

Can an apple a day keep the Doctor away?

General Information in UK

Epidemiological Lessons

Cocoa - Kuna Indians

Red Wine - French Paradox

Procyanidins

Apples

Improvement in Life Expectancy in the UK

Improvement in the Environment and General Healthcare

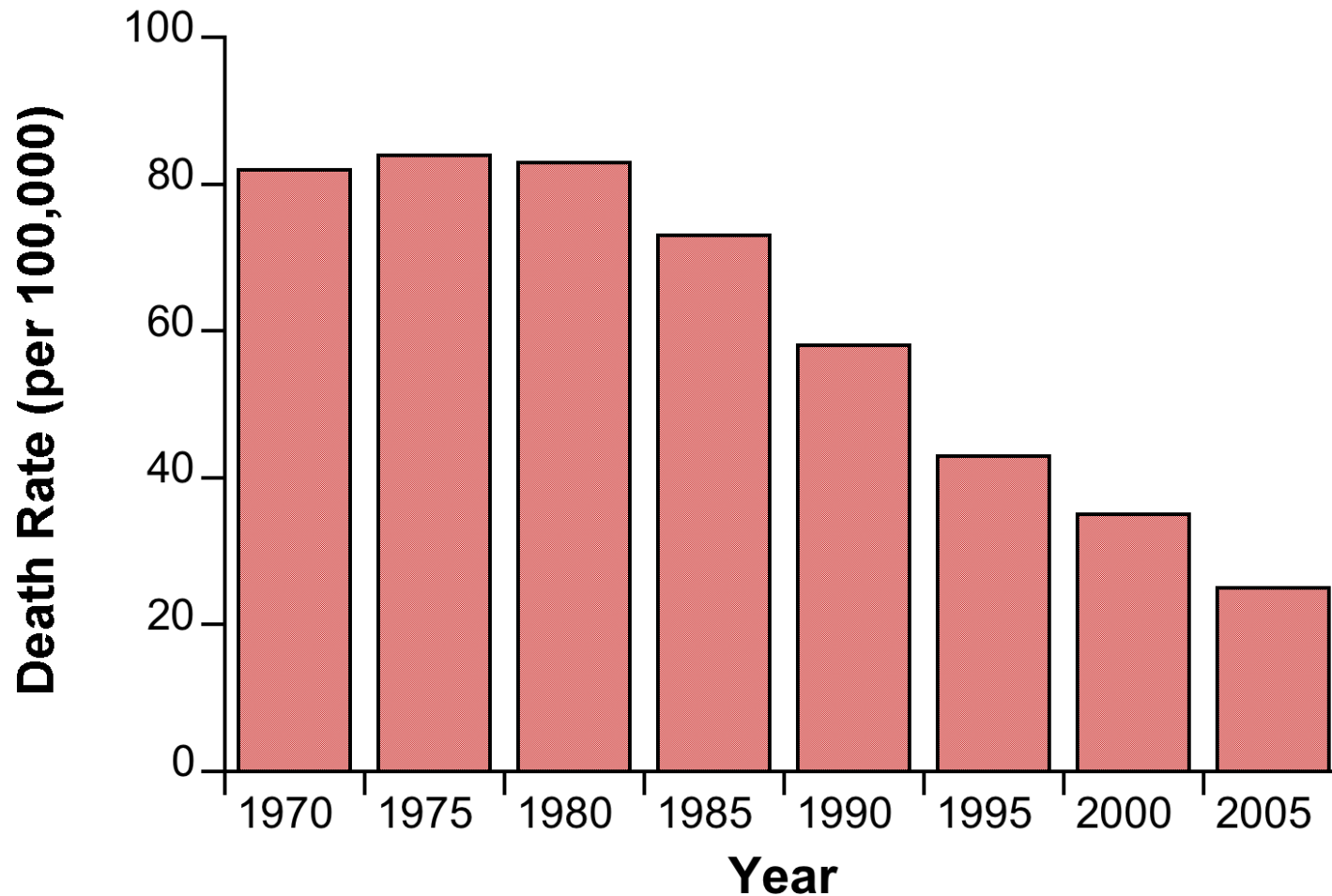
Better detection and understanding of diseases

Better and wider access to medication & vaccination

Reduction in smoking

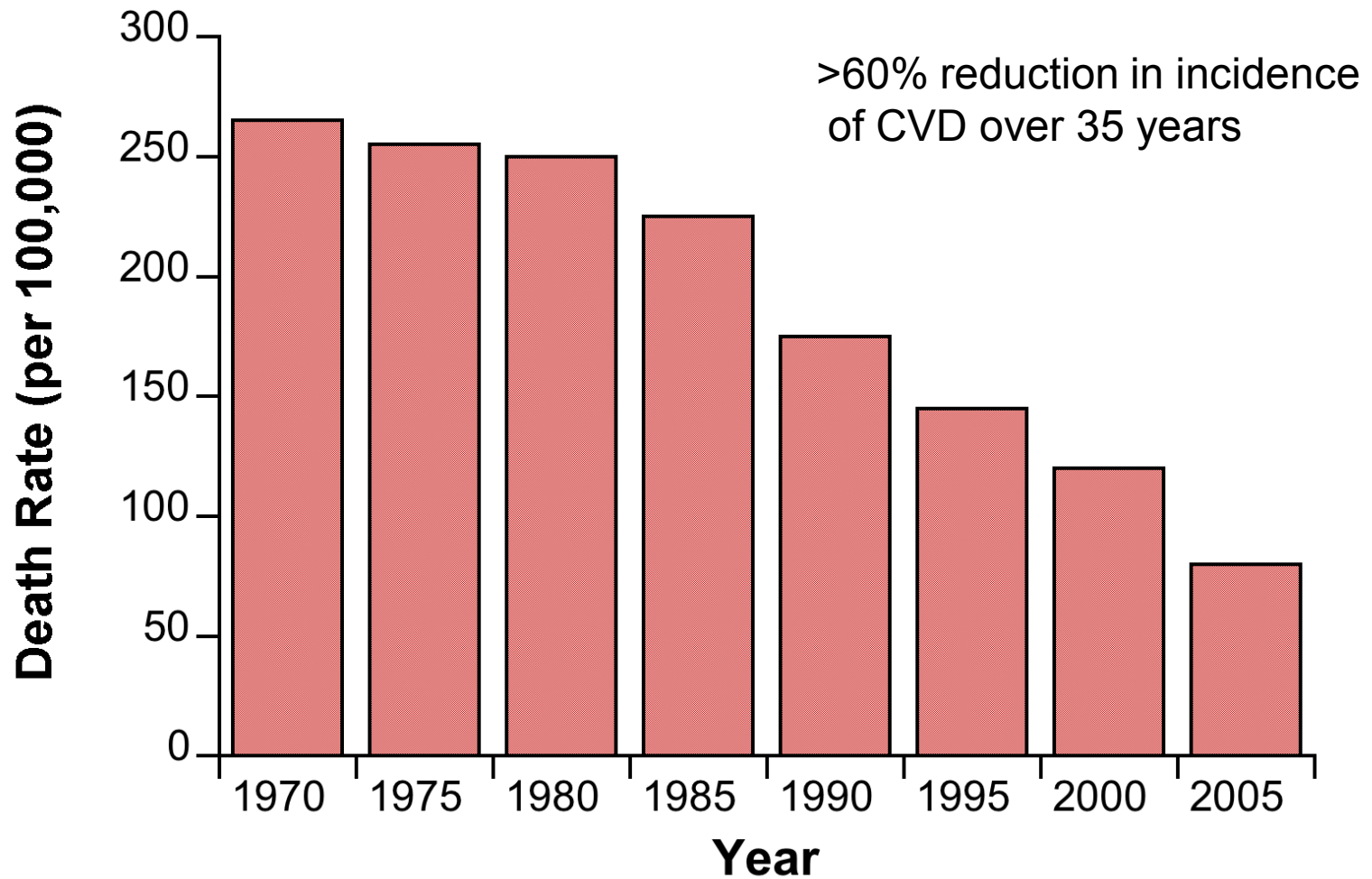
Better advice on **DIET** and EXERCISE.

Death Rate from Coronary Heart Disease in Under 65s



Office of National Statistics
(BHF web site)

Death Rate from Cardiovascular Disease in Under 75s



Office of National Statistics
(BHF web site)

Coronary Heart Disease (CHD) & Cardiovascular Disease (CVD) In the UK

Atherosclerosis, a slow inflammatory disease of the arteries, remains biggest killer in UK (& USA)
(> Cancer, for example)

CVD also develops as a consequence other conditions:

Hypertension

Type 2 Diabetes

Dementia

Kidney Disease

Rheumatic Arthritis and Systemic Lupus Erythematosus.

‘A man is as old as his arteries’ Sir Williams Osler (1862).

Epidemiology of Cardiovascular Disease lessons from the Kuna Indians?

Kuna Indians (approx' 50,000)

Occupy 46/350 islands of the San Blas Archipelago off Caribbean coast of Panama.





High levels of poverty, socially and economically excluded from the mainland

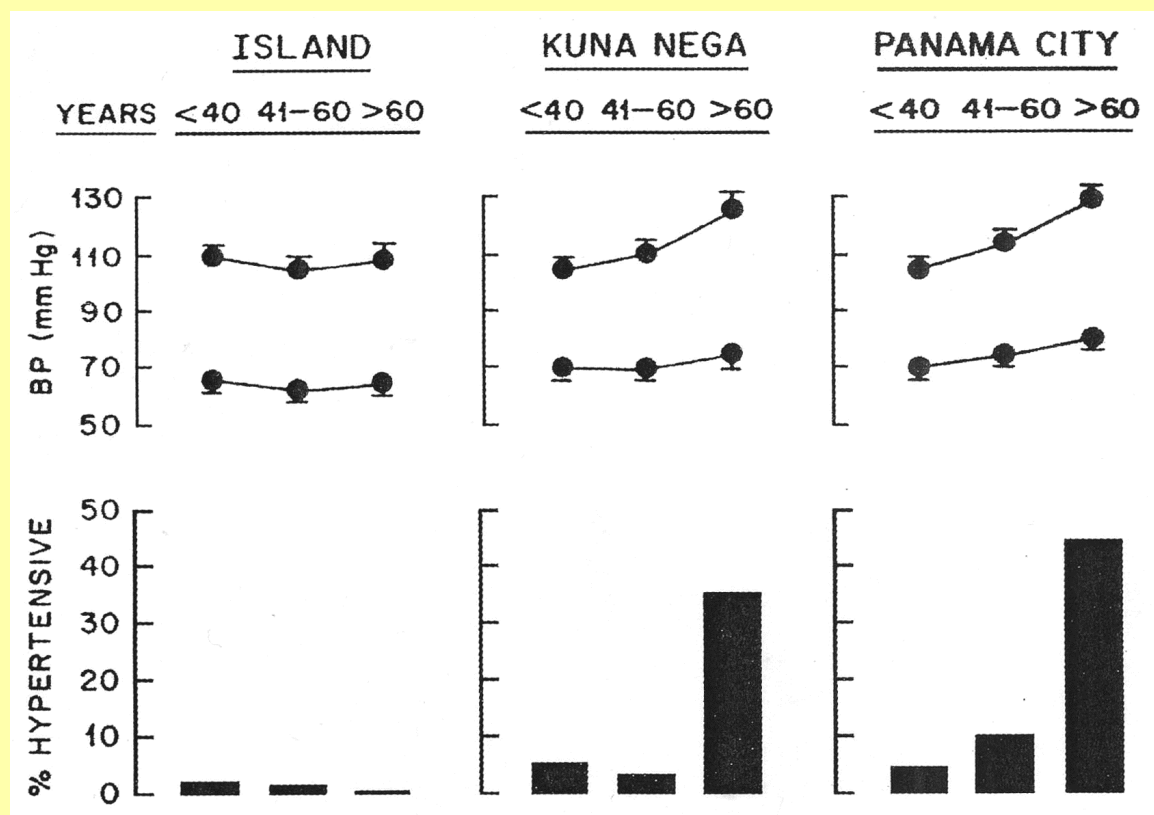
Poor health care - two hospitals, six health centres & 11 Outposts

Elderly Indians reported to have low incidence of hypertension (1942)

Genetic Factor?

Blood Pressure-Age relationship in Panamanians

Hollenberg (2006) *J Cardiovasc. Pharmacol.* 47 (Suppl 2) S99-S102



- Migrant Kuna Indians exhibit same BP-Age relationship as other Panamanians
- For Island Kuna Indians BP does not increase with age - Environmental factor!
- Low protein intake (?) **High Cocoa intake - 4-5 cups daily.**

Mortality Rate per 100,000 population for Mainland Panamanians and Kuna Indians in 2004

Bayard *et al* (2007) *Int. J. Med. Sci* 4, 53-58

	Mainland Panama		Kuna San Blas	
	Per 100,000	Deaths (77,375)	Per 100,000	Deaths (558)
Death Rate	424		192	
Infection	31	7.3%	80	41.6%
CVD	119	28.0%	11.5	5.9%
Respiratory	40	9.4%	50	26.0%
Cancer	74	17.4%	3.6	1.9%
Accidents	45	10.6%	3.6	1.9%
Diabetes	24	5.7%	3.6	1.9%

- Kuna Indians have half the mortality rate of mainland Panamanians ?
- Kuna Indians have astonishingly lower cardiovascular & diabetes mortality rate
- Kuna Indians have higher mortality rate due to infections and respiratory disorders

Conclusions

Cocoa is rich in **Procyanidins**

Cocoa intake may contribute to low BP in elderly Kuna Indians

Published epidemiology data suggests Island-based Kuna Indians have...

- High infectious and respiratory mortality rates

- Low cardiovascular-related mortality rates

- Influence of cocoa intake on mortality is unclear

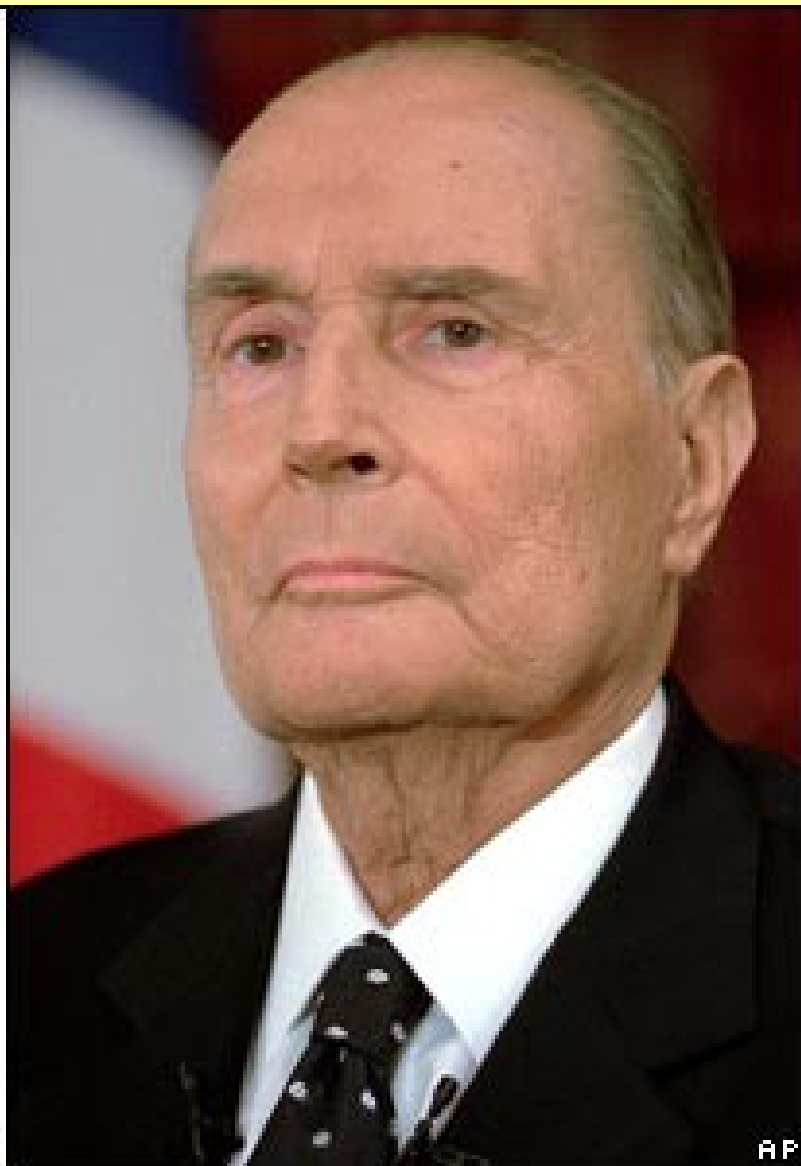
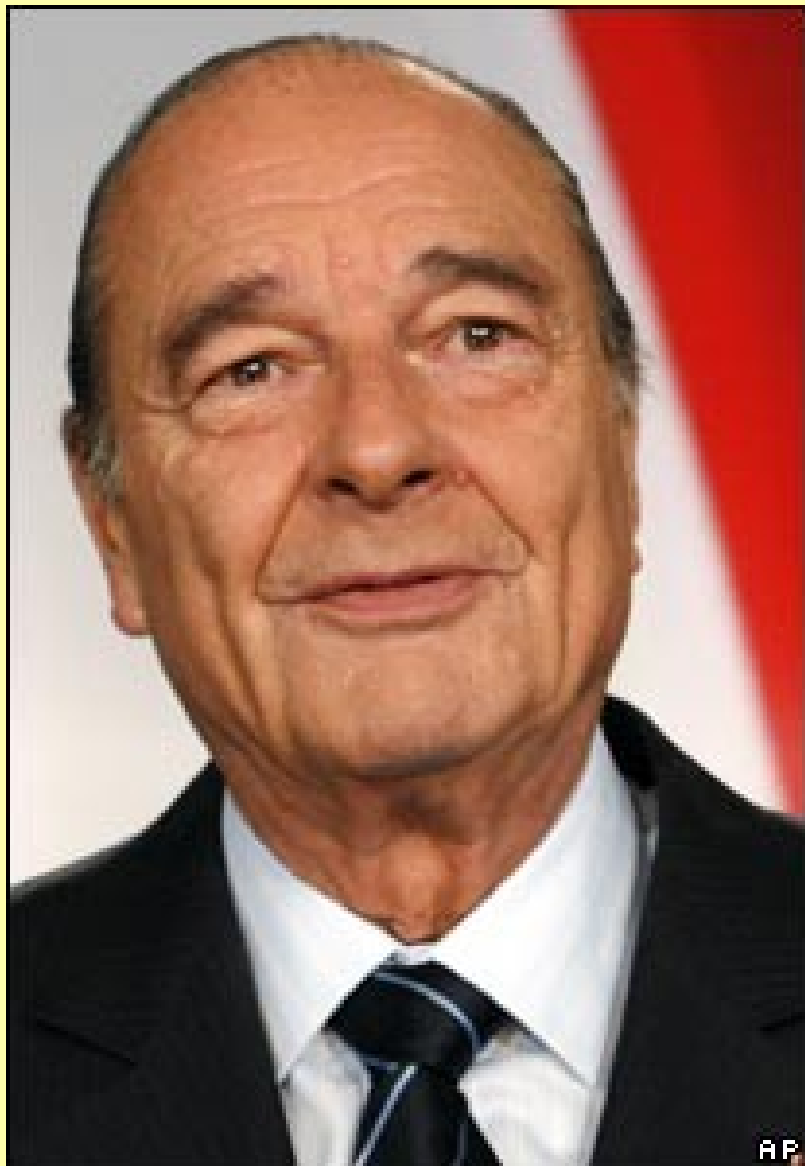
Epidemiology of Cardiovascular Disease

The French Paradox

Fewer Heart Attacks compared to UK & USA despite similar intake of saturated fats

Diet ?

Red Wine consumption ?



Evidence for major regional differences in France

Longevity increases North-East to South West

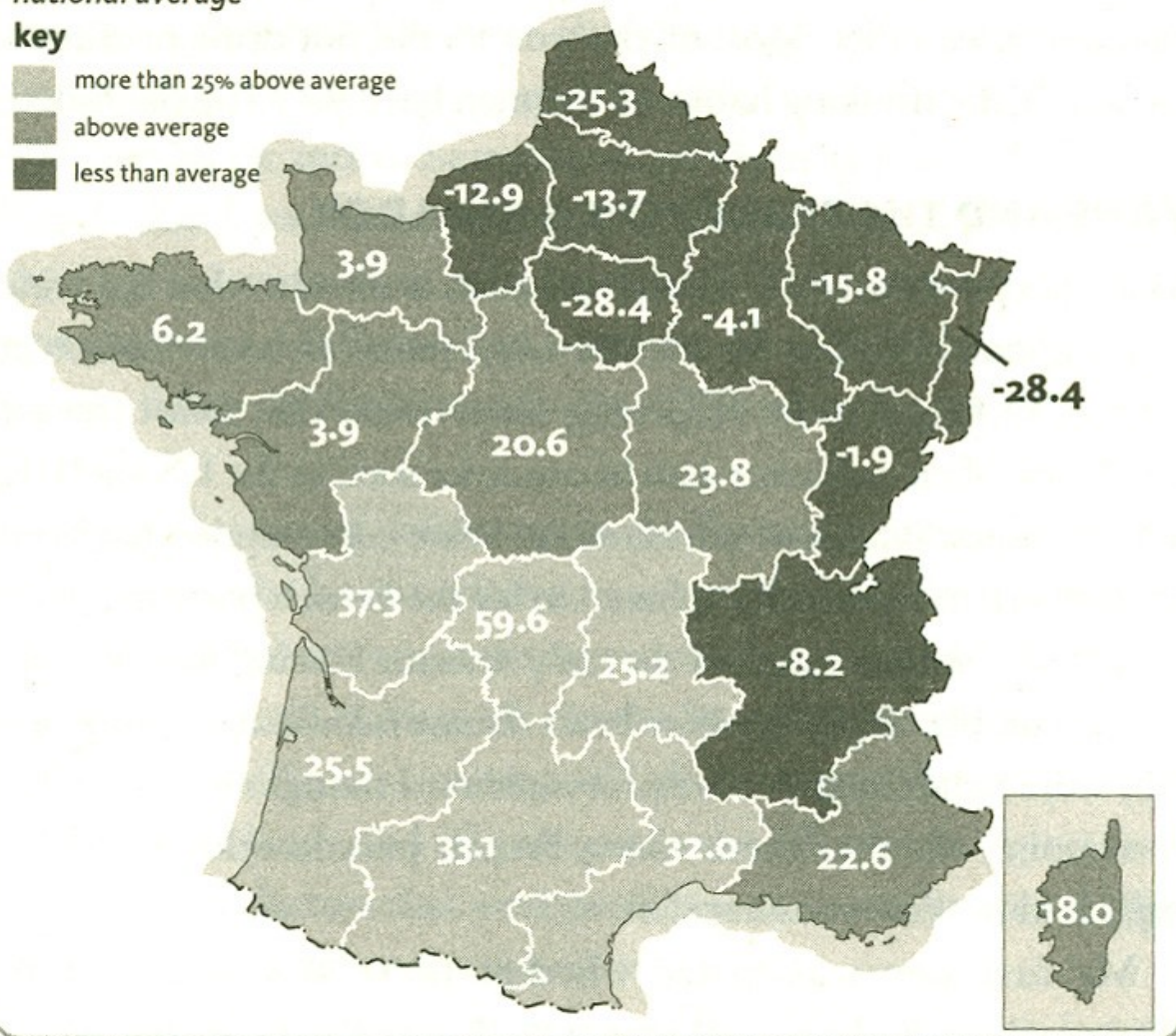
Axis of White to Red Wine growing areas

DISTRIBUTION OF MEN AGED 75+ IN FRANCE

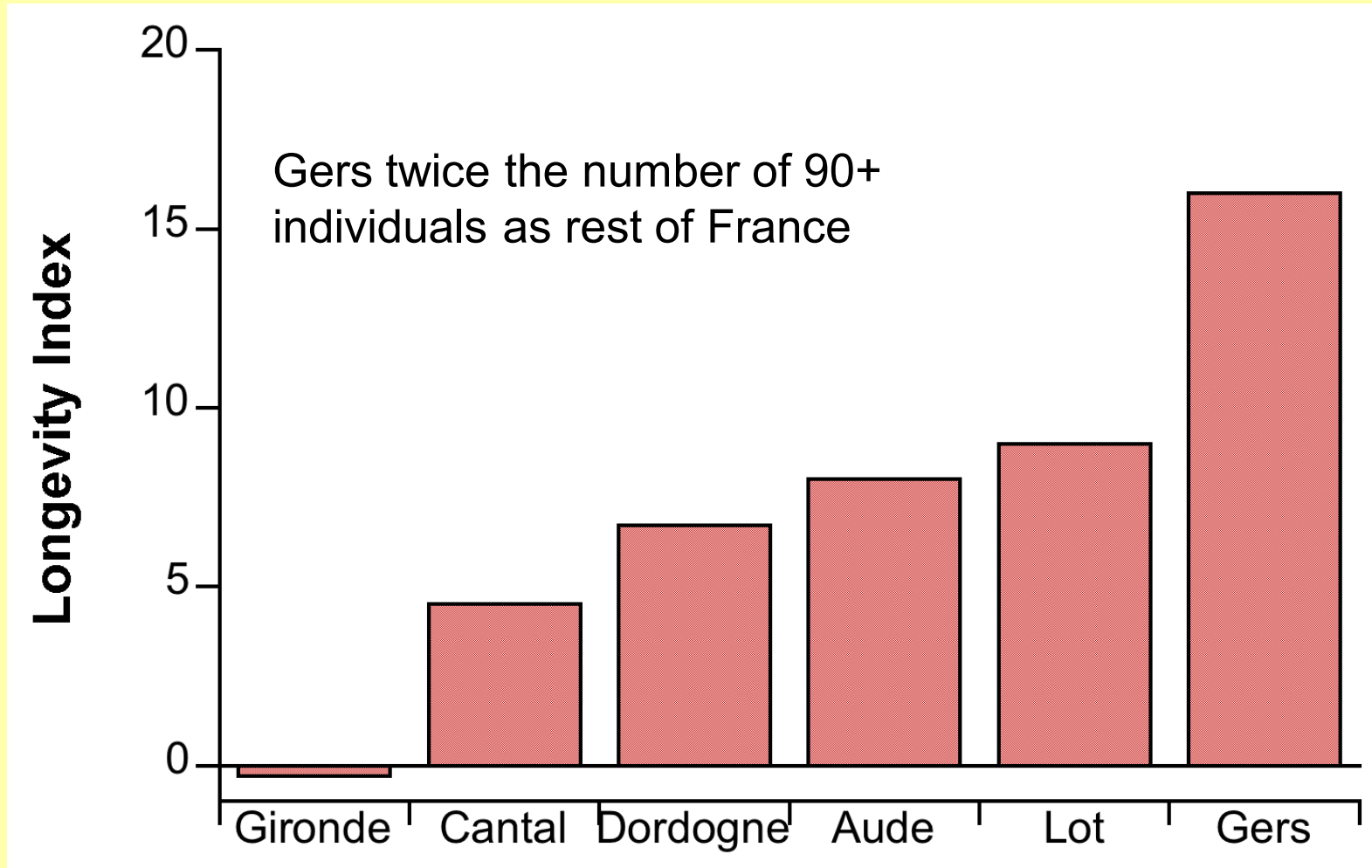
Regional differences (%) in the number of men aged 75 or more relative to the national average

key

- more than 25% above average
- above average
- less than average



Regional Longevity Index (75+ years) for SW France



Gers 'Madiran' wine contains 3-4 times 'normal' level of red wine
Procyanidins

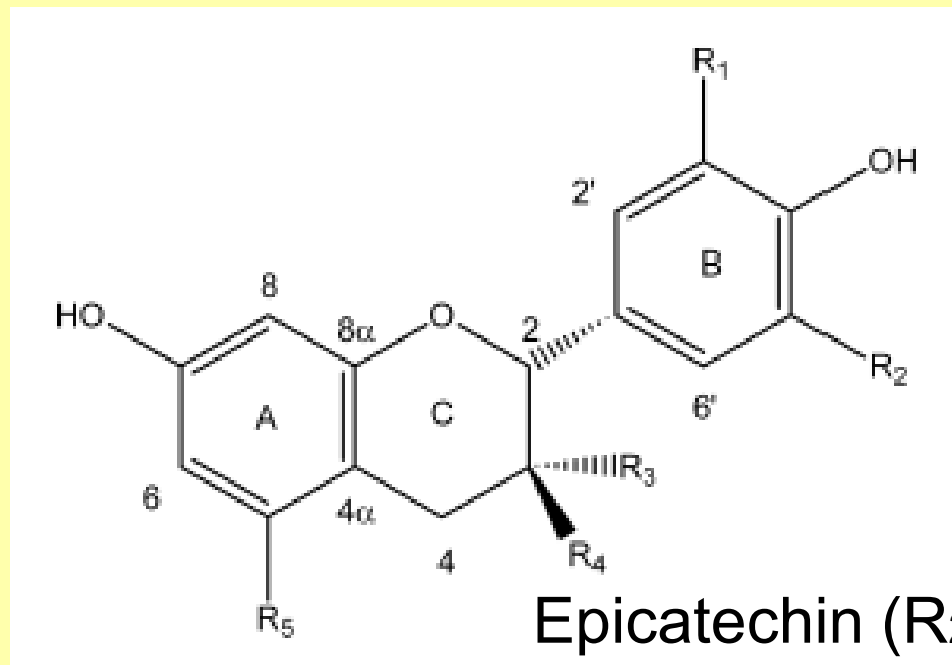
Cocoa and Red Wine - Procyanidins

Rich in polyphenols – astringent ‘bitters’ and tannins

‘Anti-oxidant activity’

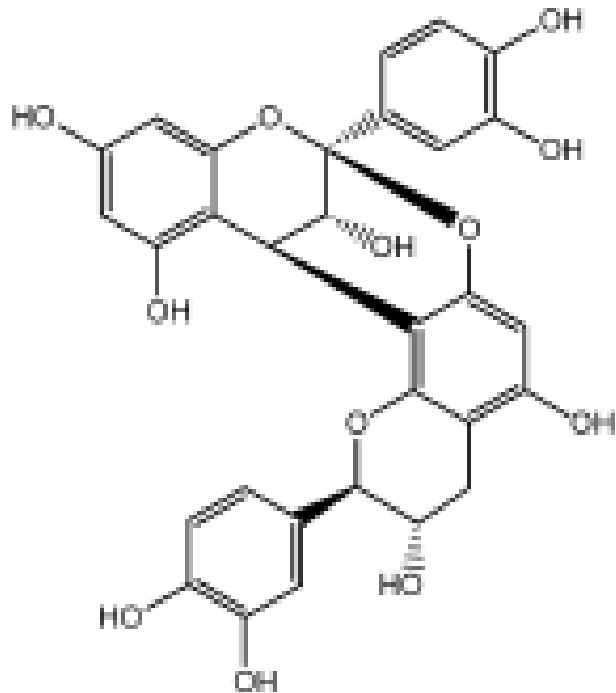
Flavonoids – one group of polyphenols

Procyanidins – one group of flavonoids

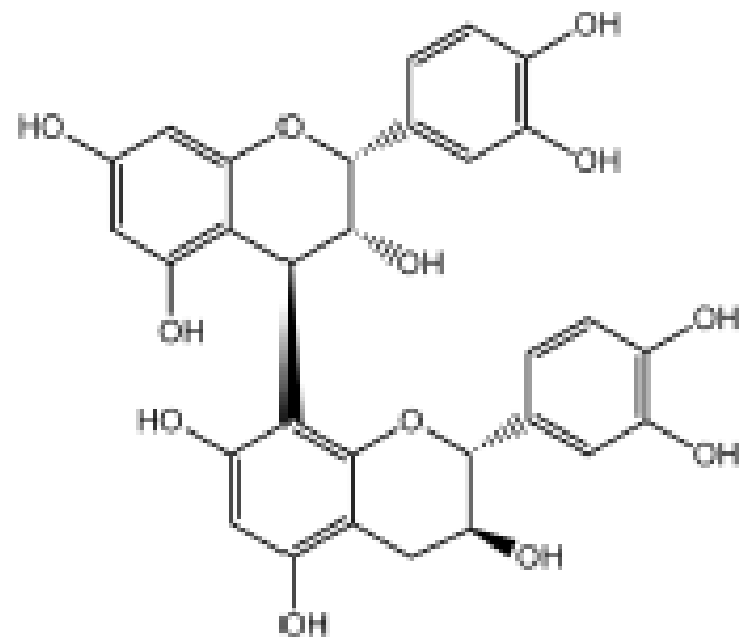


Epicatechin (and related compounds) can form dimers

A-type Dimer (A1)



B-type Dimer (B-1)



Epicatechin Content

Defatted cocoa beans – 2-10mg/g

Table 1. Characteristics of Chocolates Used ($n = 69$)^a

	plain dark chocolate ($n = 46$, labeled = 32)		milk chocolate ($n = 8$, labeled = 2)		chocolate + inclusions ($n = 15$, labeled = 5)	
	mean	range	mean	range	mean	range
labeled cocoa content ^b (%)	66	34–100	23	20–26 ^c	57	28–64 ^c
nonfat cocoa solids						
theobromine (%)	0.60	0.26–1.16	0.17	0.09–0.28	0.48	0.25–0.75
calcd nonfat cocoa solids	22.9	9.7–43.9	6.6	3.6–10.5	18.3	9.3–28.7
calcd cocoa liquor content (%)	49.8	21.1–95.5	14.3	7.8–22.7	39.7	20.2–62.3
calcd addition of cocoa butter (%)	11.8	0.0–24.2	14.4	12.2–16.5 ^c	6.3	0.0–13.4 ^c
polyphenols						
total polyphenols (mg of ECE/g)	10.9	3.4–23.4	5.9	5.2–8.5	7.9	4.1–13.9
sum of six polyphenols (mg/g)	2.00	0.18–4.99	0.67	0.46–1.22	1.64	0.64–3.04
epicatechin (mg/g)	0.78	0.07–1.94	0.27	0.19–0.50	0.64	0.26–1.20
catechin (mg/g)	0.22	0.07–0.52	0.08	0.04–0.12	0.18	0.06–0.40
dimer B2 (mg/g)	0.46	0.04–1.17	0.15	0.11–0.26	0.38	0.15–0.72
dimer B5 (mg/g)	0.09	0–0.24	0.03	0.01–0.05	0.07	0.02–0.15
trimer C1 (mg/g)	0.32	0–0.91	0.11	0.04–0.20	0.26	0.09–0.46
tetramer D (mg/g)	0.13	0–0.39	0.10	0.02–0.44	0.11	0.03–0.23

^a Total polyphenols were measured according to the Folin–Ciocalteu method reported in epicatechin equivalents (ECE) per gram of chocolate. All other polyphenols are given as milligrams per gram of product. The calculation for cocoa content is described under Methodology. ^b $n = 39$, as only 39 of the 69 chocolates stated a cocoa solids content on the label. ^c Only a limited number in this group had labeled percent cocoa content.

