

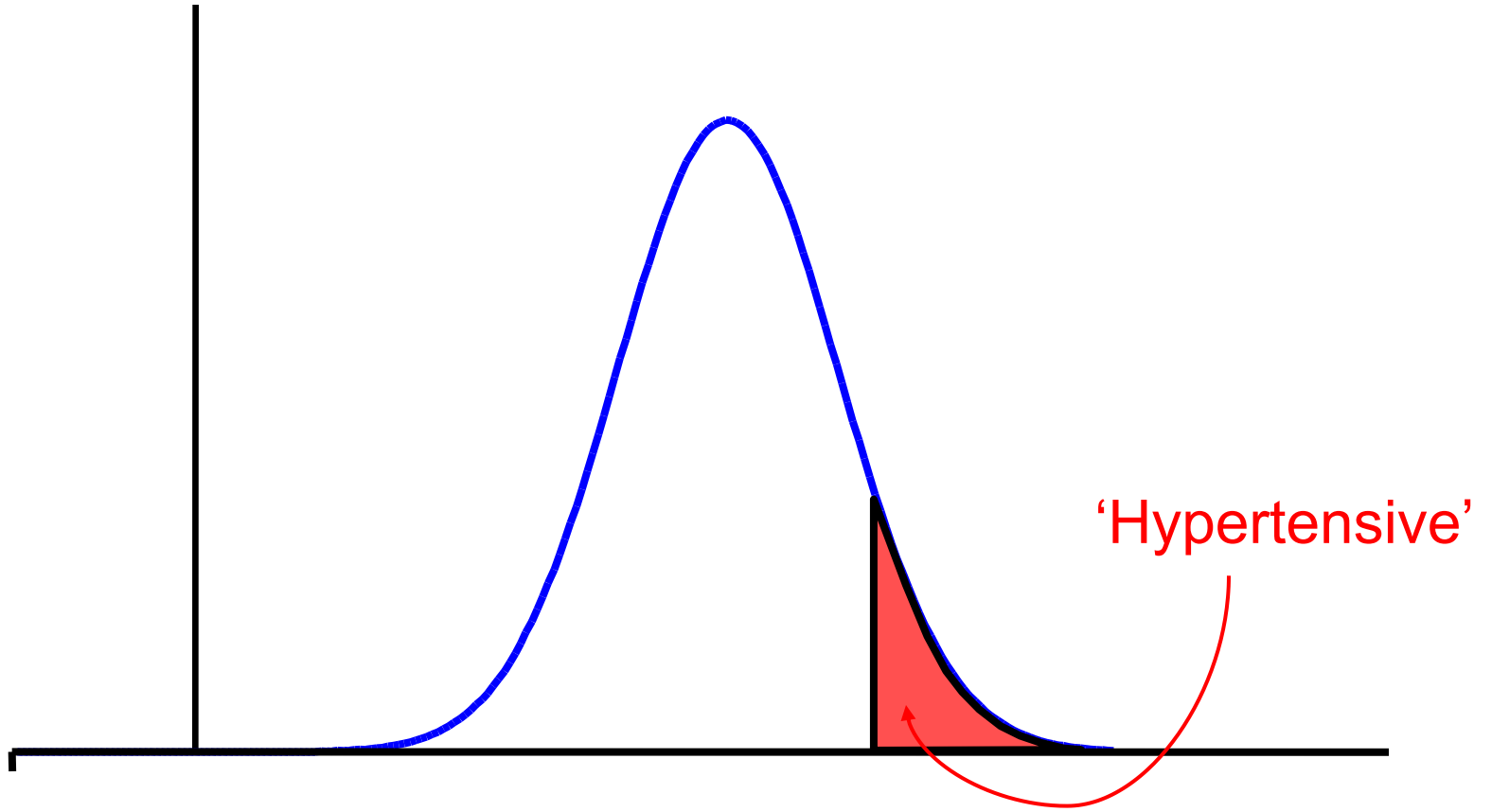


INTERNATIONAL
CENTRE FOR
CIRCULATORY
HEALTH

Prevention, investigation & treatment of hypertension

Simon Thom

NW London GP course; 22 April 2009



'Hypertensive'

Hypertension - a definition

“... a blood pressure level above which investigation and treatment do more good than harm.”

Geoffrey Rose 1971

Lifestyle interventions

BHS Guidelines

Measures that lower blood pressure:

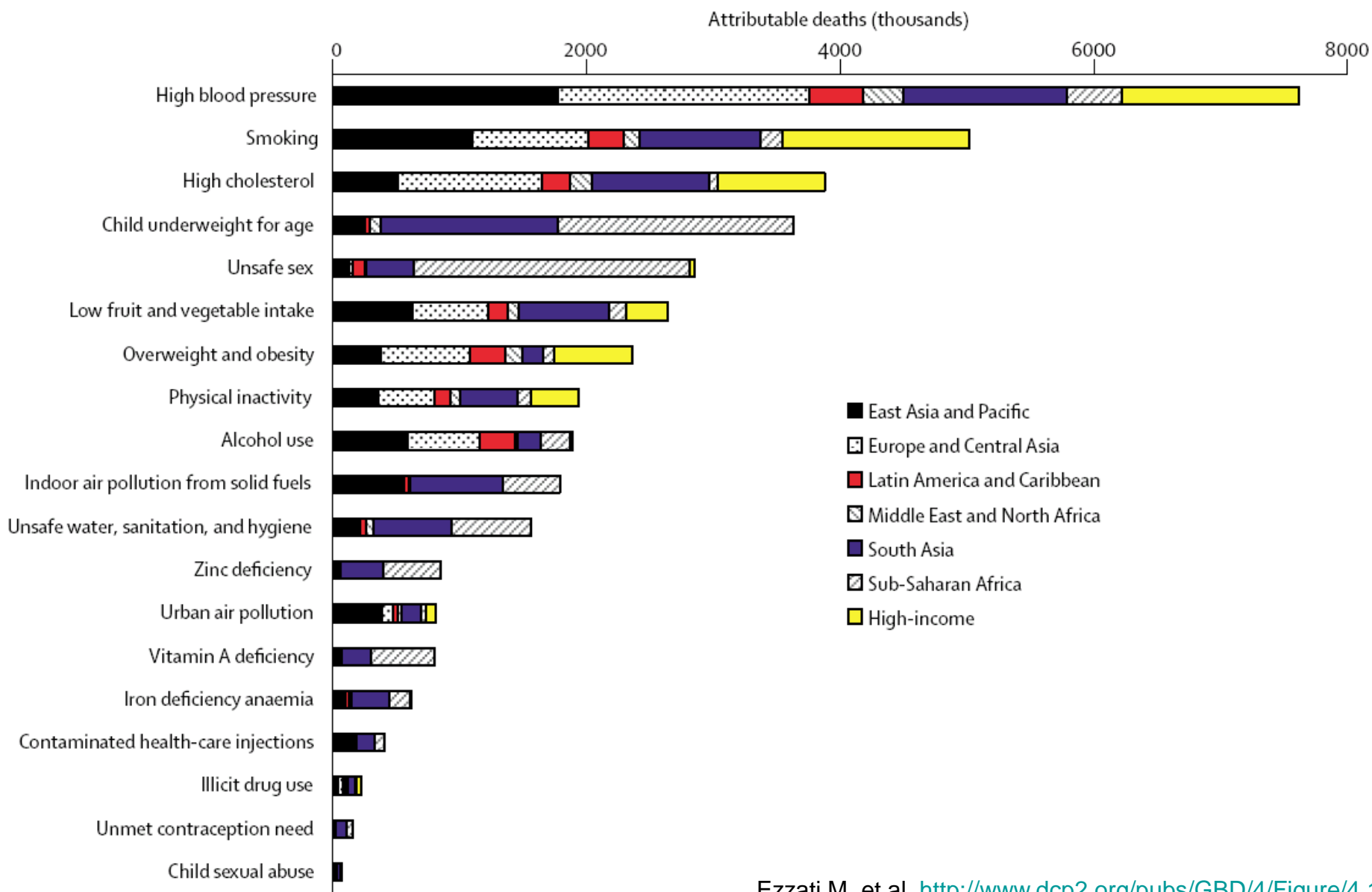
- Weight reduction
- Reduced salt intake
- Limitation of alcohol consumption
- Physical exercise
- Increased fruit & vegetable consumption
- Reduced total fat & saturated fat intake

Measures to reduce cardiovascular risk:

- Stop smoking
- Replace sat fat with poly- & mono-unsaturated fats
- Increase oily fish consumption
- Reduce total fat intake



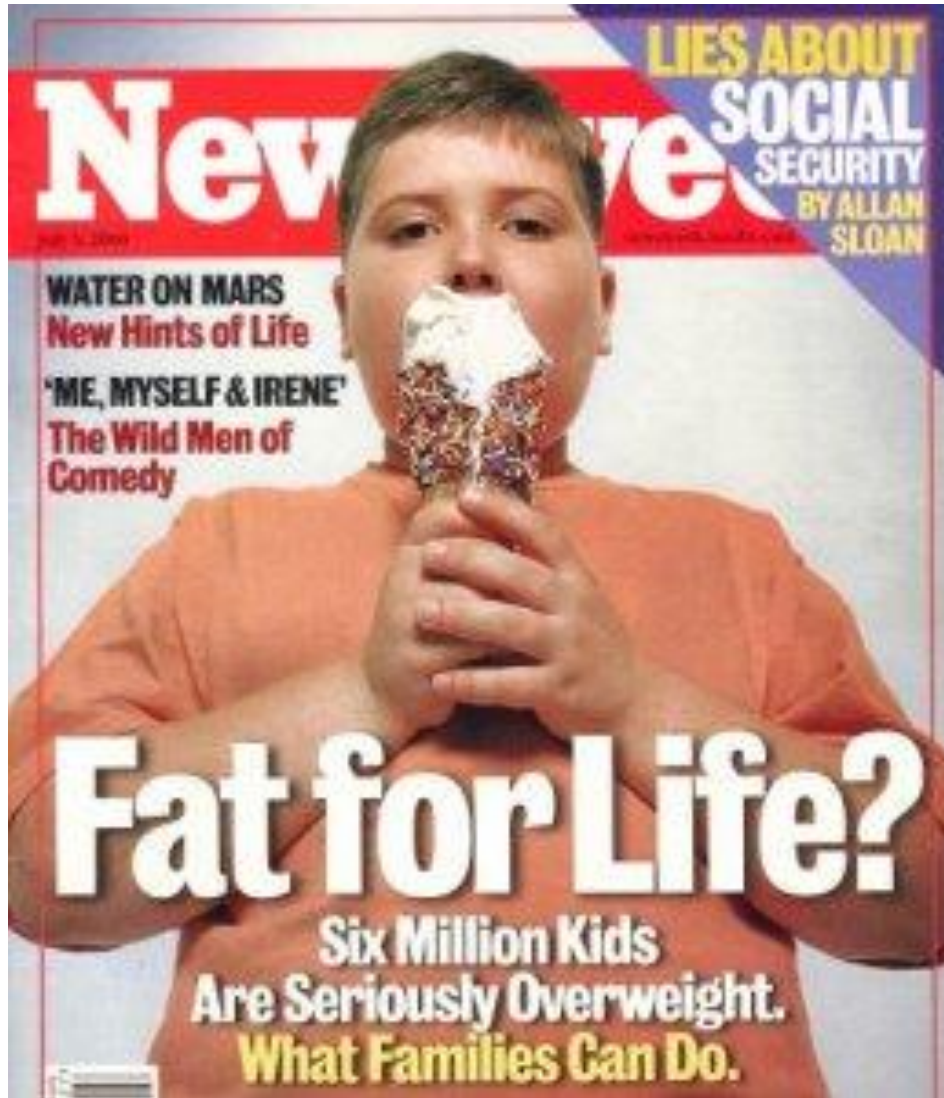
Mortality, due to leading global risk factors



Ezzati M. et al. <http://www.dcp2.org/pubs/GBD/4/Figure/4.1>

Lopez AD. et al. Lancet 2006; 367:1747-1757

There are now more young people who are overweight through calorie excess



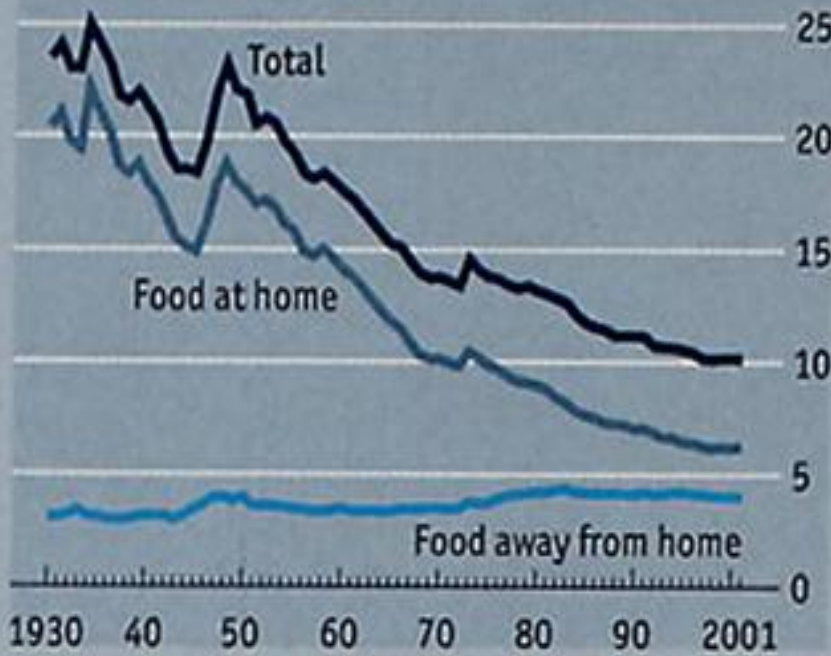
than there are young people who are starving.

US Spending on food, home & away

Kcal per person per day

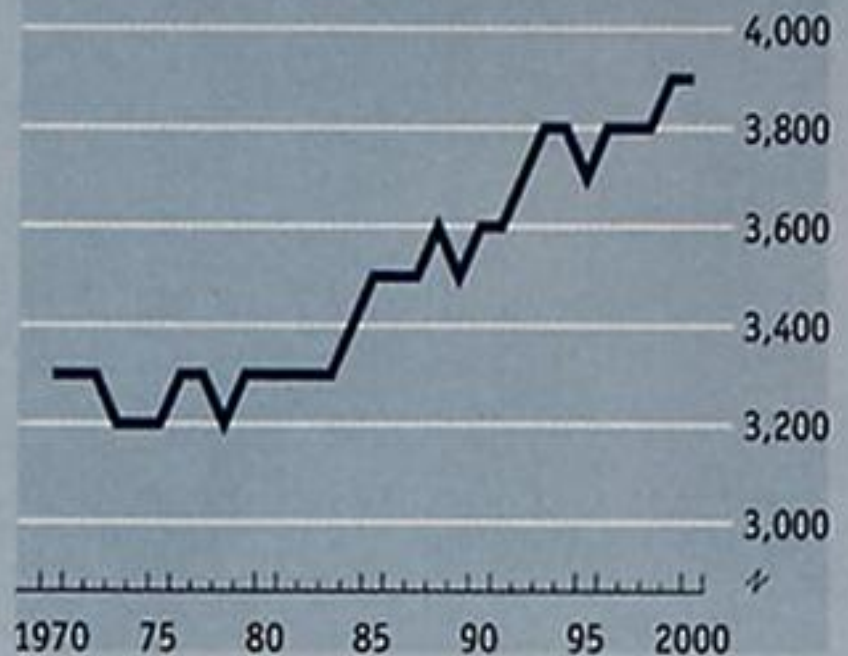
Too cheap and too plentiful

Spending on food as % of disposable income



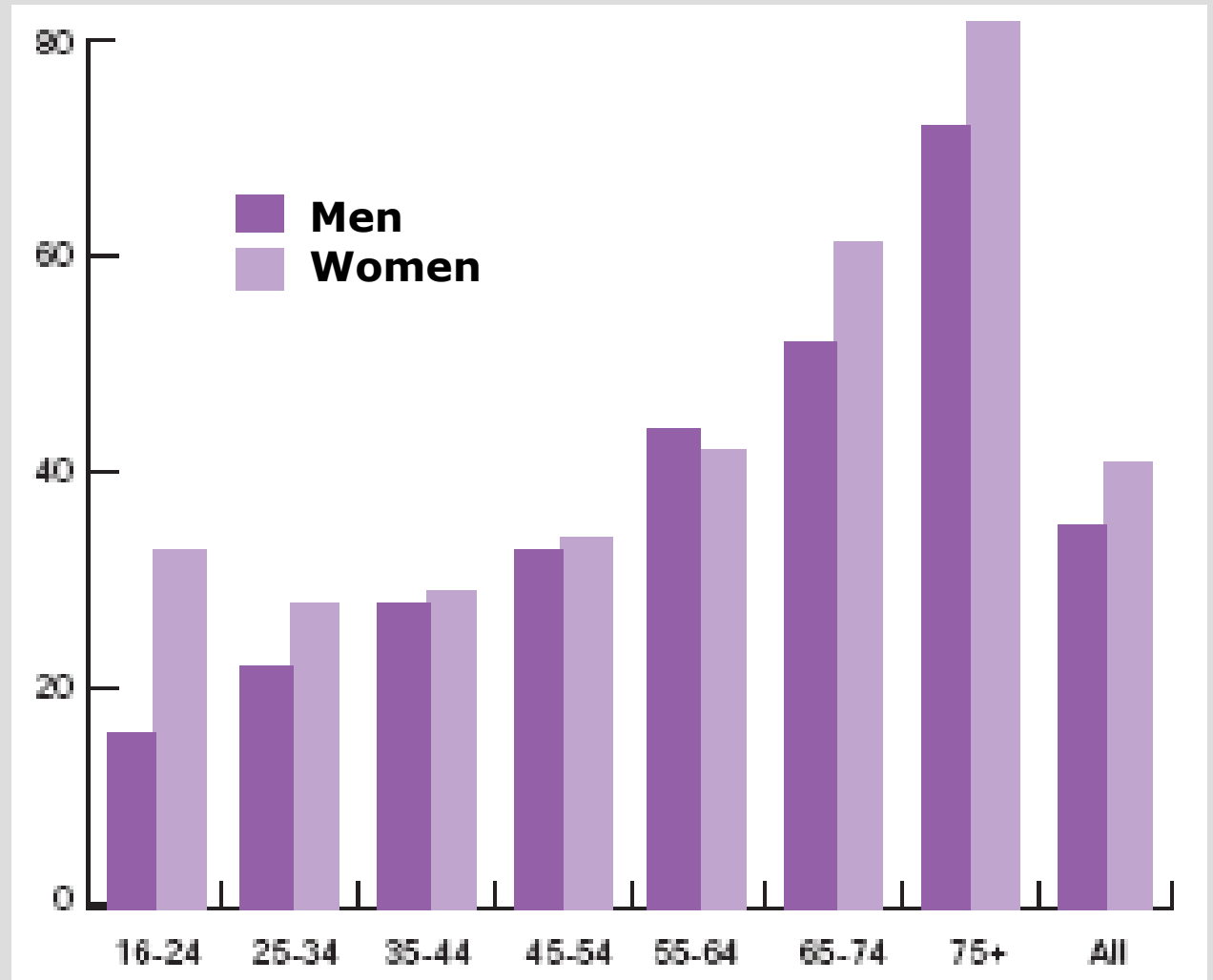
Source: USDA Economic Research Service

Kcal consumed per person per day



Prevalence of **inactivity** among adults, England 1998

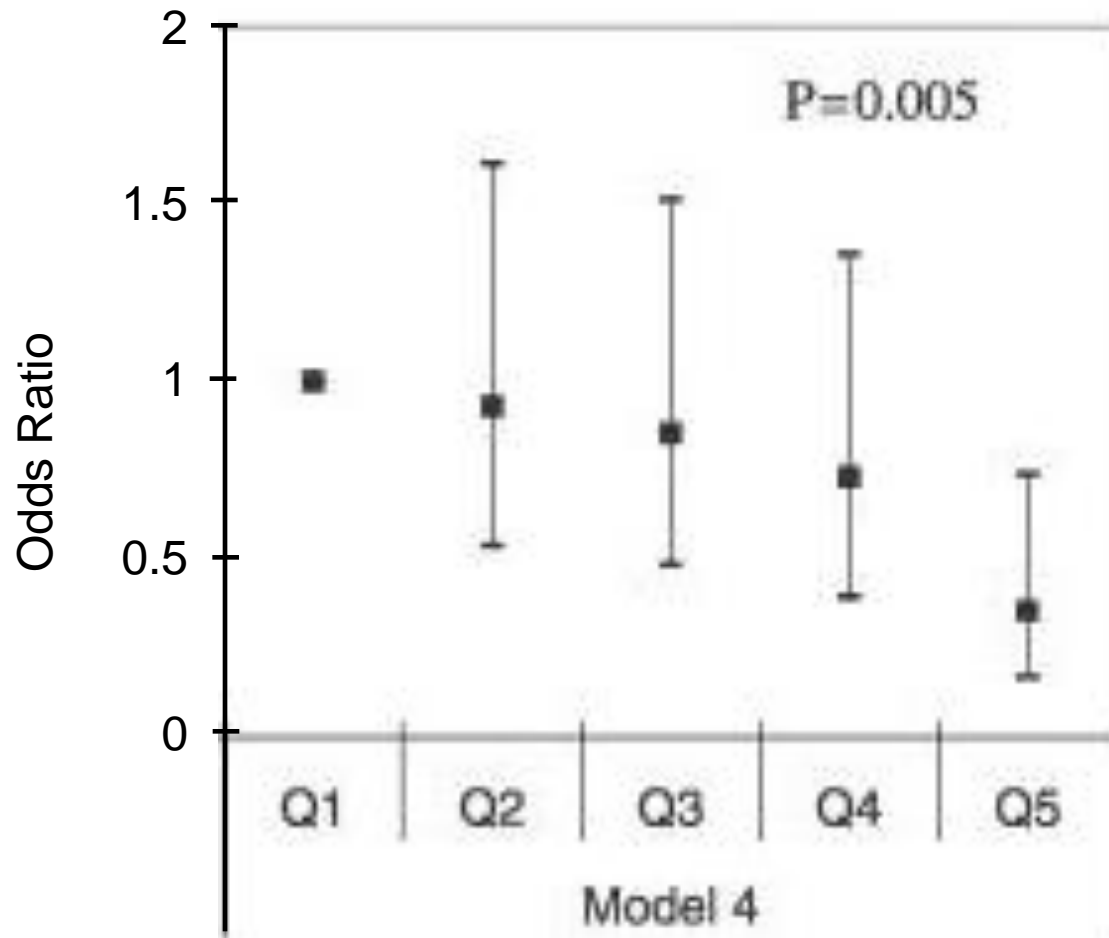
Achieving <30 mins
mod exercise / week
%



Age

Health Survey for England

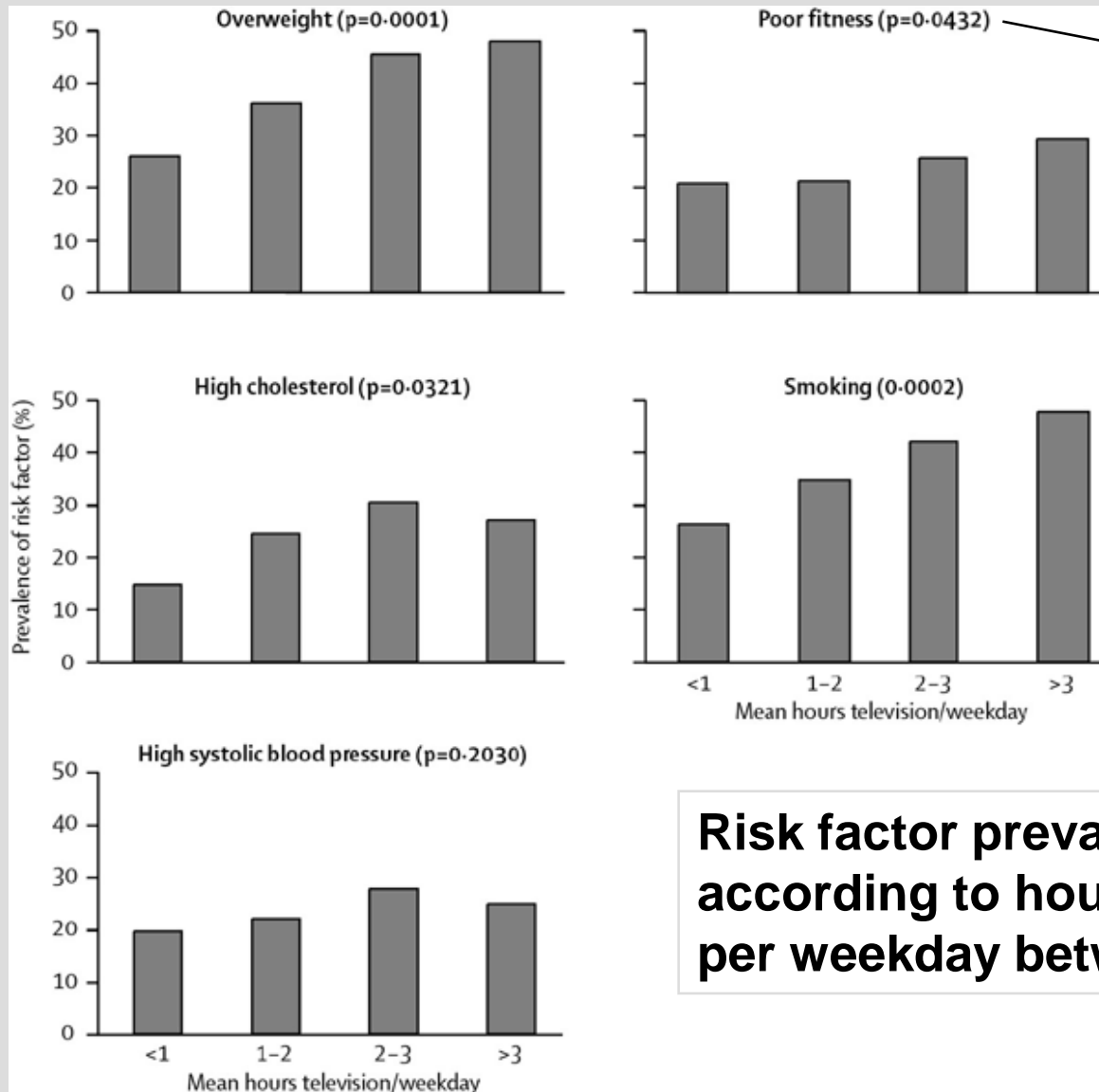
Adjusted ORs for obesity by quintiles of objectively measured minutes of moderate & vigorous activity.



2,878 12-year-old girls from the Avon Longitudinal Study of Parents and Children

Model 4 - maximally adjusted: obesity (adjusted for age, height, & height sq) regressed on quintiles of MVPA, maternal education, lowest social class, birthweight, gestational age, smoking in pregnancy, obesity of mother, sleep pattern, TV viewing, & pubertal stage.

Association between child & adolescent TV viewing & adult health: a longitudinal birth cohort study



Cycle ergometer
VO₂ max

Risk factor prevalence at age 26
according to hours of TV viewing
per weekday between ages 5 - 15

WHAT ARE
YOU GOING
TO BE WHEN
YOU GROW
UP?

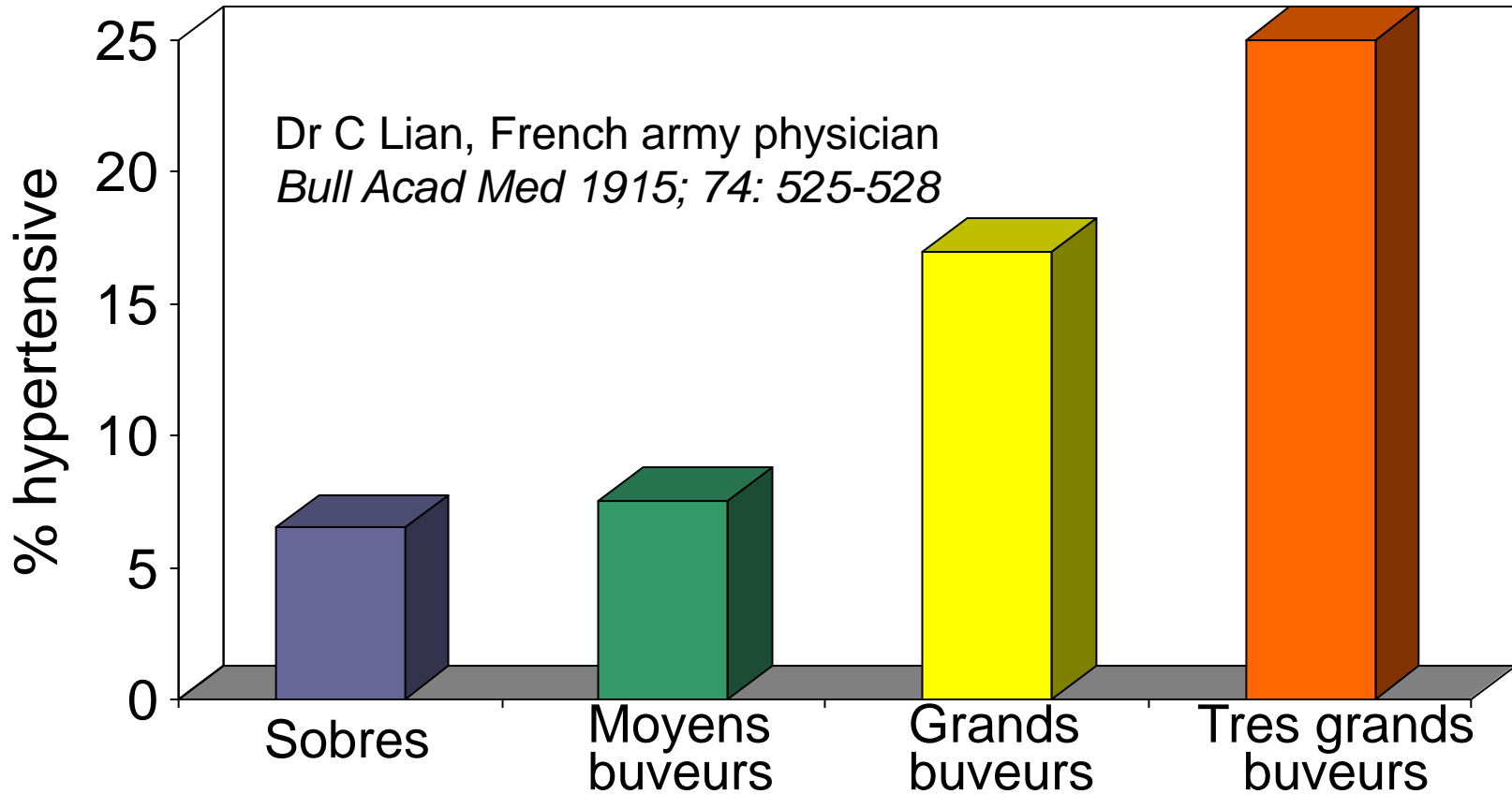
DIABETIC



ROBERT THOMPSON

Alcohol increases blood pressure

Prevalence of hypertension (>150/100) amongst French soldiers stratified by alcohol intake



Sobres: < 1 litre wine / day

Moyens buveurs: 1 - 1.5 litres wine / day

Grands buveurs: 2 - 2.5 litres wine / day + 2 aperitifs

Tres grands buveurs: > 3 litres wine / day + 4 - 6 aperitifs

Salt

- The average UK salt consumption is ~ 9 gm / day
- Dietary requirement is ~ 1.4 gm / day

Food groups contributing the most salt to our diet:

- 35% from cereal & cereal products e.g. bread, breakfast cereals, 'morning goods'
- 26% from meat & meat products e.g. bacon & ham, burgers, sausages
- 8% from milk & milk products e.g. milk, cheese

Recommendations

**.... for prevention are synonymous
with those for treatment**

Lifestyle measures: BHS IV

- Maintain normal weight for adults (BMI 20-25 kg/m²)
- Reduce salt intake to <100 mmol/day (<6g NaCl or <2.4 g Na⁺/day)
- Limit alcohol consumption to ≤3 units/day for men and ≤2 units/day for women
- Engage in regular aerobic physical exercise (brisk walking rather than weight lifting) for ≥30 minutes per day, ideally on most of days of the week but at least on three days of the week
- Consume at least five portions/day of fresh fruit and vegetables
- Reduce the intake of total and saturated fat

WCRF recommendations for cancer prevention

- Be as lean as possible without becoming underweight.
- Be physically active for at least 30 minutes every day.
- Avoid sugary drinks. Limit consumption of energy-dense foods (particularly processed foods high in added sugar, or low in fibre, or high in fat).
- Eat more of a variety of vegetables, fruits, whole grains, & pulses such as beans.
- Limit consumption of red meats (such as beef, pork & lamb) & avoid processed meats.
- If consumed at all, limit alcoholic drinks to 2 for men & 1 for women a day.
- Limit consumption of salty foods & foods processed with salt.
- Don't use supplements to protect against cancer.

Special Population Recommendations

- It is best for mothers to breastfeed exclusively for up to 6 months & then add other liquids & foods.
- After treatment, cancer survivors should follow the recommendations for cancer prevention.
- Do not smoke or chew tobacco.

Expected benefits

The effect of lifestyle modifications on BP

Modification	Recommendation	S-BP reduction
Weight reduction	Maintain normal weight (BMI 18.5 – 24.9 kg/m ²)	1 mmHg/kg
DASH eating plan	Diet rich in fruit & veg, low fat dairy prod, low sat & total fat	8 - 14
Reduced Na ⁺ intake	<100 mEq/l (2.4 g Na ⁺ /day)	2 - 8
Physical activity	Regular aerobic activity (brisk 30 min walk / day)	4 - 7
Moderate alcohol	Not more than 2 drinks men, 1 drink women daily	2 - 3

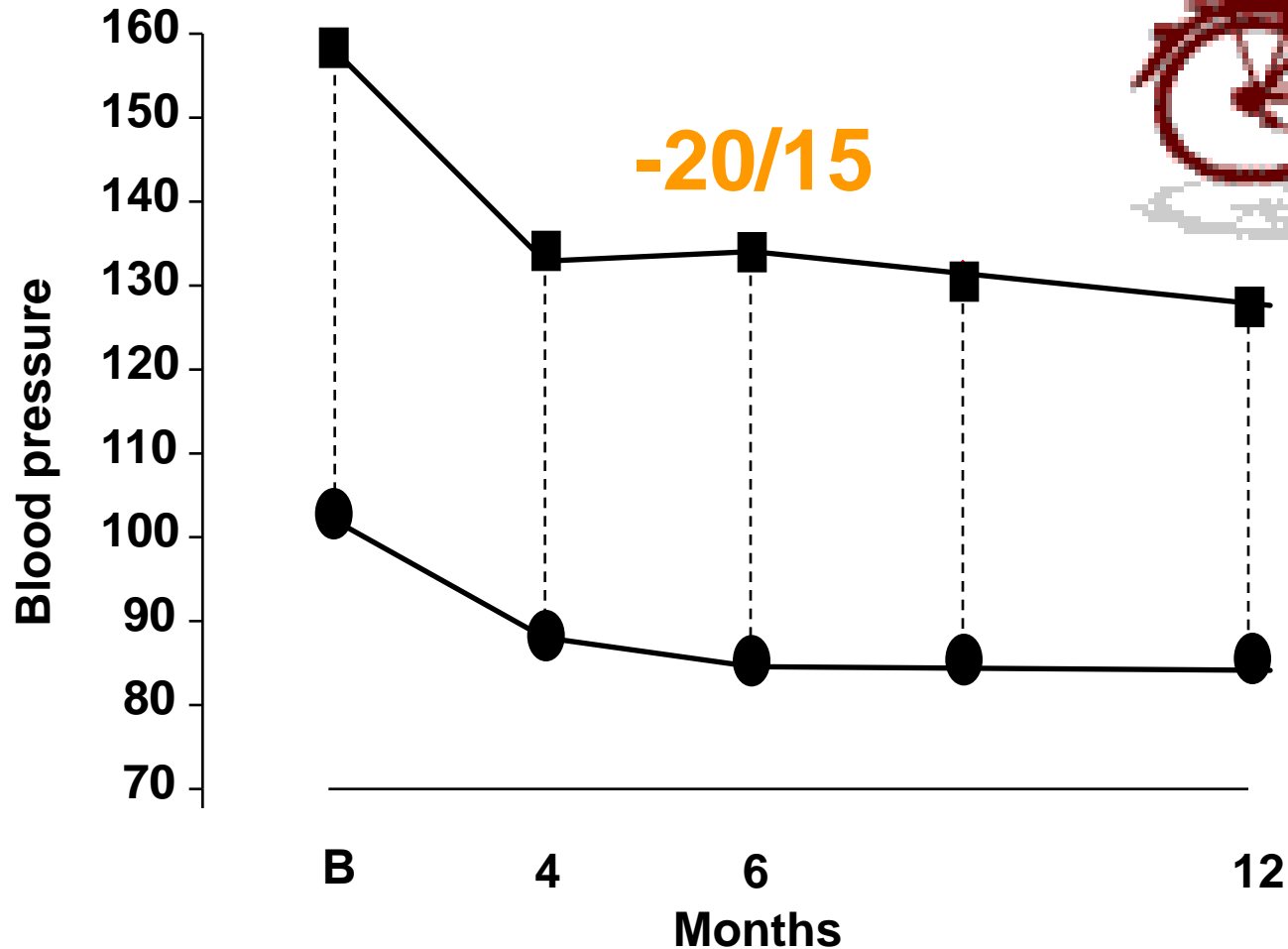
Potassium and BP

1. **Clinical trials, epidemiological and laboratory studies suggest:
↑ dietary K⁺ intake → ↓ B.P. levels
- 3 / 2 in meta-analysis**

Whelton P, JAMA 1997; 277:1624

2. **The hypotensive effect of K⁺ may be dependent upon a high Na⁺ intake.**

Effect of one year's regular exercise on blood pressure



Meta-analysis, 106 RCTs (6805 subjects) - 4.6 / 2.4

Dickenson et al. 2006

Jennings G et al. J Hypertension 1986; 4(6): 659

How

Tracking of CVD risk factors

Behavioural patterns – smoking, physical activity, eating habits and weight tracking from childhood, through adolescence to adulthood.

Kvaavik E. Oslo Youth Study
Arch Ped Adolesc Med 2004; 157: 1212



Wilsgaard T. The Tromso Study Am
J Epidemiol 2001; 154(5): 418

Twisk JW. The Amsterdam
Growth and Health Study
Am J Epidemiol 1997; 145: 888

Kuh DJ. MRC National survey
J Epidemiol Community Health
1992; 46: 114

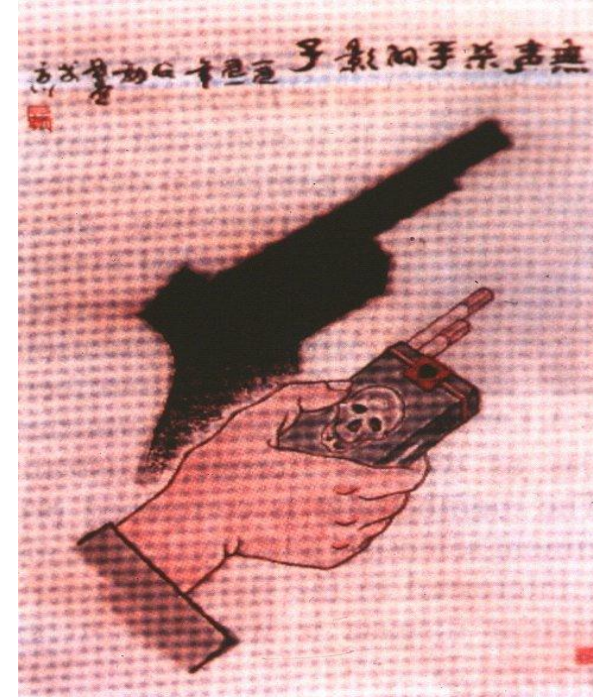
The DASH diet

More

- Fruit, vegetables
- Fresh
- Whole grains, beans
- Un-sat oils
- Fish, poultry

Less

- Sat fat
- Salt
- Processed
- CHOate
- Sugary drinks
- Cholesterol



“Goodies” -

Nuts, green tea, (alcohol ...?)

Circulation 2002; 106: 3143-421

Circulation 2004; 110: 227-239

Appel LJ et al. OmniHeart Study. JAMA. 2005; 294: 2455

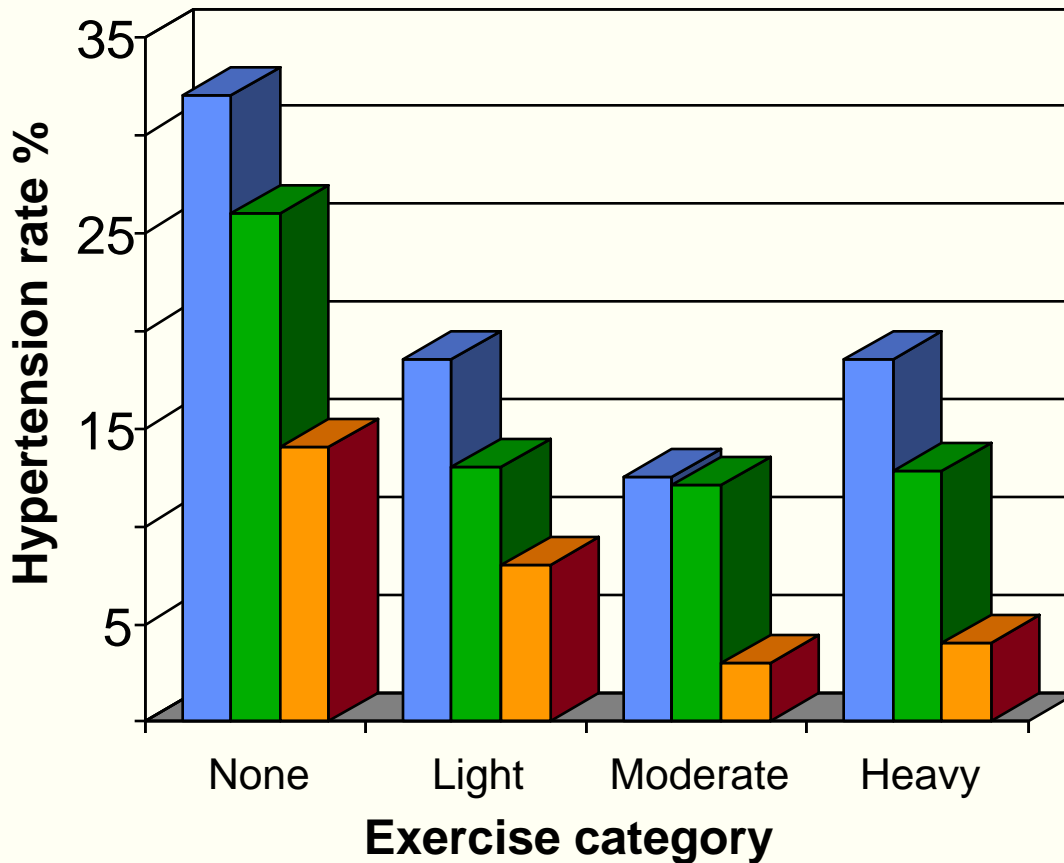
<http://www.nhlbi.nih.gov/guidelines/cholesterol/>

<http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/>



Less active, less fit people (men, women & children) have a 30 - 50% greater chance of developing hypertension

Paffenbarger '83, Blair '84, Hansen '91, Lowry '95



Protective effect of exercise vs. hypertension in older women, 50 - 89 yrs

- Overall HTN
- Systolic HTN
- Diastolic HTN



“Pulling open a bag of potato chips... would that be considered as ‘aerobic’ or ‘anaerobic’ exercise?”

Exercise advice

Practical approaches

- **Tailor advice to individual.**
- **Know the area in which your patients live.**

Useful questions:

- **What did you used to do?**
- **What do you enjoy?**
- **Where do you live & what local facilities are available?**
- **Where do you work – how do you get there?**

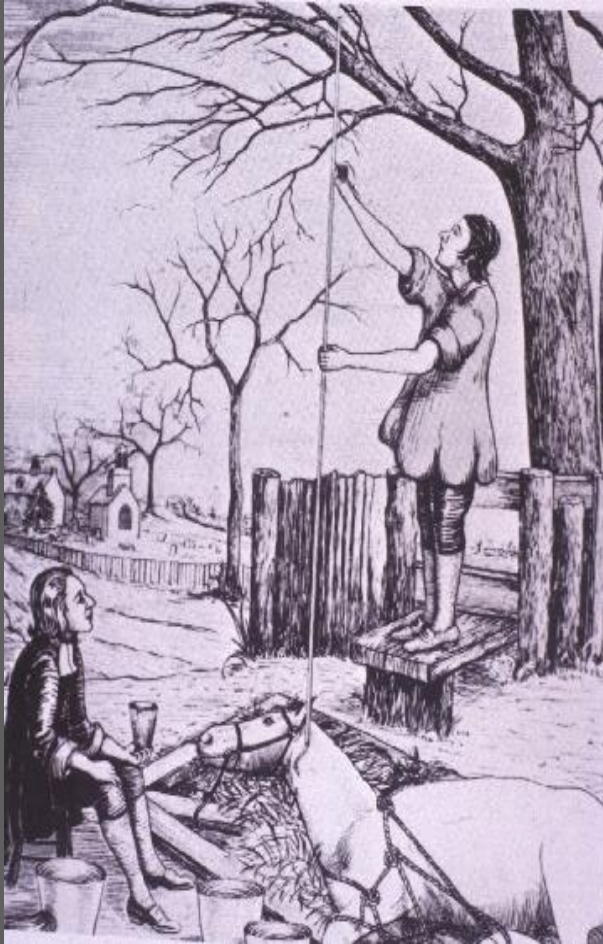
Investigation & drug treatment

Investigating the hypertensive patient

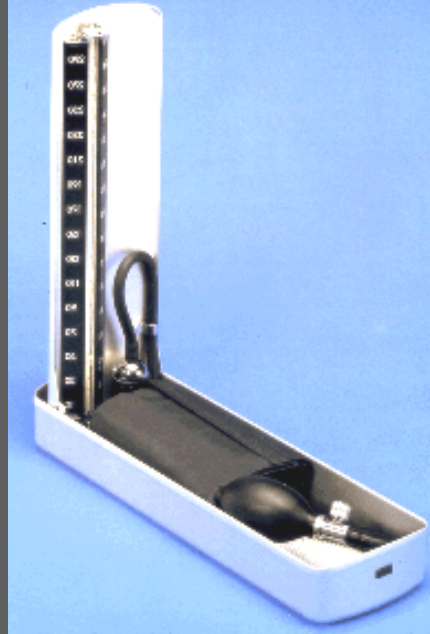
Objectives:

- Confirm BP elevation
- Assess risk factors for hypertension
- Assess target organ damage
- Diagnose secondary hypertension
- Identify other risk factors for CVD
- Identify concurrent conditions

BP measurement 18th – 21st centuries



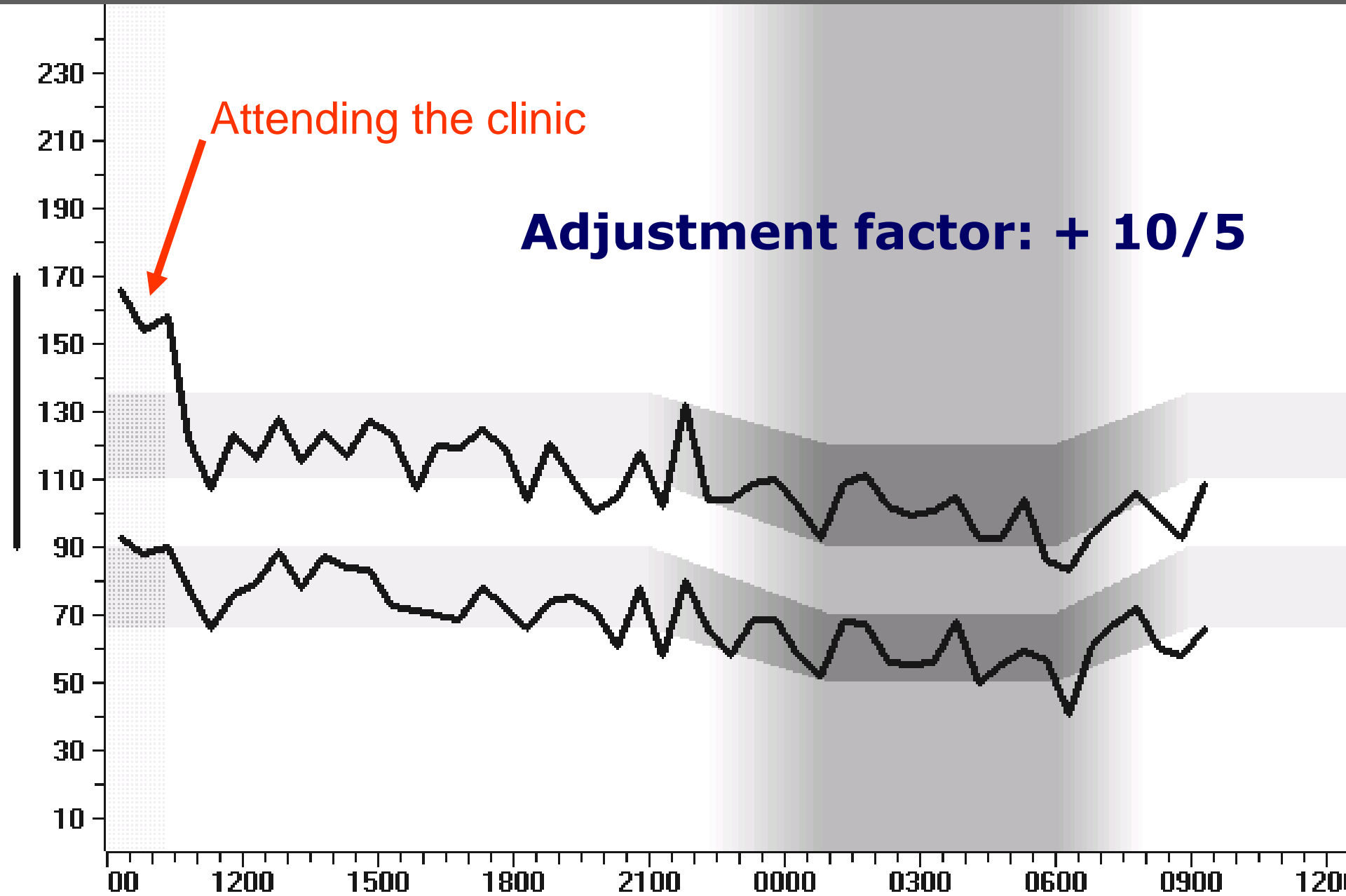
1733



ABPM – when to use:

- Unusual blood pressure variability
- Possible ‘white coat’ hypertension
- Informing equivocal treatment decisions
- Office hypertension in individuals with low cardiovascular risk
- Symptoms suggestive of hypotensive episodes
- Hypertension resistant to drug treatment
- Determining 24-hr efficacy of treatment

'White-coat' pattern of BP profile



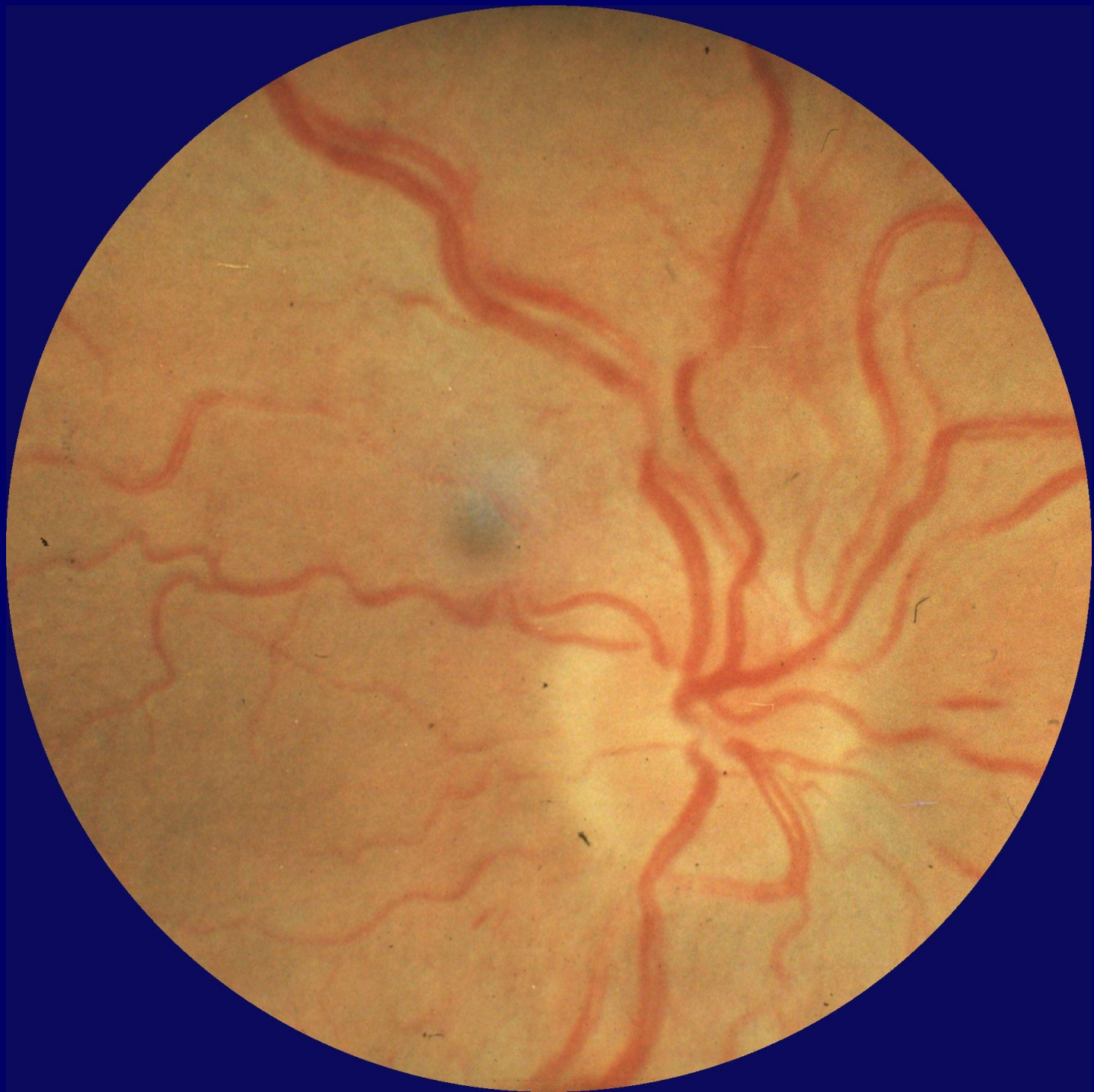
History & examination aims

To assess:

- target organ damage: heart, brain, fundi, kidneys
- clues to 2^o hypertension: symptoms, signs and drug history
- hypertension risk factors: weight, family history, salt intake, alcohol
- other CVD risk factors: lipids, smoking, diabetes, exercise habit
- concurrent conditions: asthma, gout, claudication, Raynaud's, pregnancy.....

Drugs which may affect BP

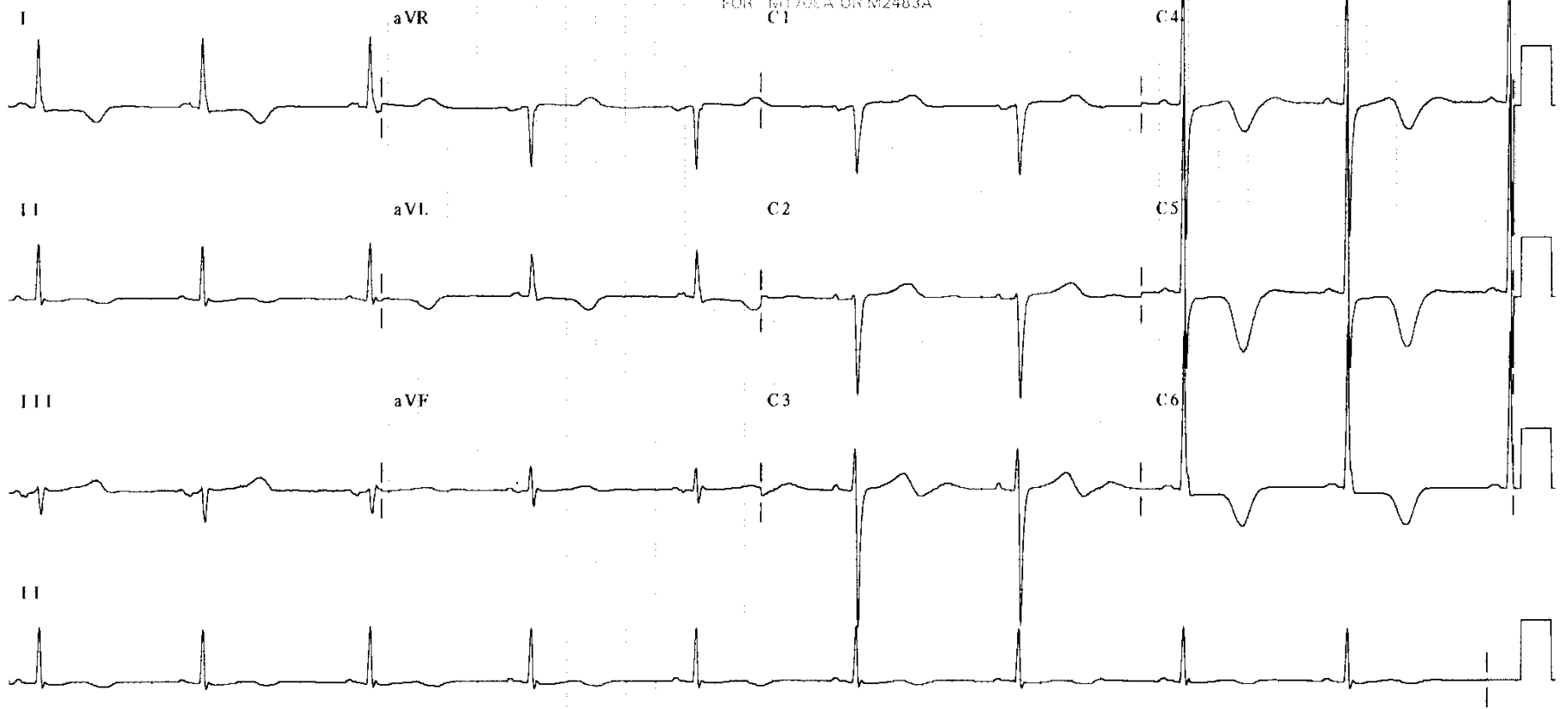
- Oral contraceptive pill
- Non-steroidal anti-inflammatory drugs
- Liquorice
- Cocaine
- Amphetamines
- Other sympathomimetics
- Steroids
- Erythropoietin, cyclosporin



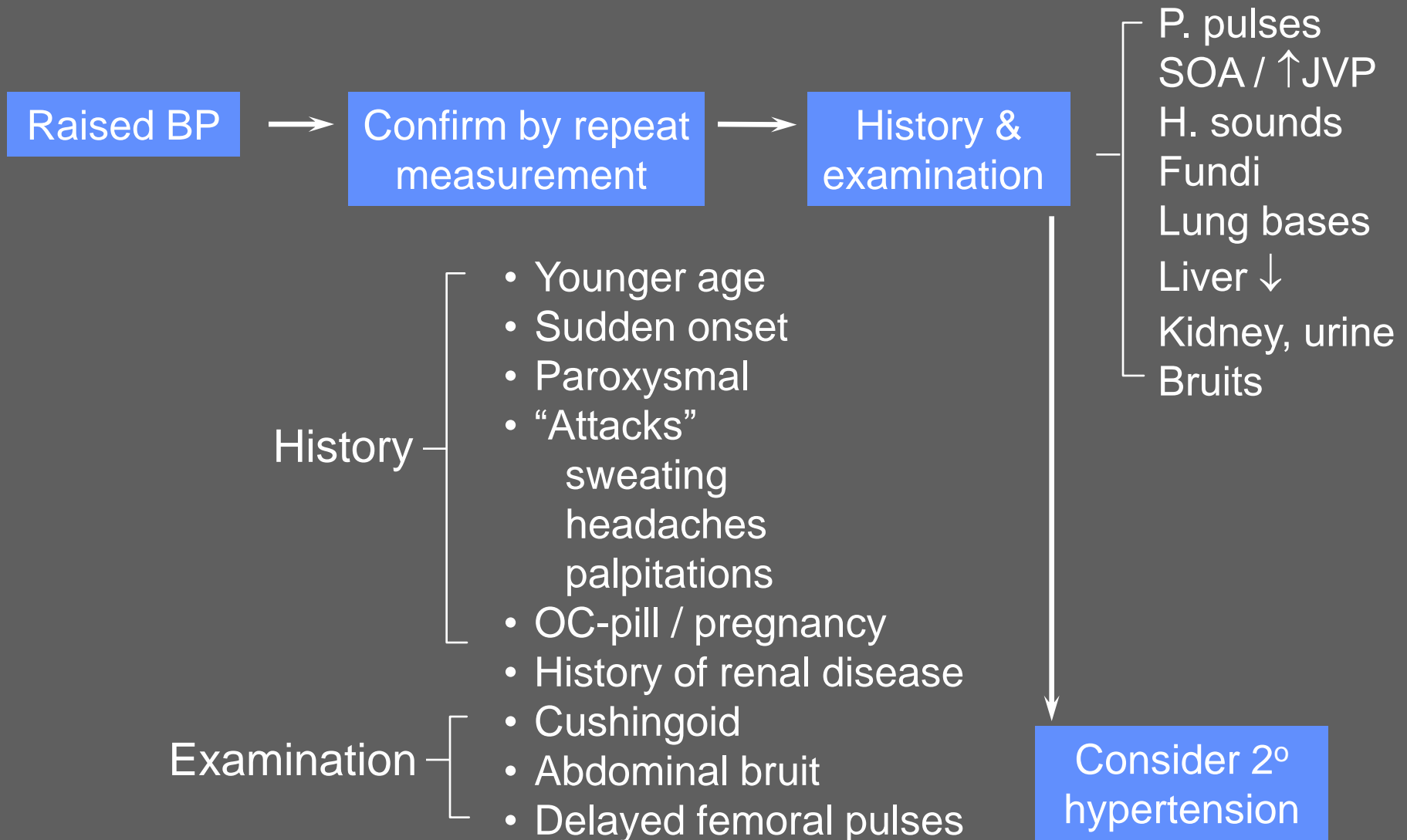
Investigations for all patients

- Urine
 - ▶ 'Stix' tests: blood, protein, sugar
 - Blood
 - ▶ Creatinine + electrolytes
 - ▶ Sugar + lipids
 - ▶ LFT's + γ GT + FBC
 - ECG
-
- CRP
 - Aldosterone & renin
 - Echocardiography
 - Carotid IMT

FOR M1700A OR M2483A
C1



Hypertension management algorithm



Indications for further investigation

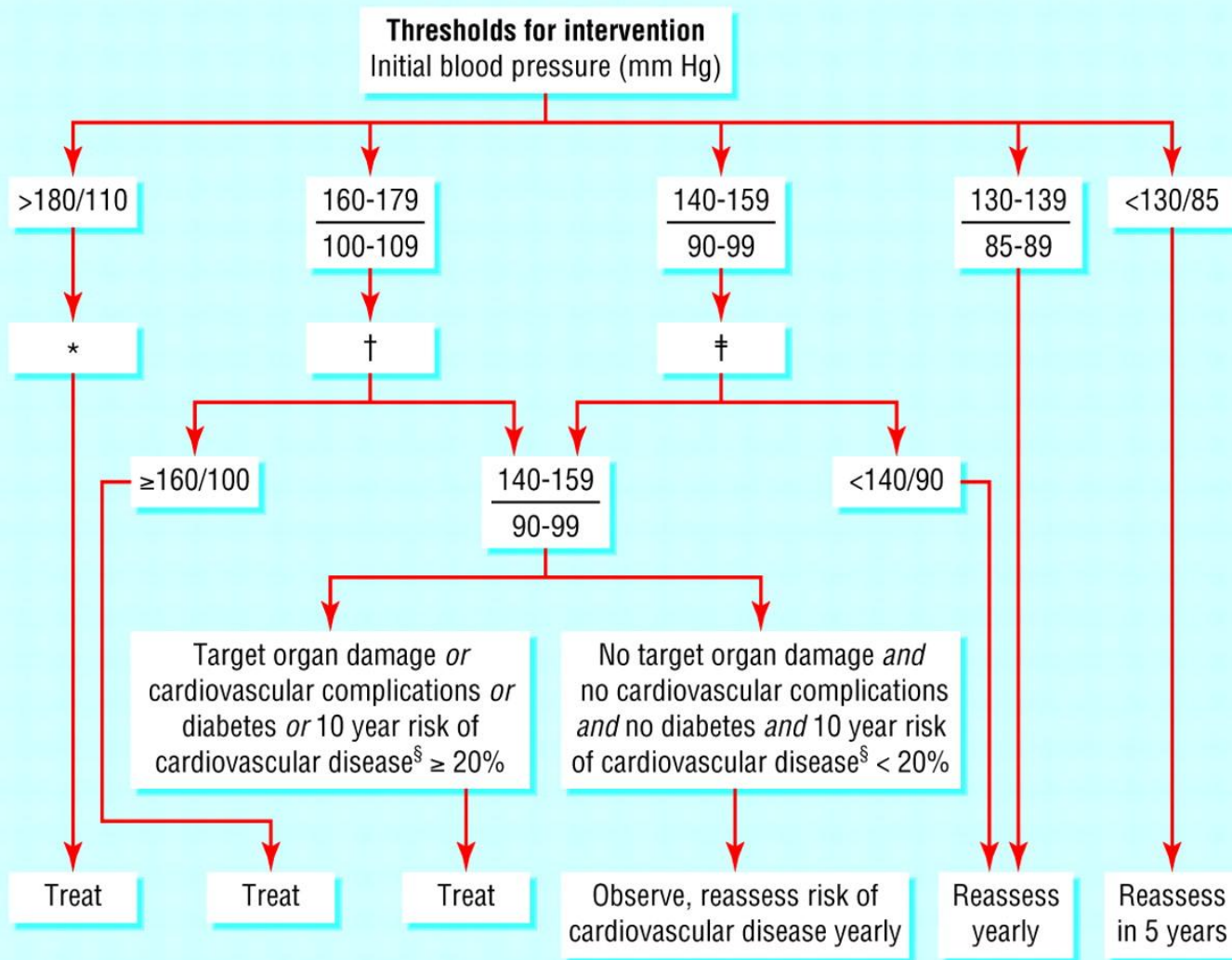
- Clinical features of an underlying cause
- Onset before age 30
- Rapid progression
- Proteinuria, haematuria, glycosuria
- Severe hypertension; difficult to control
- Vascular disease - peripheral, carotid, coronary
- Heart failure

Symptom	Condition
Thirst, polyuria, nocturia	Chronic renal disease, diabetes, hyperparathyroidism
Loin pain, colic	Analgesic nephropathy, pyelonephritis, polycystic disease, renal artery stenosis
Haematuria, oedema	Glomerulonephritis
Muscle weakness	Conn's
Postural hypotension	Phaeochromocytoma, Conn's
Palpitations, sweating, paroxysmal headache	Phaeochromocytoma

Classification of BP levels

<u>British Hypertension Society</u>	SBP		DBP
Optimal	<120	<i>and</i>	<80
Normal	<130	<i>and</i>	<85
High normal	130-139	<i>or</i>	85-89
Hypertension	≥140	<i>or</i>	≥90
<u>JNC VII</u>	SBP		DBP
Normal	<120	<i>and</i>	<80
Prehypertension	120-139	<i>or</i>	80-89
Hypertension	≥140	<i>or</i>	≥90

Intervention thresholds



* Unless malignant phase of hypertensive emergency confirm over 1-2 weeks then treat

† If cardiovascular complications, target organ damage, or diabetes is present, confirm over 3-4 weeks then treat; If absent remeasure weekly and treat if blood pressure persists at these levels over 4-12 weeks

‡ If cardiovascular complications, target organ damage, or diabetes is present, confirm over 12 weeks then treat; If absent remeasure monthly and treat if these levels are maintained and if estimated 10 year cardiovascular disease risk is $\geq 20\%$

§ Assessed with risk chart for cardiovascular disease

Diuretics (thiazides)

- Benefits
 - Effective in elderly, systolic hypertension & blacks
 - Inexpensive, effective & well-tolerated in low doses
 - Proven to prevent cardiovascular events
- Drawbacks (often associated with high doses)
 - Potassium depletion, impaired glucose tolerance, ventricular ectopics, impotence

ACE inhibitors / ARBs

- Benefits
 - Safe and effective
 - Reduce morbidity & mortality in heart failure
 - Retard progression of renal disease in patients with diabetes & proteinuria
- Drawbacks
 - Most common adverse effect dry cough (ACE-i)
 - Rare but life-threatening angioedema (ACE-i)
 - Less effective in blacks
 - Not for young women

Calcium antagonists

- Benefits
 - All subgroups effective and well-tolerated
 - Effective in preventing stroke in elderly with systolic hypertension
 - Effective in blacks
 - Metabolically neutral
- Drawbacks
 - Rapid-onset, short-acting calcium antagonists should be avoided (never use capsular nifedipine)
 - Tachycardia, flushing, ankle oedema
 - Constipation (verapamil)

α -blockers

- Benefits
 - Safe and effective 3rd / 4th line agent
 - Potential advantages in those with dyslipidaemia & glucose intolerance
- Drawbacks
 - No trial evidence of benefit on CV risk
 - Risk of postural hypotension

Spironolactone

- Aldosterone antagonist
- Useful add-on R_x
 - in ASCOT, addition of spironolactone ↓ BP by 21/9
- Use limited by SE's (e.g. gynaecomastia)
- Risk hyperkalaemia in renal impairment / with ACE-I

Other drugs

Centrally-acting drugs

- Imidazoline receptor antagonists
 - Rilmenidine, moxonidine
- Reserpine, methyldopa, clonidine
 - Generally less favourable side-effect profile
 - Reserpine cost-effective but use low dose

Vasodilators

- Hydrallazine and minoxidil
 - Tachycardia, headache, sodium & water retention

Aliskiren

β -blockers

Indications / contraindications for different drugs

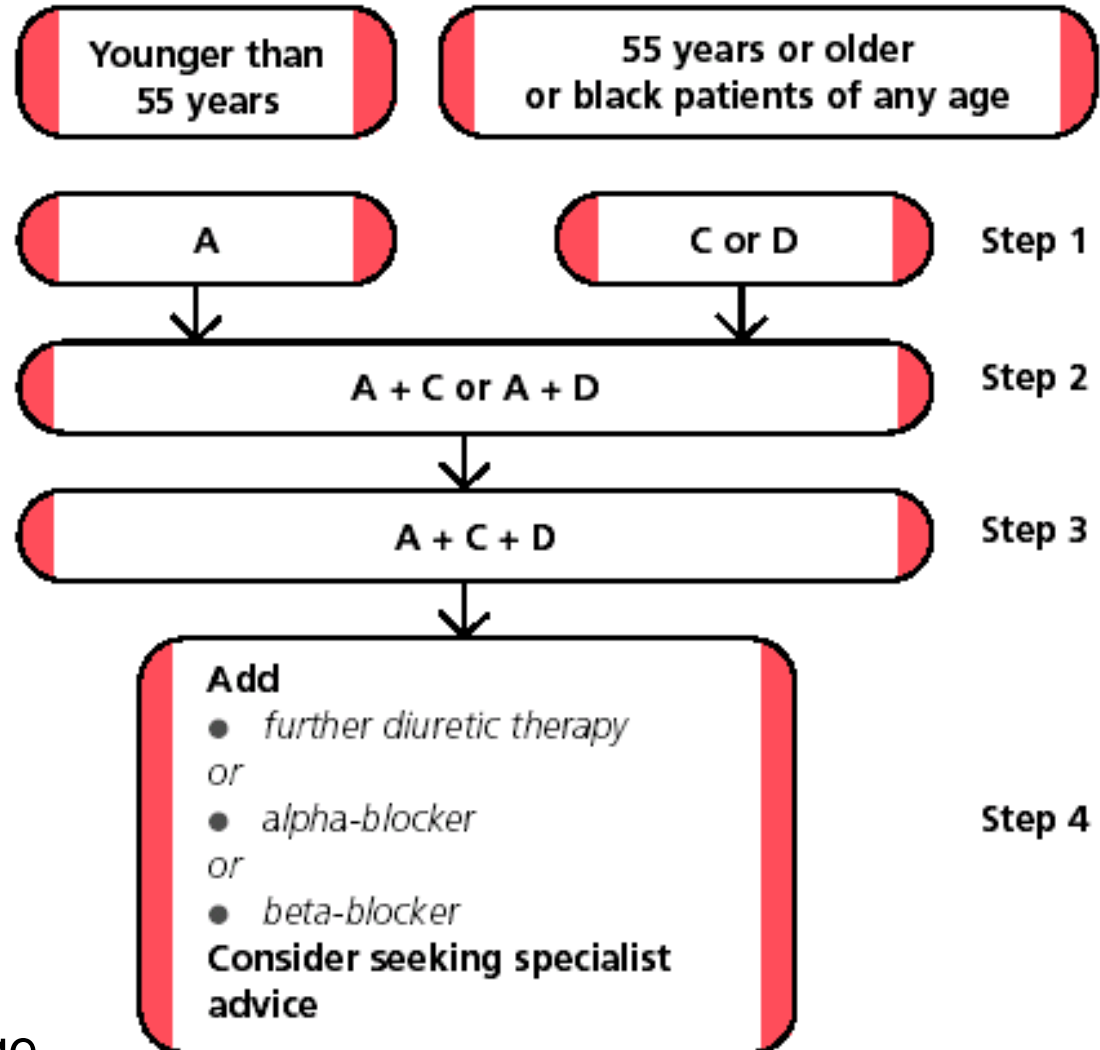
Class	Compelling	Possible	Caution	Contraindicated
α-blockers	BPH		Postural \downarrow BP, CHF	Incontinence
ACE-I	CHF, post-MI, CHD, type 1 DM nephrop, 2 ^o stroke prevention	CRF, type 2 DM nephropathy, proteinuria	Renal impairment, PVD	Pregnancy, renovasc dis
ARB's	ACE-I intolerance, type 2 DM nephrop, LVH	Post-MI, proteinuria, CHF	Renal impairment, PVD	Pregnancy, renovasc dis
β-blockers	MI, angina	CHF	Heart failure, PVD, DM	Asthma/COPD, heart block
CCB (dhp)	Elderly, ISH	Elderly, angina	-	-
CCB (rate limiting)	Angina	MI	With β - blockade	Heart block, CHF
Thiazides	Elderly, ISH, CHF, 2 ^o stroke prevention	-	-	Gout

Choosing drugs for patients newly diagnosed with hypertension

Abbreviations:

A = ACE inhibitor
(consider angiotensin-II receptor antagonist if ACE intolerant)
C = calcium-channel blocker
D = thiazide-type diuretic

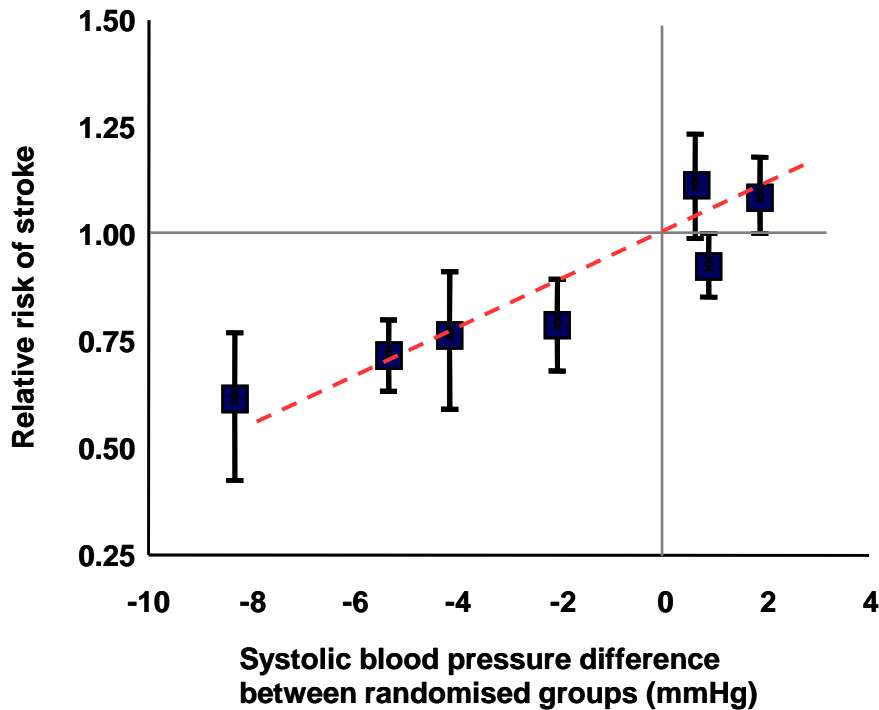
Black patients are those of African or Caribbean descent, and not mixed-race, Asian or Chinese patients



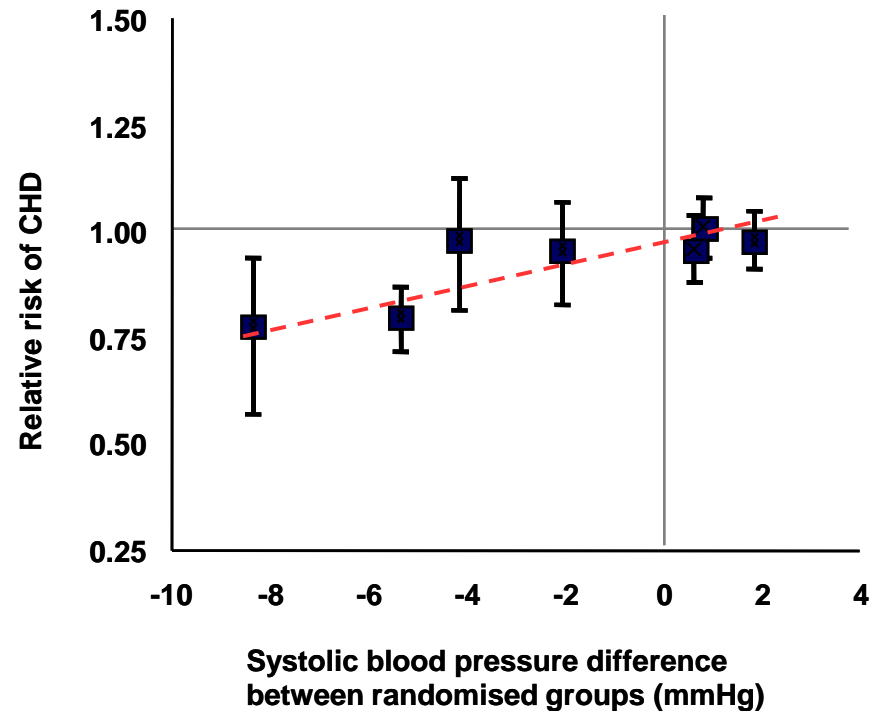
*NB women of child-bearing age

Benefits of BP lowering are proportional to BP reductions/differences

Stroke



Coronary heart disease



Blood pressure targets

- Non-diabetics
 - Optimal SBP <140, DBP <85 mmHg
 - Audit standard <150/90 mmHg
- Diabetics
 - Optimal BP <130/80 mmHg
 - Audit standard <140/80 mmHg

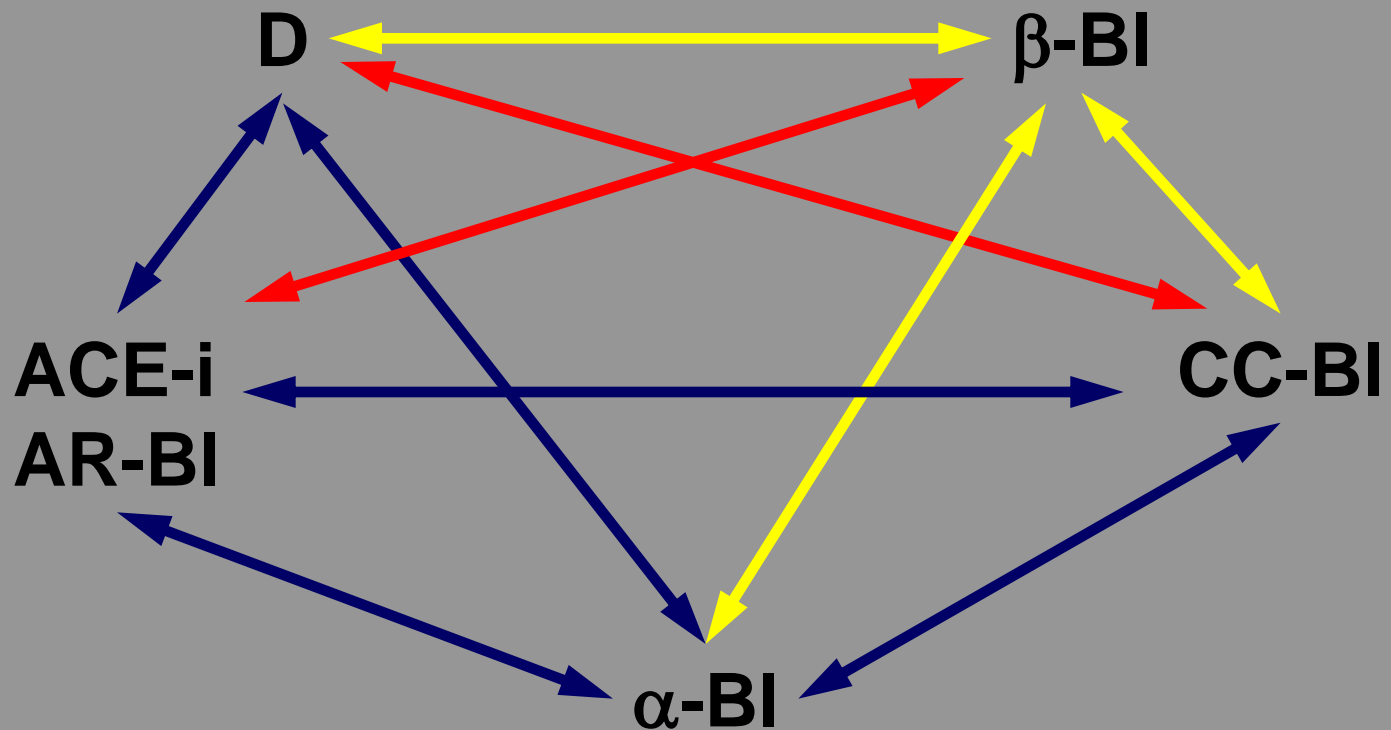
**Blood pressure targets:
achieving targets**

**at least 2/3 of all hypertensive
patients require 2 or more drugs
to control their BP**

Combination therapy

- Effective drug combinations utilise drugs from different classes for the additive hypotensive effect that comes from combining drugs with different 1^o actions, while minimising the compensations that limit the fall in BP
- It is often preferable to add a small dose of a second drug rather than increase the dose of the original drug
- This allows both drugs to be used in the low dose range that's more likely to be free of side effects
- Fixed low dose combinations may be advantageous

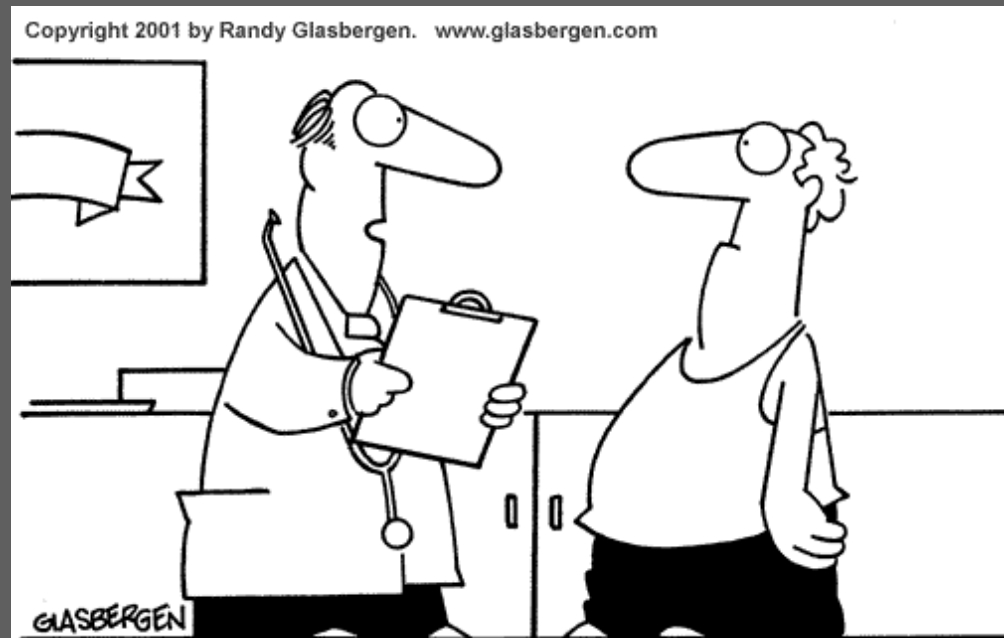
GOOD, BAD & UGLY COMBINATIONS



Why would you go yellow

Aspirin for patients with hypertension

- 75 mg
 - Aged ≥ 50
 - BP controlled $< 150/90$
 - No contraindications
- and
- CV complications or TOD
- or
- CVD event risk $\geq 20\%$
- or
- Diabetes



“An aspirin a day will help prevent a heart attack if you have it for lunch instead of a cheeseburger.”

Suggested indications for specialist referral

Urgent treatment needed

Accelerated or severe (> 220/120) hypertension

Impending complications (e.g. TIA, LVF)

Possible underlying cause

Clues to a 2^o cause

Elevated creatinine

Proteinuria or haematuria

Sudden onset or worsening of hypertension

Resistant to multidrug regimen (≥ 3 drugs)

Young (any hypertension < 20 yrs; needing Rx < 30 years)

Therapeutic problems

Multiple drug intolerance or contraindications

Persistent non-adherence

Special situations

Unusual BP variability

Possible white coat hypertension

Pregnancy

END

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