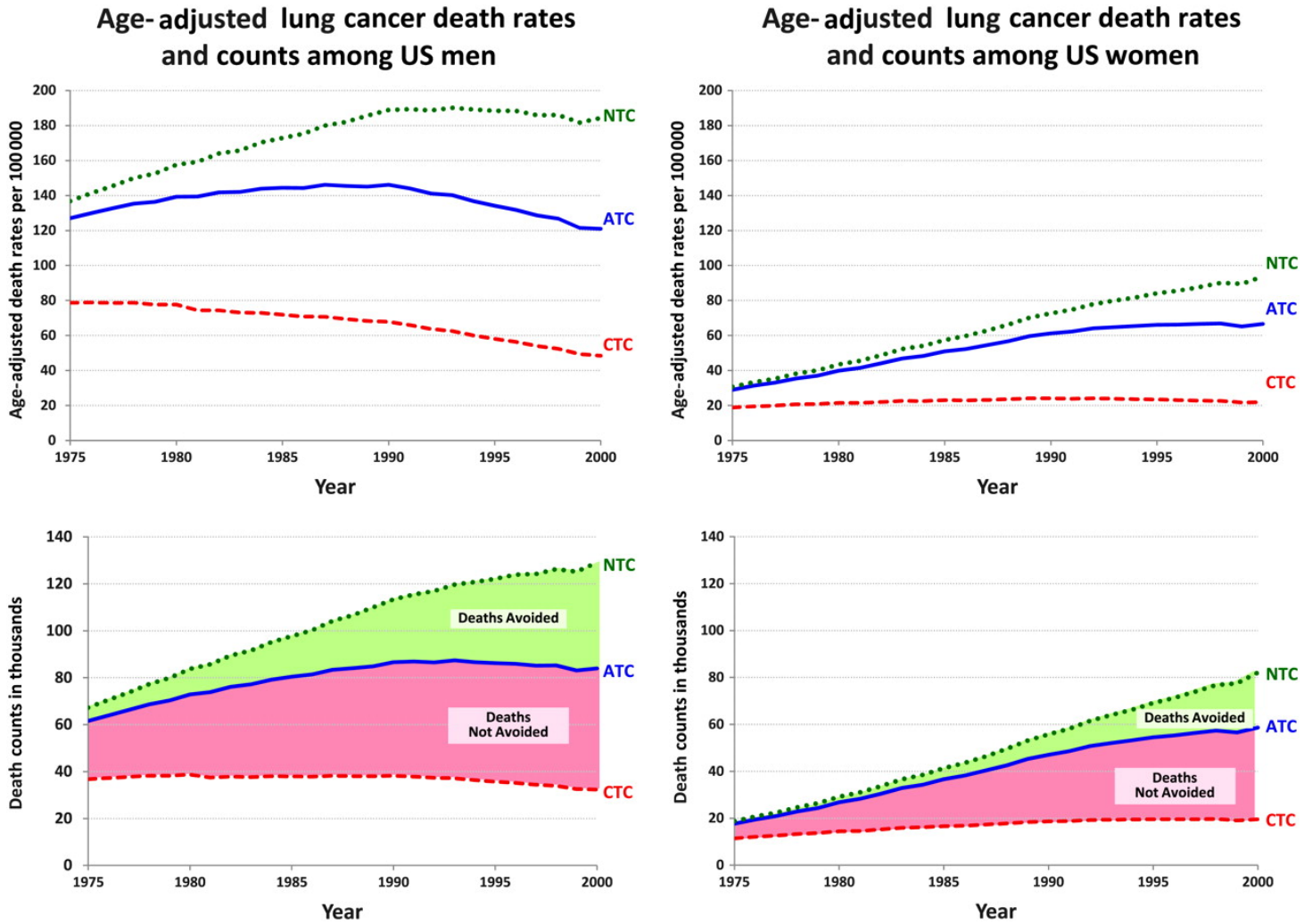
A total of 1,638,910 new cancer cases and 577,190 deaths from cancer are projected to occur in the U.S. in 2012. Between 1990/1991 and 2008, the most recent year for which data is available, overall death rates decreased by about 23% in men and 15% in women.

This translates to more than 1 million deaths from cancer that were avoided.

MOST OF THIS CHANGE HAS BEEN DUE TO CHANGES IN

SMOKING HABITS

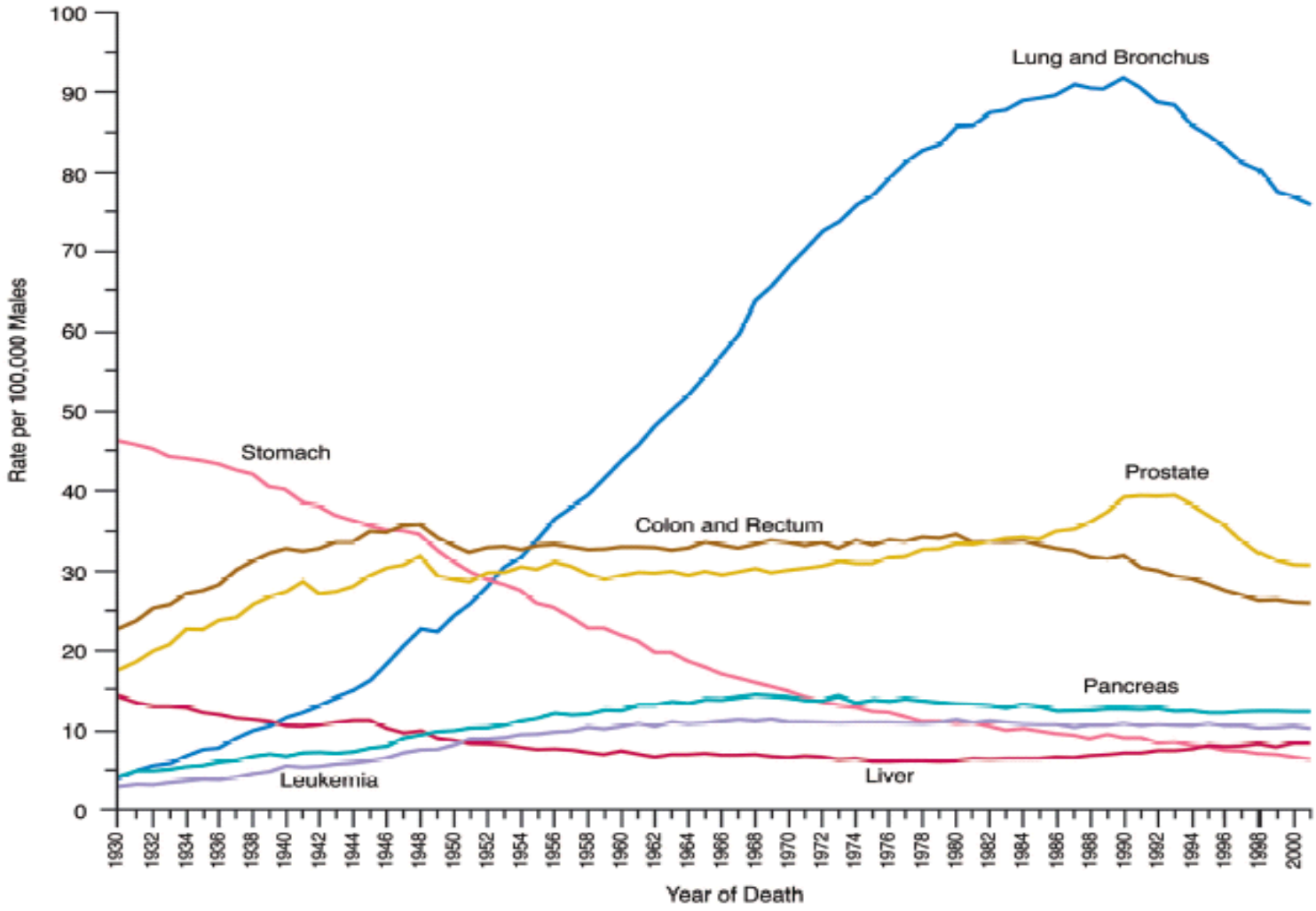
Lung cancer death rates and counts for men and women aged 30-84 for modeled scenarios.
ATC = Actual Tobacco Control; CTC = Complete Tobacco Control; NTC = No Tobacco Control.



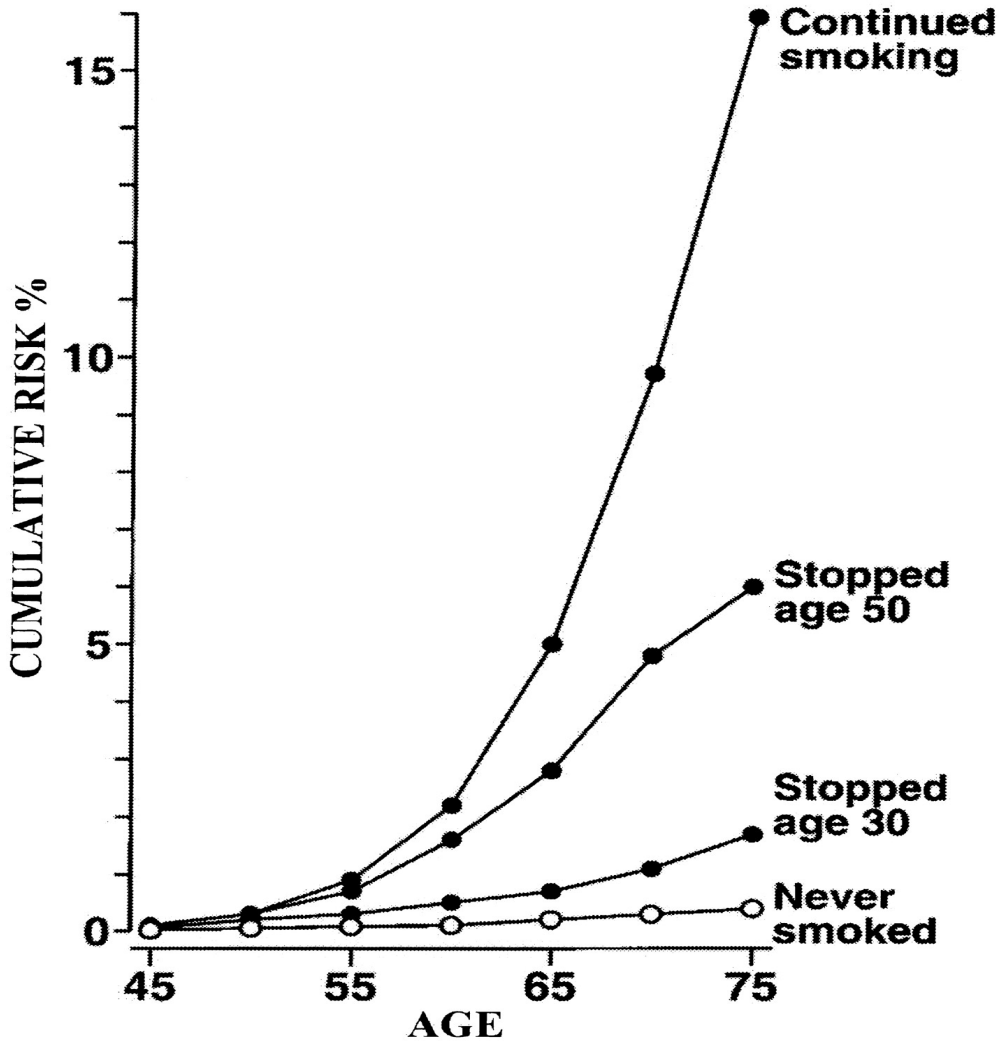
Moolgavkar S H et al. JNCI J Natl Cancer Inst 2012;jnci.djs136

JNCI

Cancer death rates for selected cancer types among males, US, 1930-2001



Cumulative risk of lung cancer mortality among men in the United Kingdom who smoke, according to the age when they stopped smoking. [Figure adapted from the original by permission of the British Medical Journal (56)].



Vineis P et al. JNCI J Natl Cancer Inst 2004;96:99-106

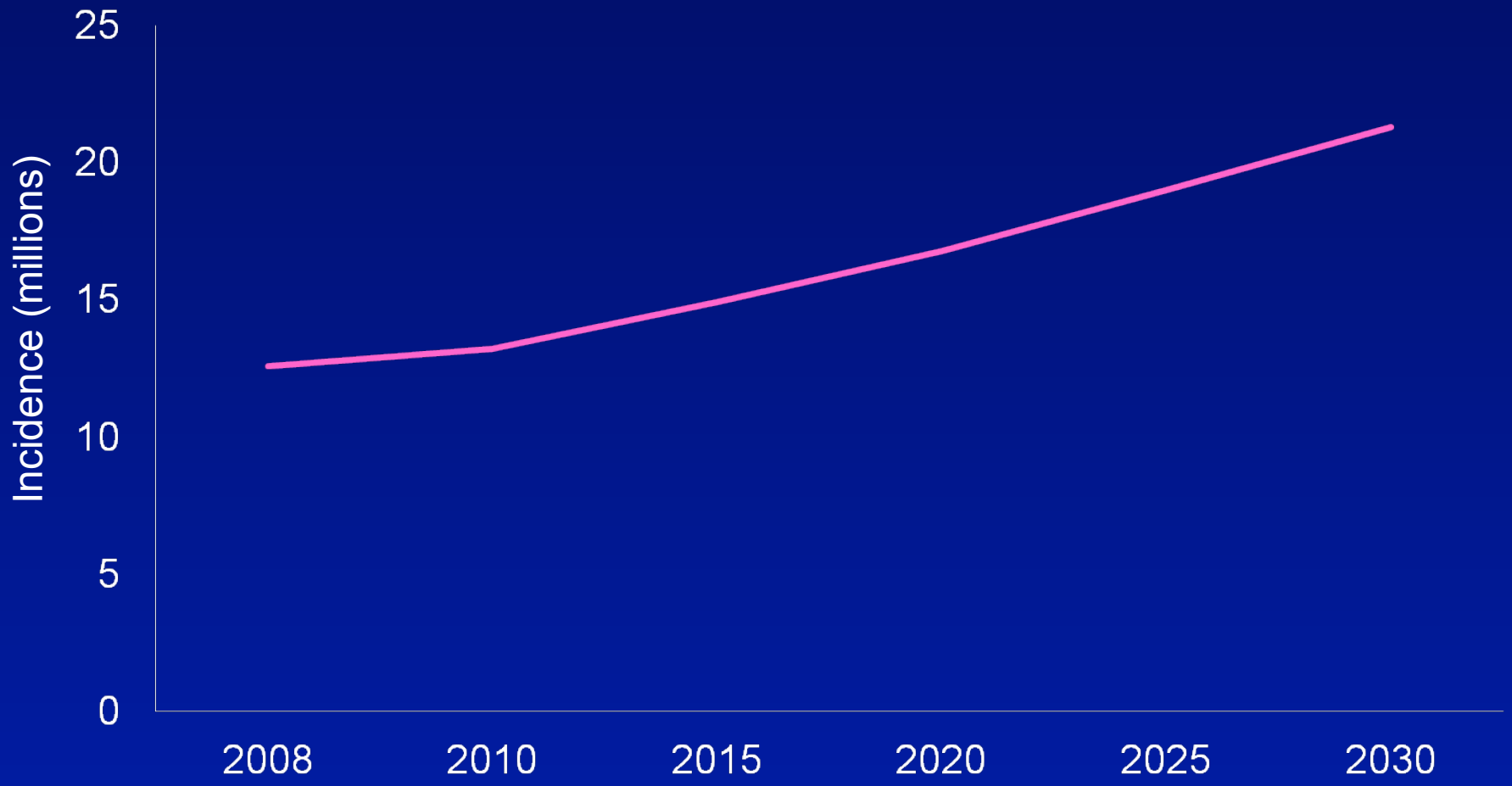
Globalization of cancer

Africa will manifest a strong increase of cancer cases in the next decades, just for the effect of demographic increase.

But also “Westernization” is spreading to Africa, including sedentary lifestyle, dietary changes, use of cigarettes …

(Sylla and Wild, 2012)

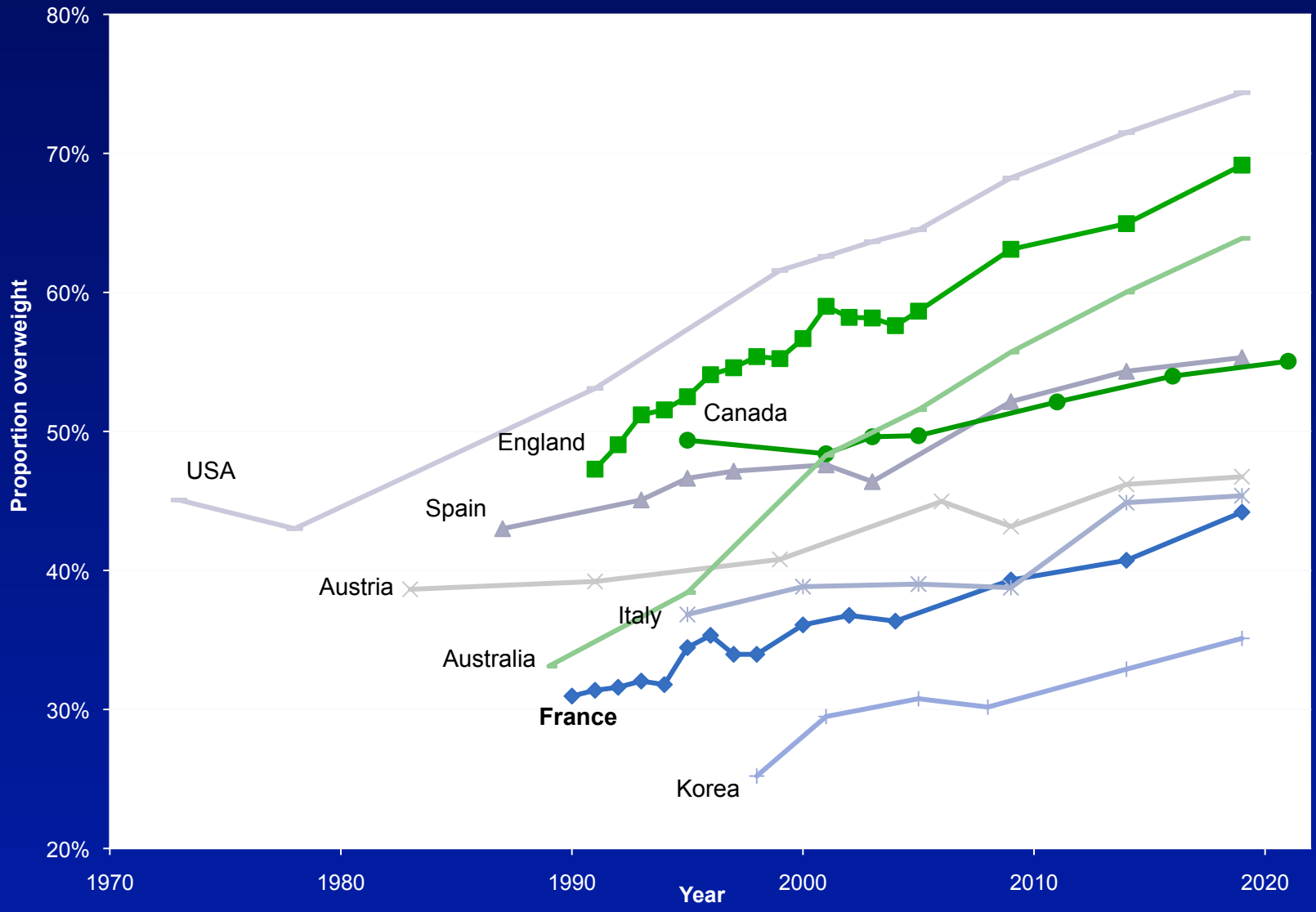
Projected Worldwide Cancer Incidence (Numbers) 2008-2030 (Globocan, IARC)



Atri importanti trends temporali in relazione allo sviluppo economico:

obesità
diabete
età al menarca

Trends in Overweight and Obesity

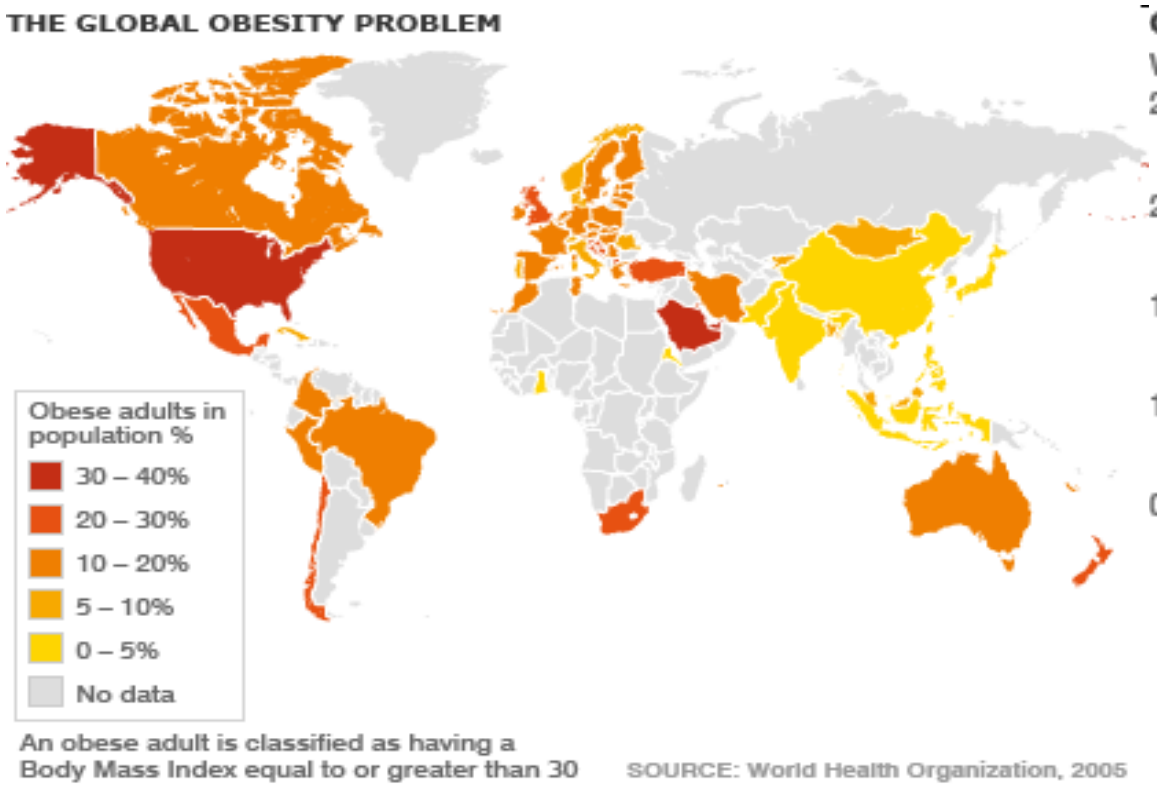


WHO, 2010

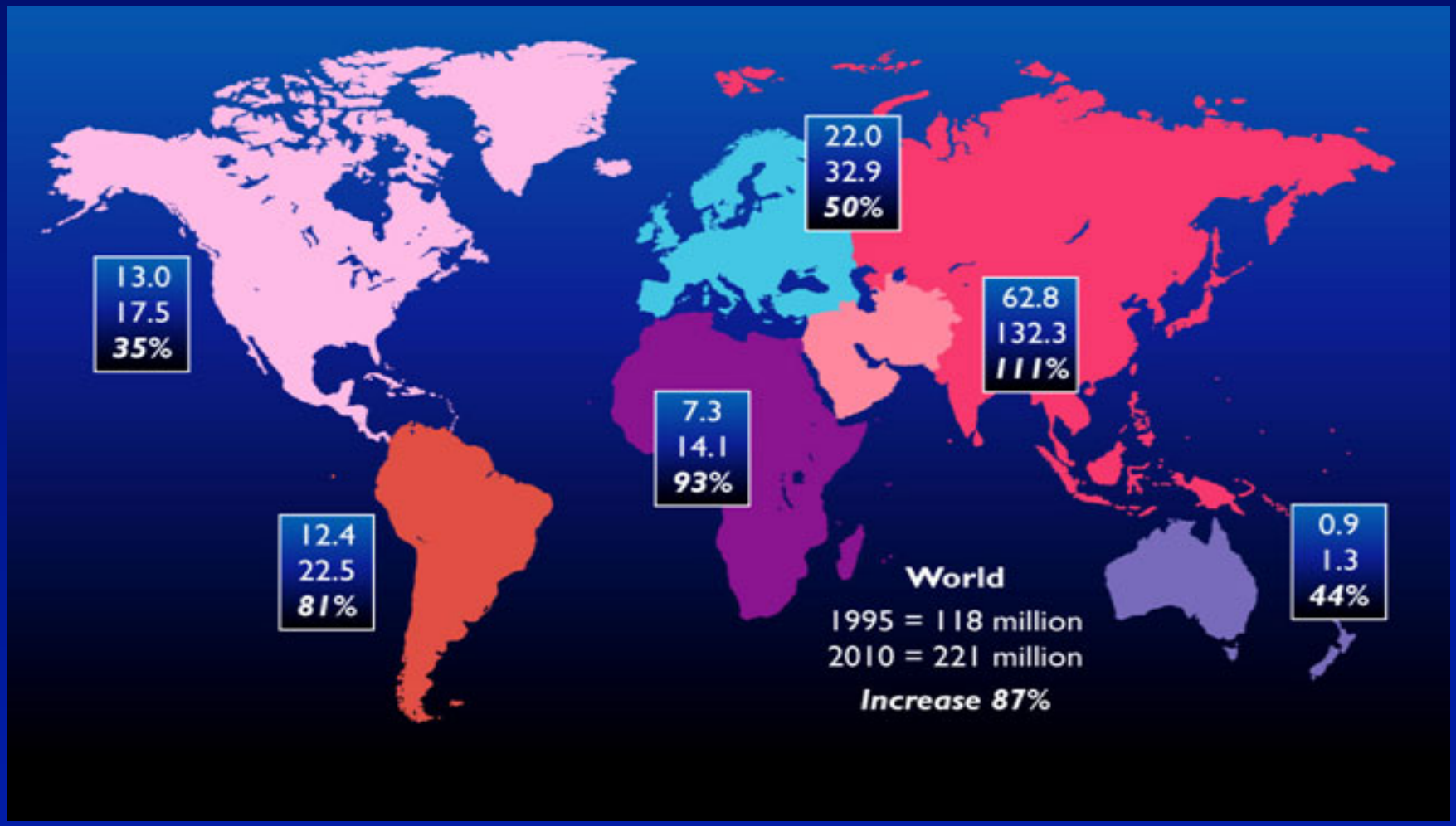
Normal weight: < 25 kg/m^2

Overweight: [25-30[kg/m^2

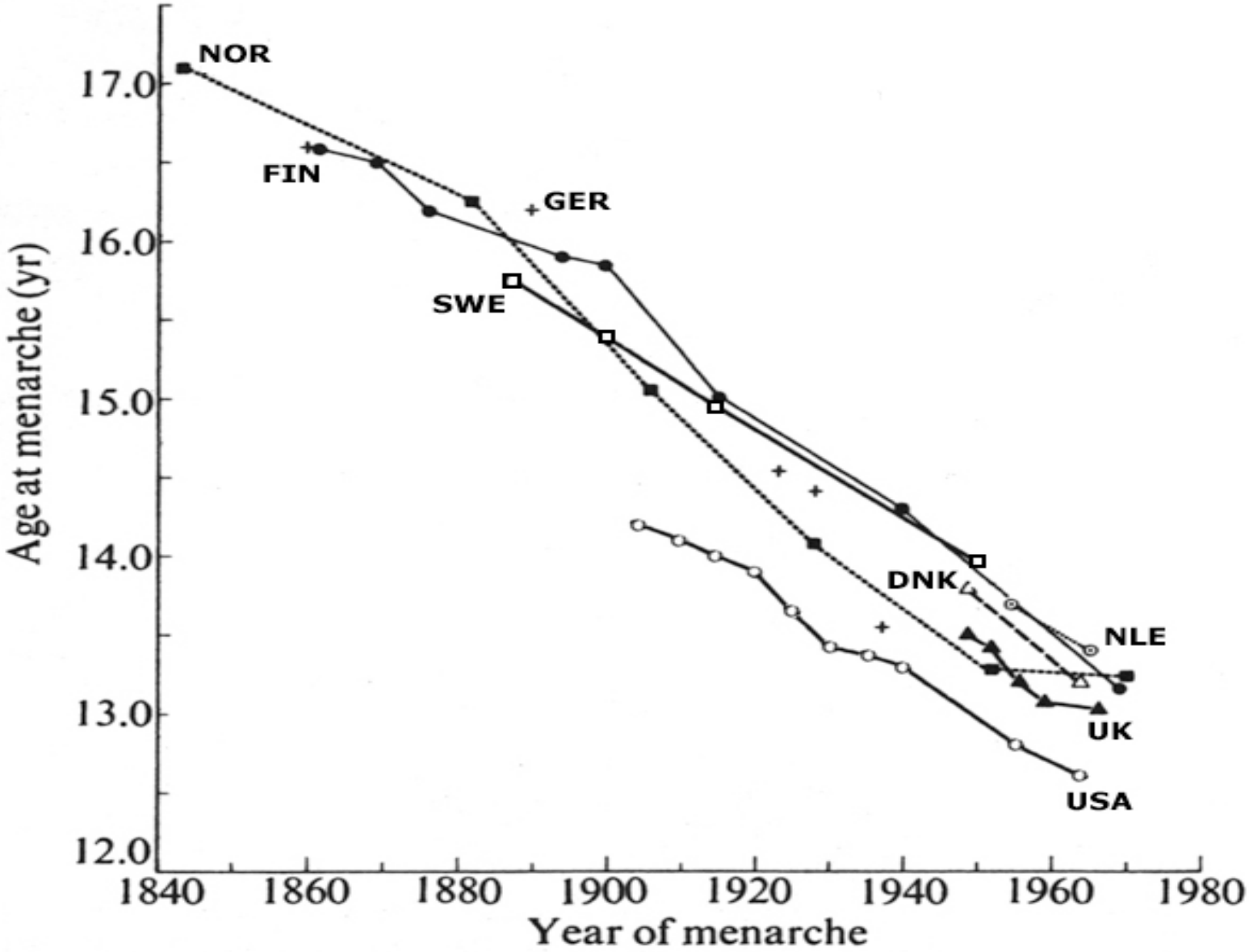
Obesity: ≥ 30 kg/m^2



Global projections for the diabetes epidemic: 1995-2010



Trends Towards Earlier Menarche



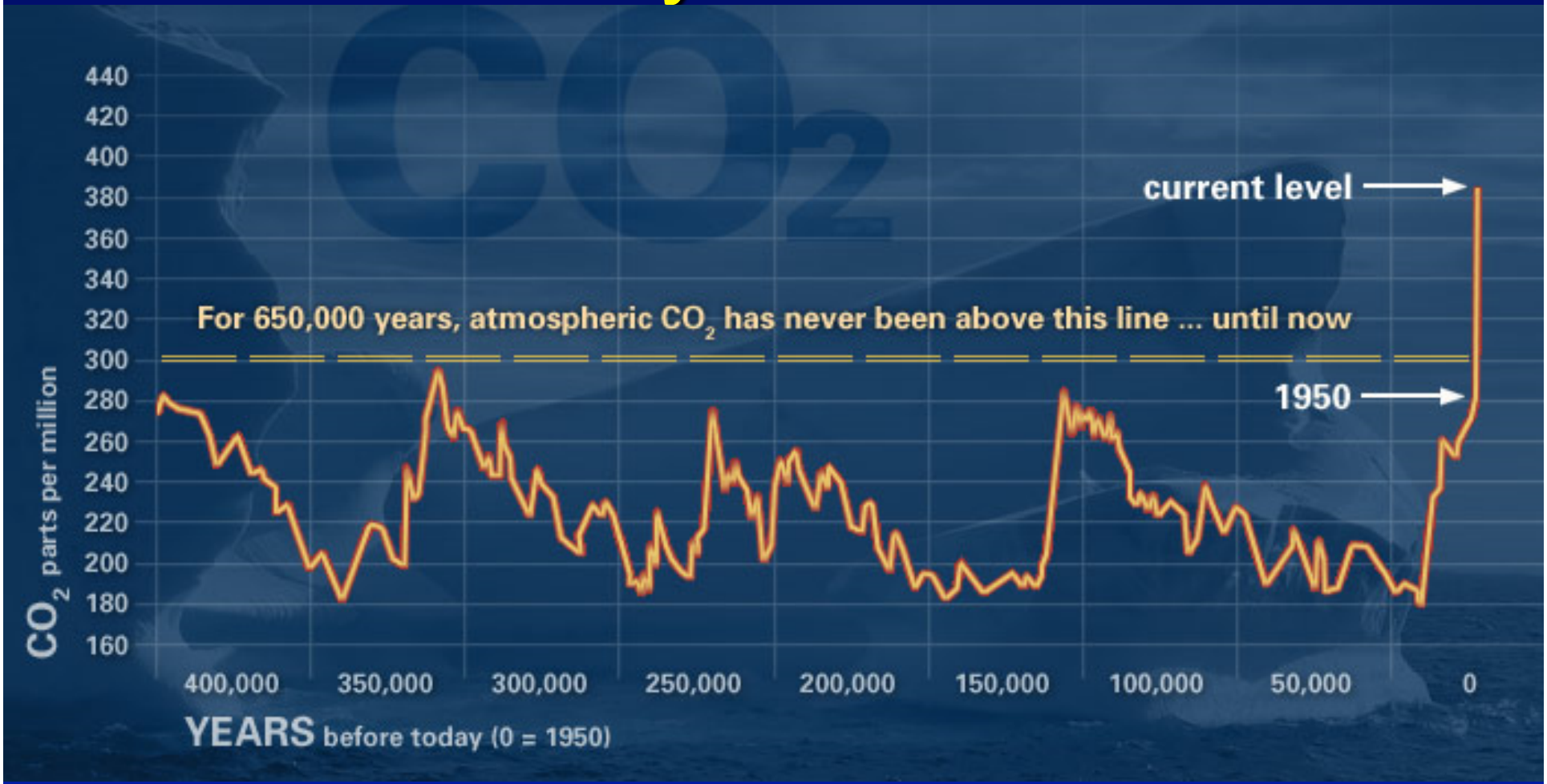
Conclusioni

Molti fenomeni epidemiologici sono soggetti a mutamenti secolari e pertanto prevedibili sul periodo medio-lungo (fumo e cancro del polmone, PSA e cancro della prostata, obesità e diabete, età al menarca e sviluppo economico)

E’ prevista un’epidemia di tumori nei paesi a basso reddito nel prossimo secolo

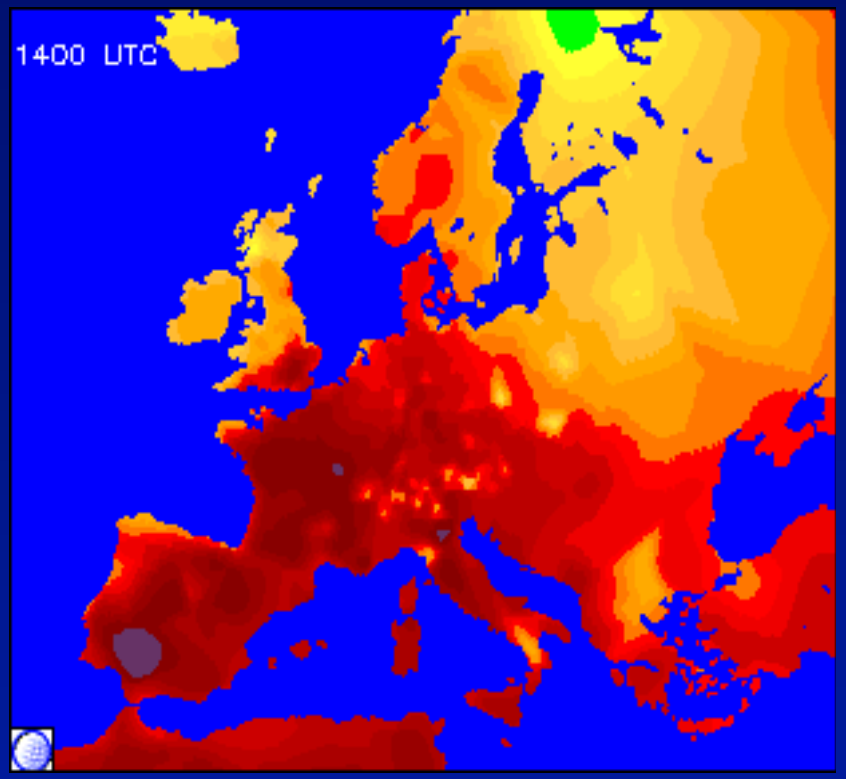
Il cambiamento climatico

CO 2 over the last 650,000 years



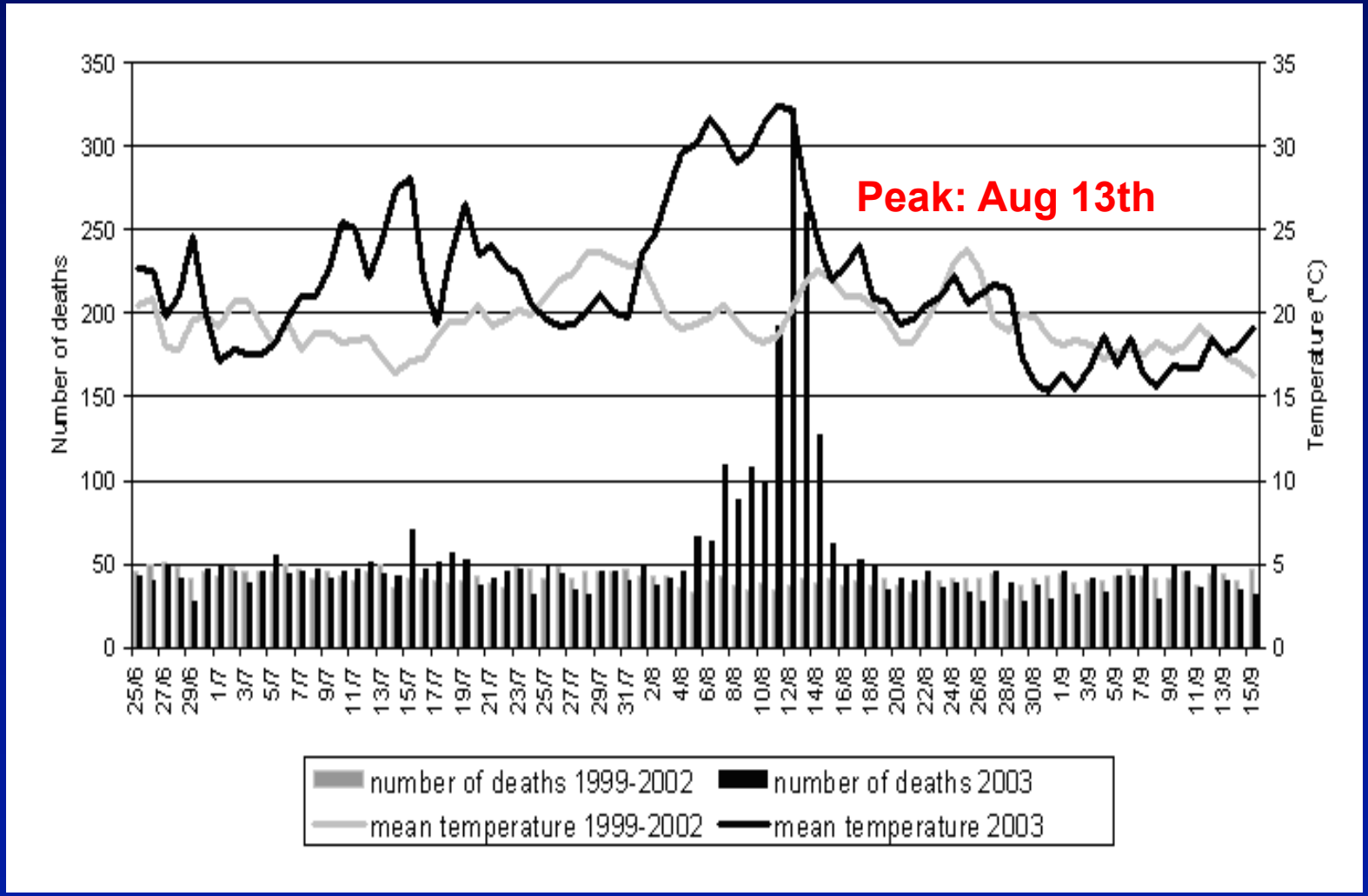
France, August 2003

~14800 deaths (30,000+ in Europe)



Temperature distribution across Europe on 10 August 2003 at 1500hrs

Mortality in Paris during heat wave 1999-2002 compared to deaths in 2003



Source: Institut de Veille Sanitaire , 2003

A neglected consequence of climate change is the increasing salinity level in coastal areas, due to several mechanisms including sea level rise.

Salinity in drinking water can reach extremely high levels like in coastal Bangladesh, and potentially millions of people are exposed to a substantial risk of high blood pressure.

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The setting and the problem

- **Bangladesh is vulnerable to natural hazards and the future effects of climate change.**
  - **Deltaic plains of the Ganges, Brahmaputra Meghna rivers**
  - **Suffer from acute climate events – floods, droughts, cyclones**
  - **Long-term environmental degradation → salination & soil degradation, river erosion**
  - **Effects likely to be exacerbated by climate change & sea-level rise**

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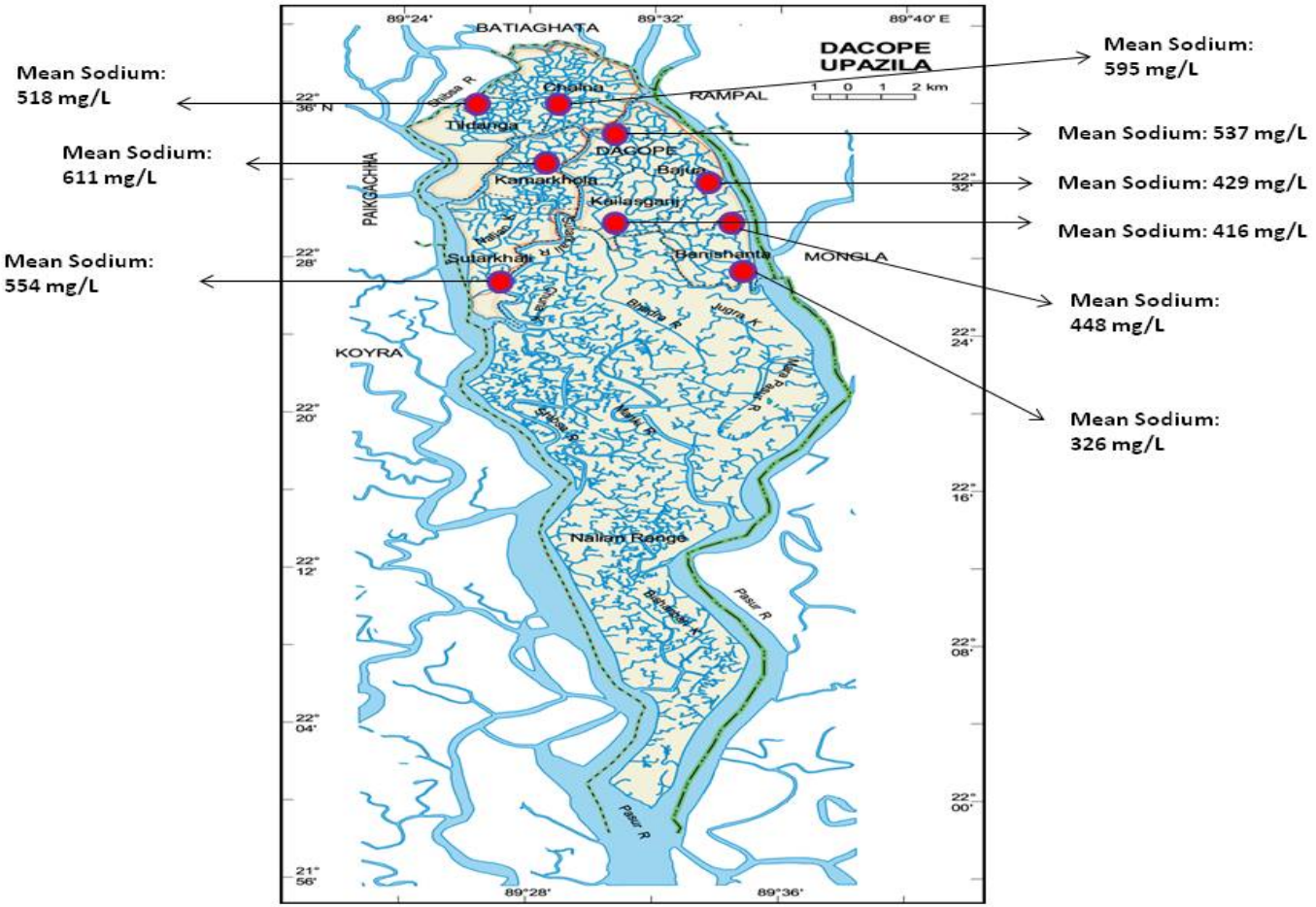

Average sodium levels in drinking water in the different areas included in the study (1,006 healthy pregnant women at week 20 of pregnancy)(Khan et al, submitted)

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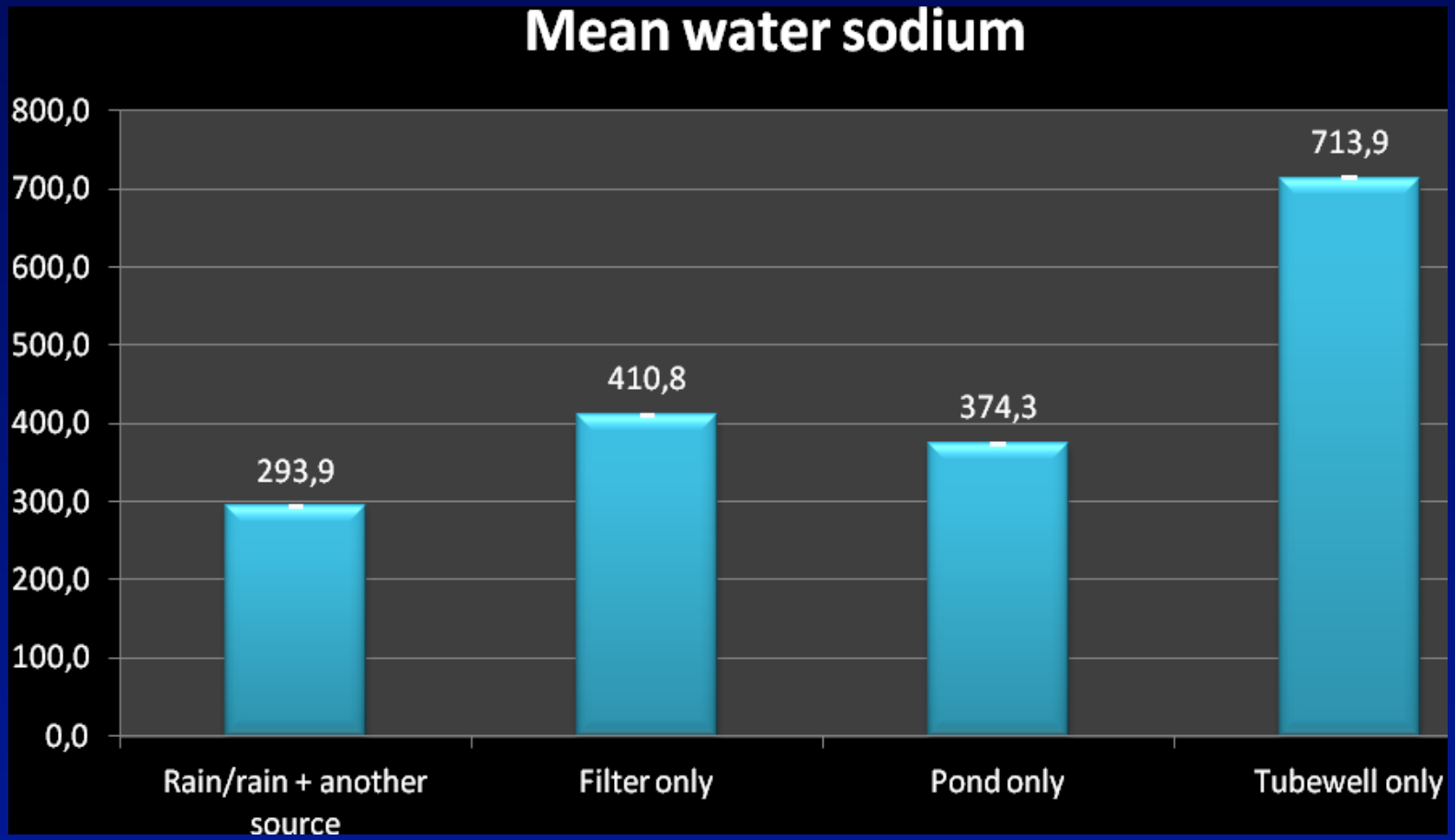

Mean Water Sodium by water source

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Logistic regression of disease outcome (pre-eclampsia, eclampsia and/or gestational hypertension) with water sodium levels

Water sodium mg/L	Crude Odds Ratio (OR)	OR Adjusted by age, parity, SES
Min – 300	1.00	1.00
300.01 – 600	2.73 (1.70 – 4.40)	3.36 (2.07 – 5.60)
600.01 – 900	3.65 (2.30 – 5.80)	4.35 (2.61 – 6.94)
900.01 - max	5.21 (3.25 – 8.33)	5.40 (3.28 – 8.92)

A large share of the population in coastal Bangladesh may be consuming levels of up to 16g/day of salt in the dry season from only 2L of natural drinking water.

Based on the INTERSALT model, the changes introduced by water salinity would lead a large proportion of the population to develop pre-hypertension (systolic BP between 120 and 139mmHg or diastolic BP between 80 and 89mmHg) and hypertension (SBP>140mmHg or DBP>90mmHg), depending on the baseline levels.

(Vineis P, Khan A: *Science*. 2012 Nov 23;338(6110):1028-9)

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The larger picture

634 million people live in coastal areas within 30 feet (9.1m) of sea level. About two-thirds of the World's cities with over 5 million people are located in these low-lying coastal areas.

The IPCC predicts that sea level will further increase in the next decades. This will make the problem of salinity in drinking water becoming a major health issue in most coastal areas, particularly in low-income countries.

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Thank you!

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