

IMPORTANCE OF DIETARY SALT RESTRICTION IN THE CONTROL OF HYPERTENSION AND ASSOCIATED VASCULAR DISEASES

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**11th National Conference of
Hypertension and Renal Diseases
May 14, 2009 **ANTALYA**, Turkey**



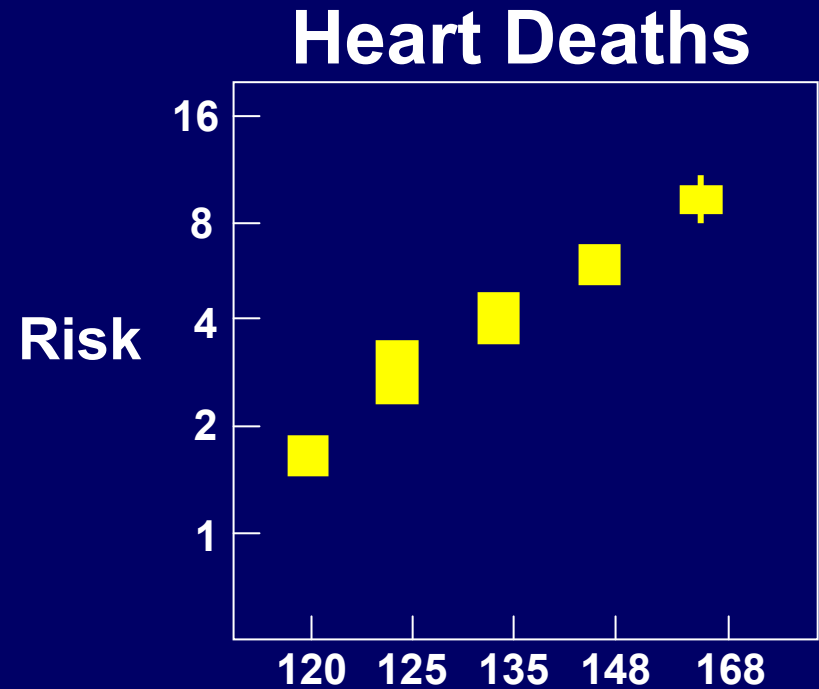
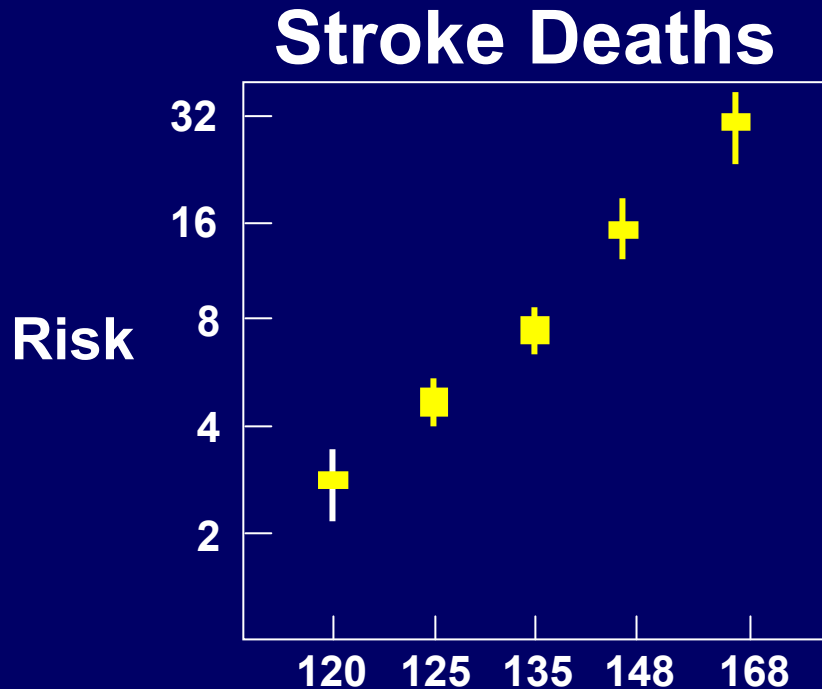
Magnitude of BP Problem: Population Perspective

- Worldwide, cardiovascular disease (heart disease and stroke) is the leading cause of death
- 62% of strokes and 49% of CHD events attributed to elevated BP*
- 26% of adults worldwide (972 million) have hypertension**

*WHO, World Health Report 2002: Reducing Risks, Promoting Healthy Life,

**Kearney Lancet 2005;305:217

Systolic BP and Risk of Death



Systolic Blood Pressure (mmHg)

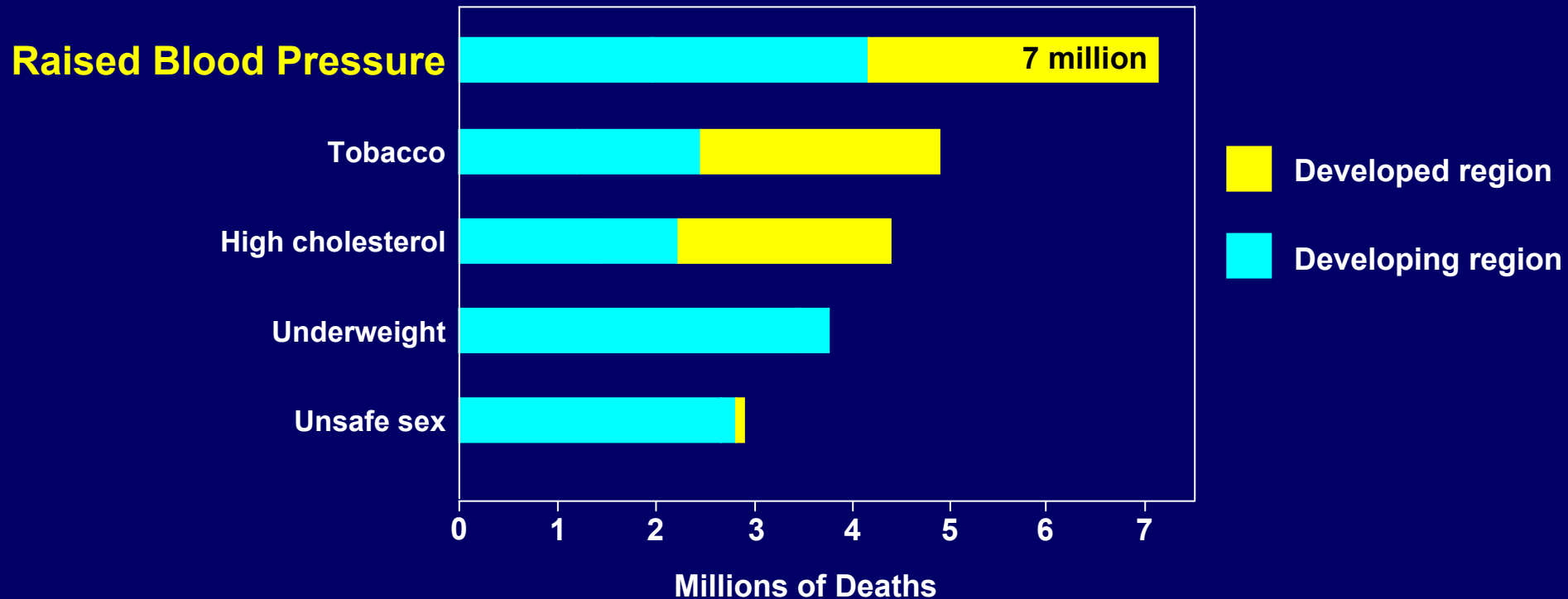
The risk starts at systolic **115 mmHg**
(83% adults)

Magnitude of BP Problem: Individual Perspective

- The lower your blood pressure, the lower your risk of cardiovascular disease (even if you do not have hypertension)
- Your lifetime risk of developing hypertension is 90%*

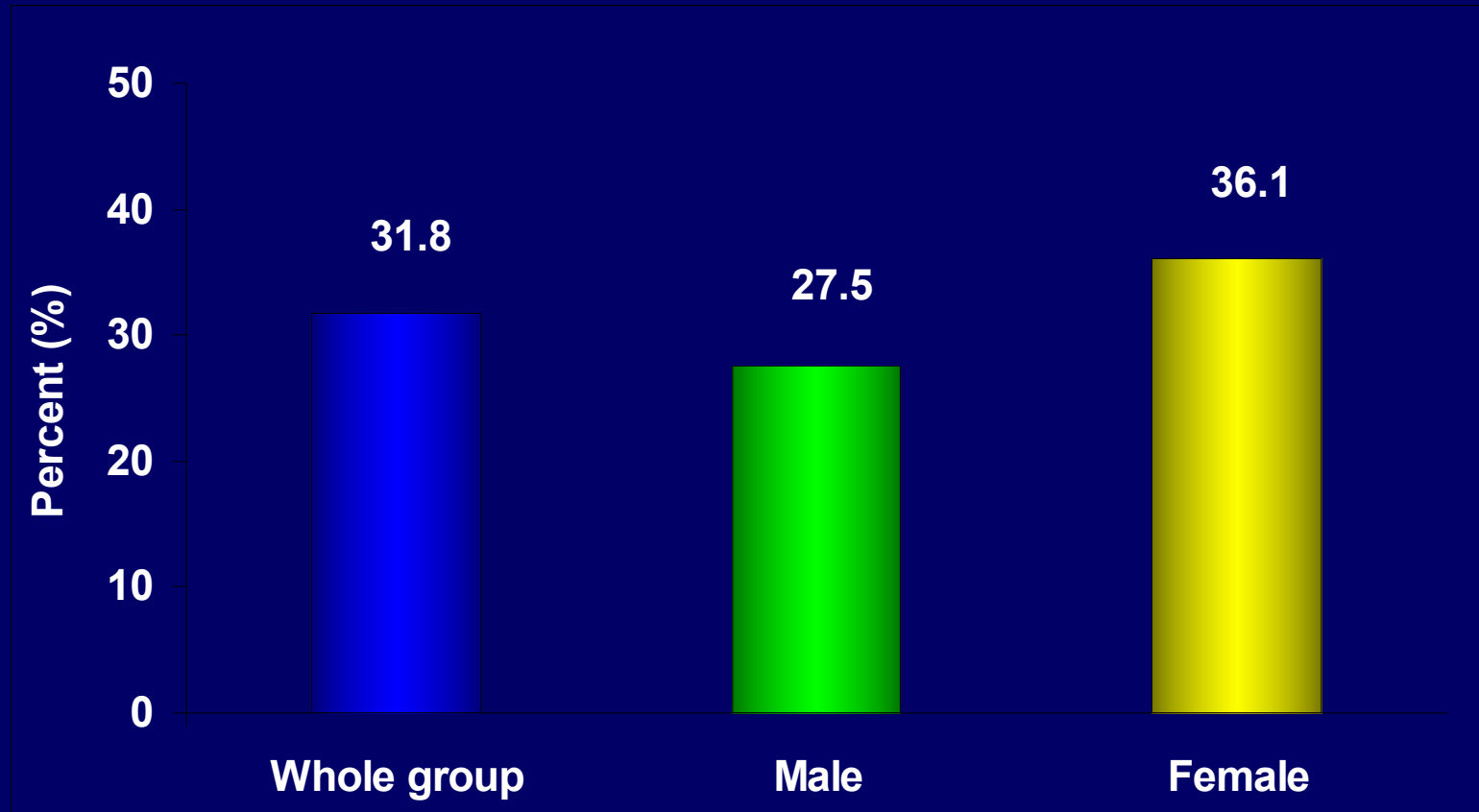
*Vasan, JAMA 2002;287:1003

Major Underlying Factors Causing Death - Worldwide



**Raised BP is responsible for 62% of all
Strokes & 49% of all Heart Disease**

Hypertension in Turkey-2003



Slide Courtesy of: Dr. Mustafa Arici

What puts up population BP?

- Salt intake
- Lack of fruit and vegetables
- Weight
- Lack of exercise
- (Alcohol excess)

Salt

Up to 5000 yrs ago 0.1 g/d, now 10 to 12 g/d

Why?

- (a) Preserves food
- (b) Cleans up bad food

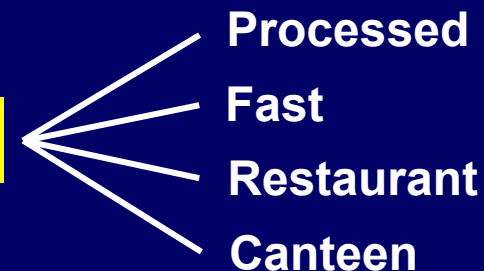
Now no need

- (a) Refrigeration
- (b) Better chemicals



But eating 10 to 12 g/d - courtesy of the food industry

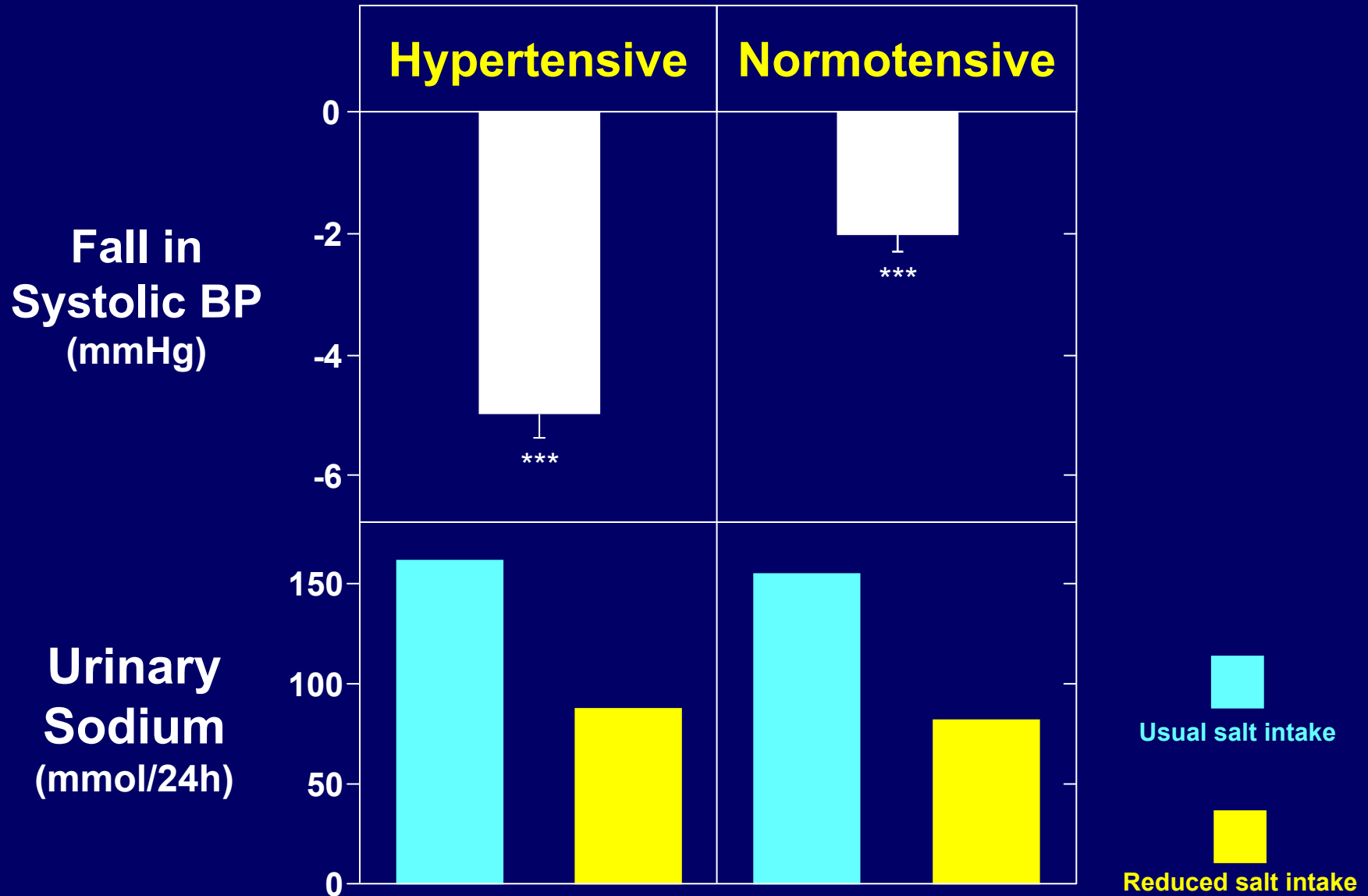
80% of salt hidden in food



Adverse Effects of Excess Salt Intake

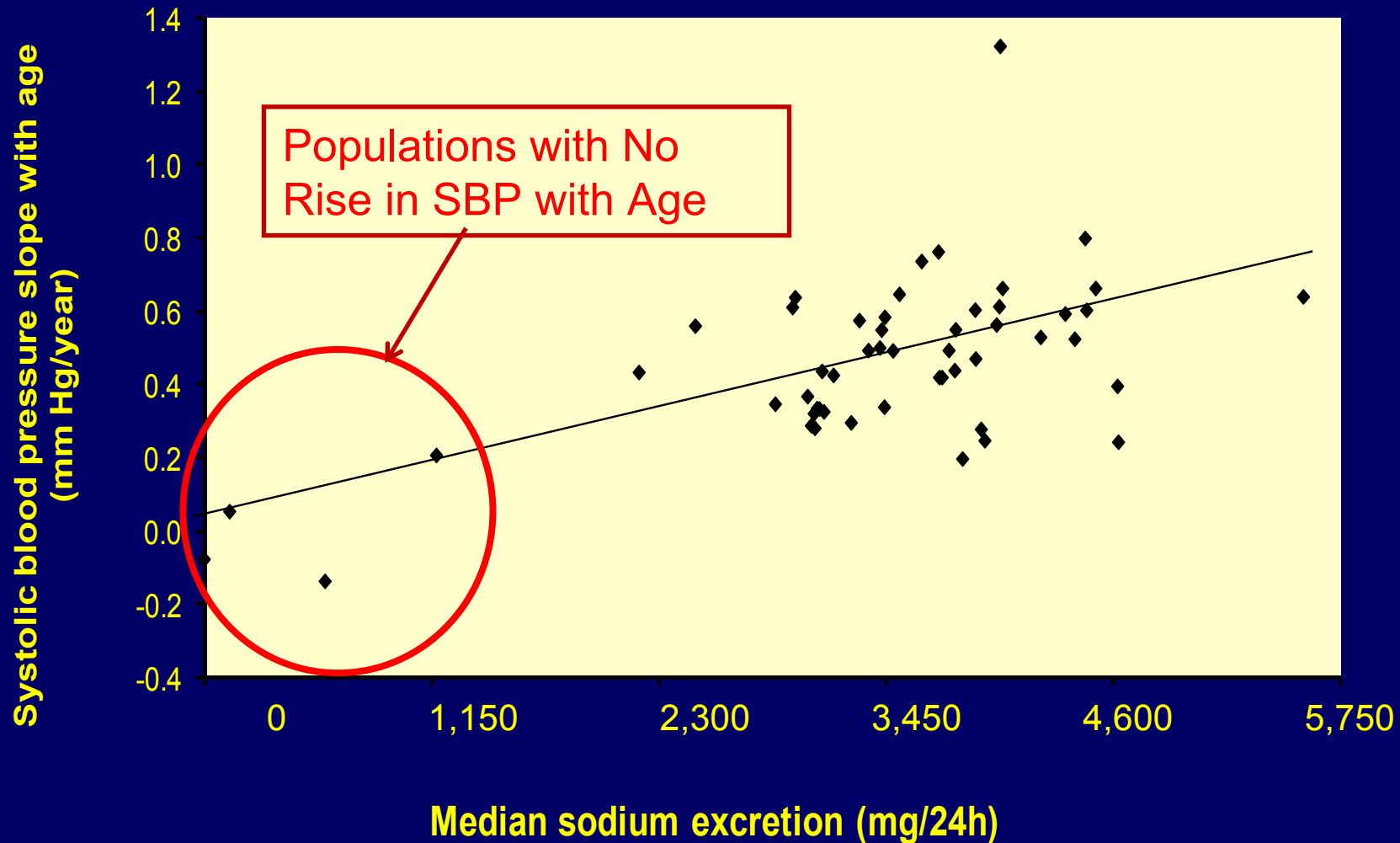
- Established relationship
 - Increased blood pressure → **Stroke, CVD and CKD**
- Probable relationship
 - Gastric cancer
- Suggestive relationship
 - Increased risk of osteoporosis
 - Increased left ventricular mass
- Hypothesized relationship
 - Overweight/obesity

Meta-analysis of Modest Salt Reduction Trials of one month or Longer

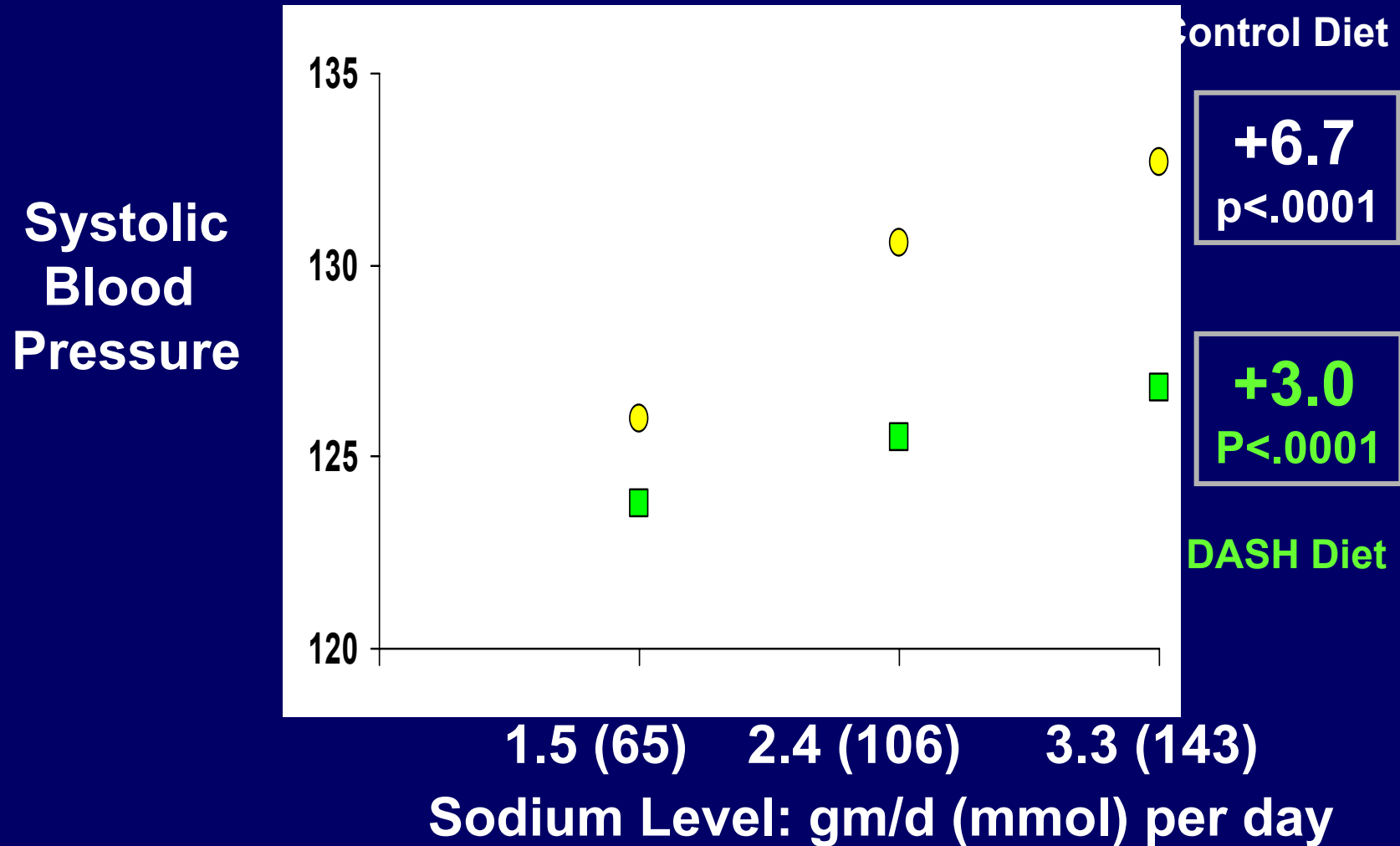


*** P<0.001 reduced salt vs. usual salt intake.

SBP Slope with Age (mmHg/yr) by Median Na Excretion in 52 Communities Worldwide



Sodium Dose Response Trials: DASH-Sodium Trial*



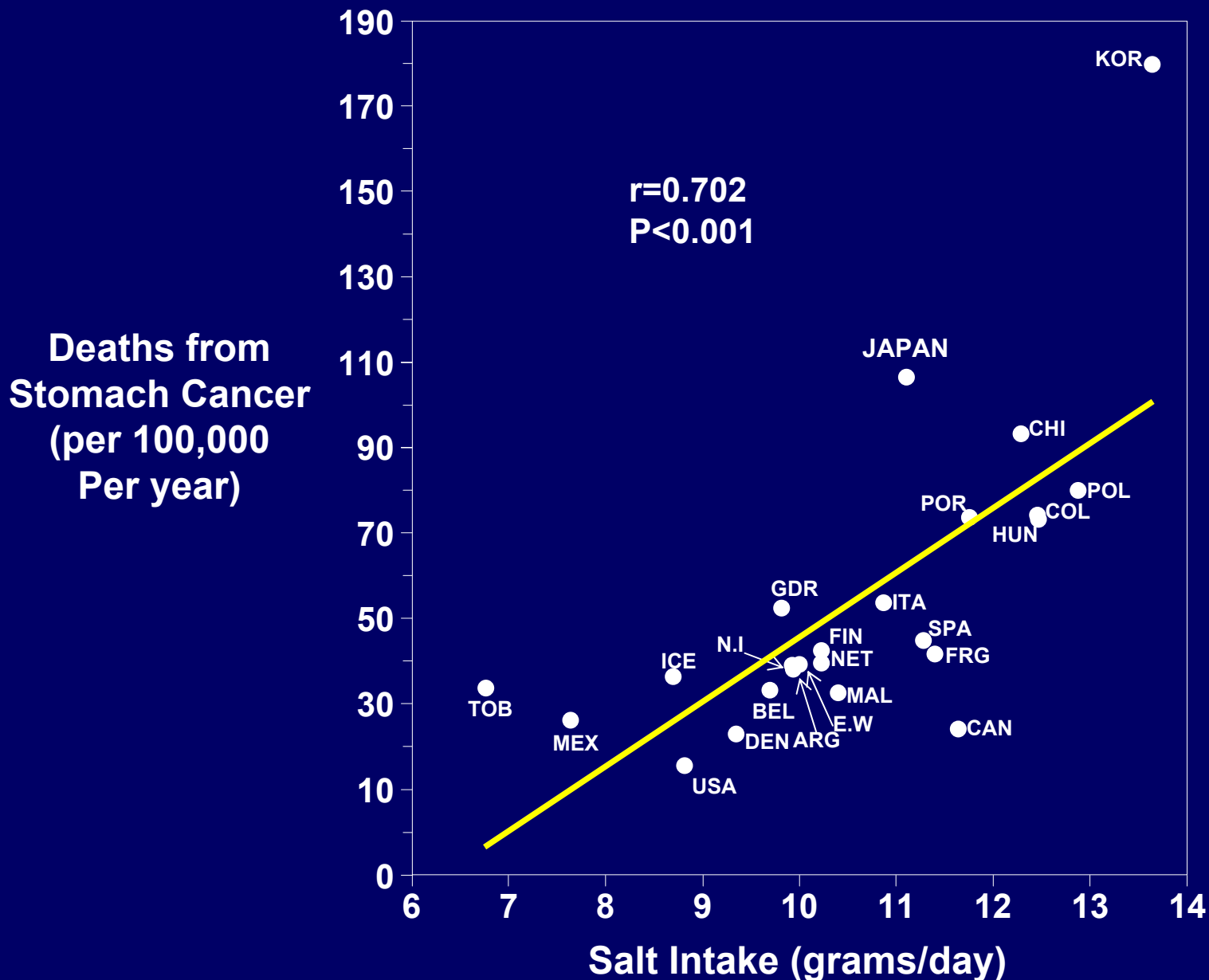
*Sacks, 2001 (412 prehypertensive and hypertensive adults)

Effects of Reduced Na on CVD Events: Results from 3 Randomized Trials

	INTERVENTION	OUTCOME	FU
TONE ¹ (2001) 639 Elderly	↓ Na	21% ↓ CVD events	2.3 yrs
Taiwan Veterans ² (2006) 1,981 Elderly	↓ Na / ↑ K Salt	41%* ↓ CVD Mortality	2.6 yrs
TOHP Follow-up ³ (2007) 3,126 Prehypertensives	↓ Na	30%* ↓ CVD events	10-15 yrs
			*p<0.05

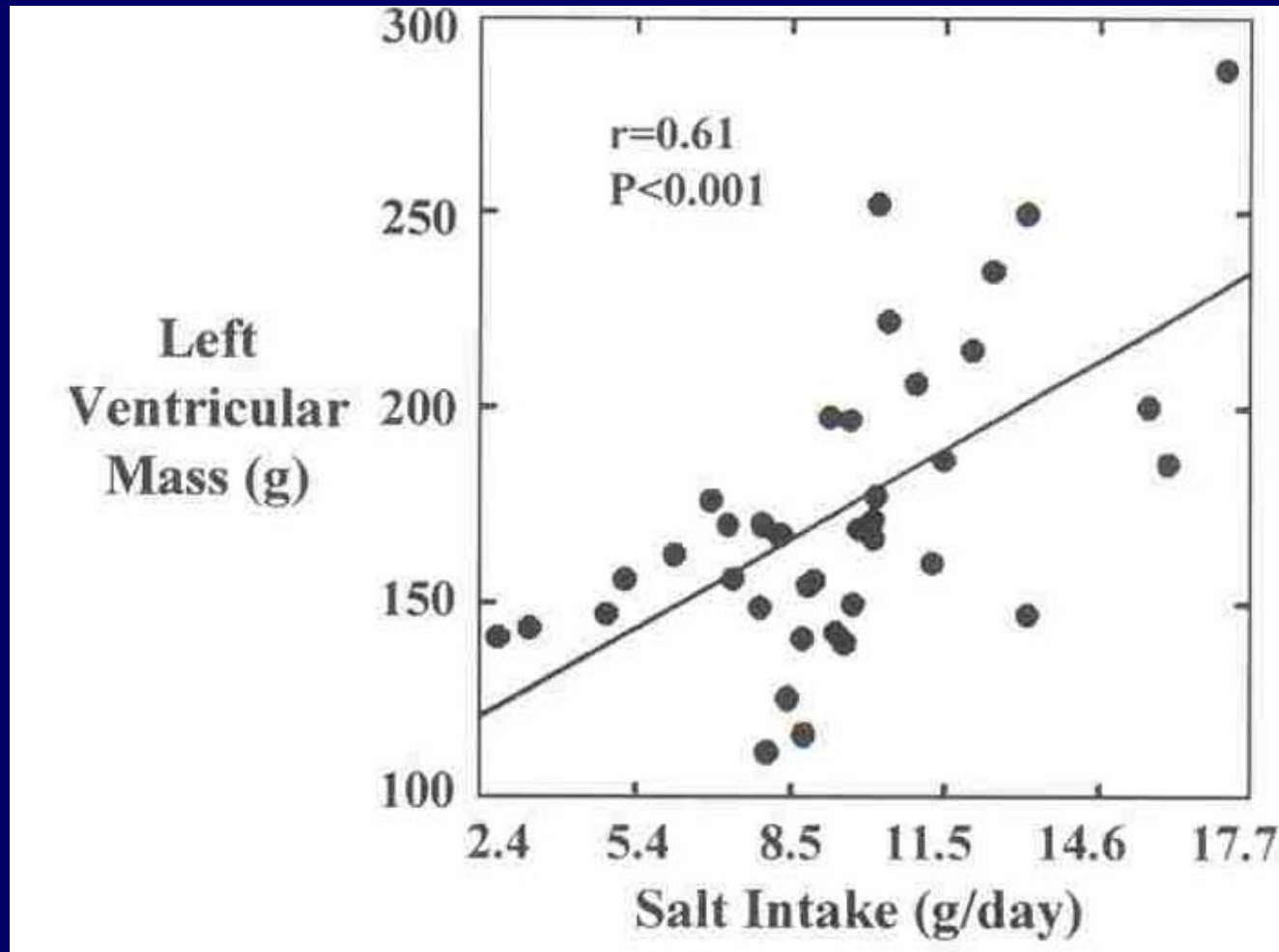
¹Appel, Arch Int Med, 2001; ²Chang, AJCN, 2006; ³Cook, BMJ, 2007

Salt and Stomach Cancer: Ecological Analysis



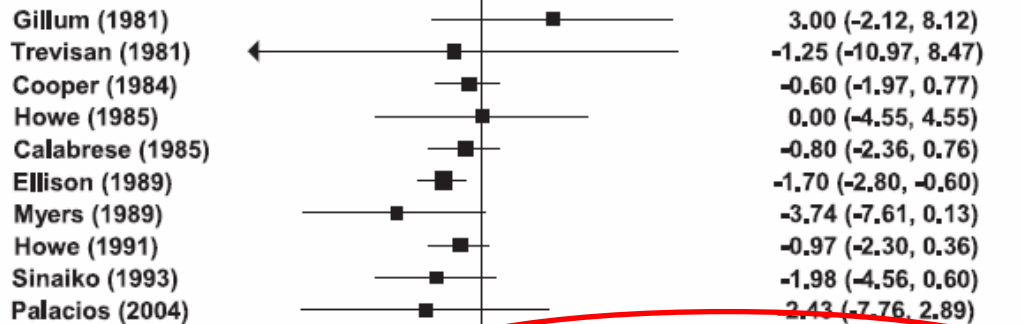
Adapted from Joossens, Int J Epi 1996;25:494-504

Correlation between salt intake and LV mass in pop with SBP >121 mm Hg

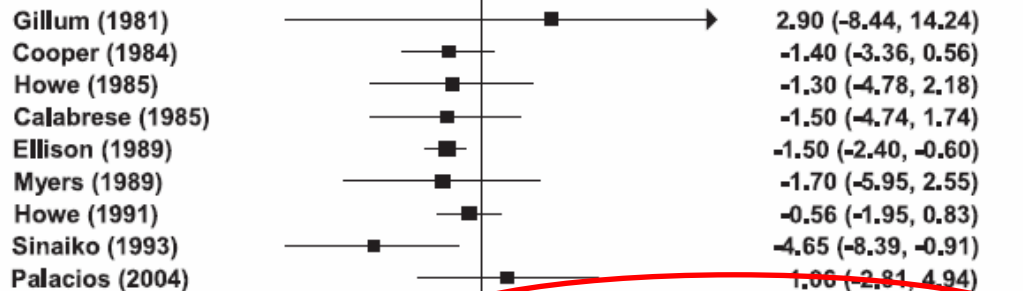


Effects of Sodium Reduction in Children: Results of a Meta-Analysis

Systolic



Diastolic



-10 -5 0 5 10

Change in BP (mmHg)

- 10 Trials
- 966 Children
- Mean age=14
- Median duration = 20wk
- 42% Reduction in Na

Blood Pressure Measured in Adolescence and Young Adults is Associated with Subsequent Cardiovascular Disease

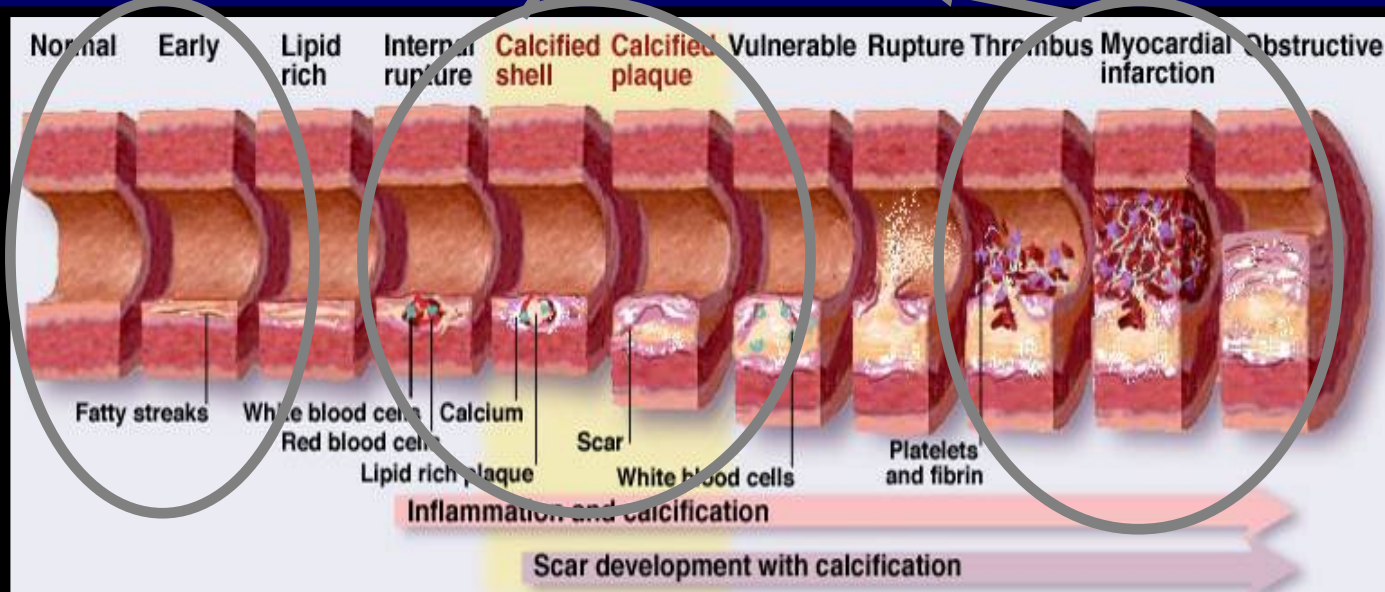
Blood Pressure Associated with:

Autopsy Studies

- Fatty Streaks¹

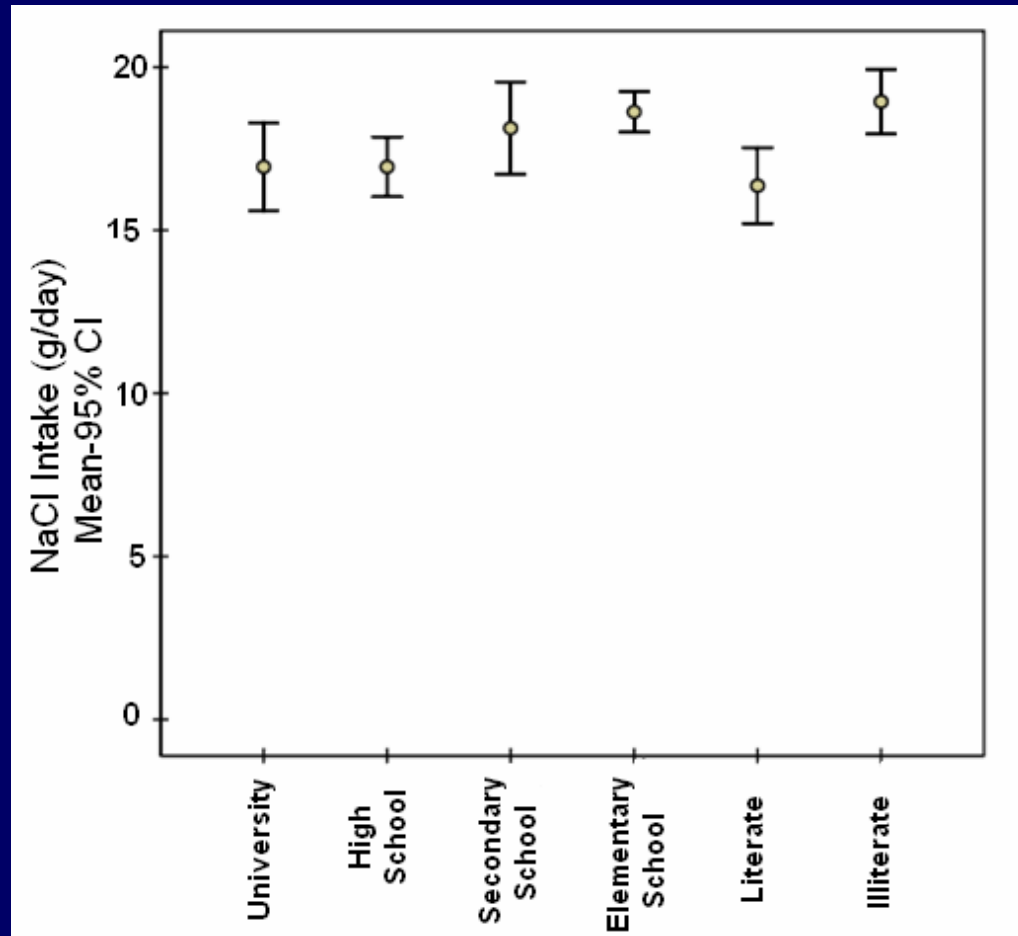
Observational Studies

- Coronary Artery Calcification²
- Cardiovascular Events³



¹Pathologic Determinants of Atherosclerosis in Youth (PDAY)
²Coronary Artery Risk Development in Young Adults (CARDIA), Muscatine Study
³Harvard, U.Penn, and U.Glasgow Alumni Studies

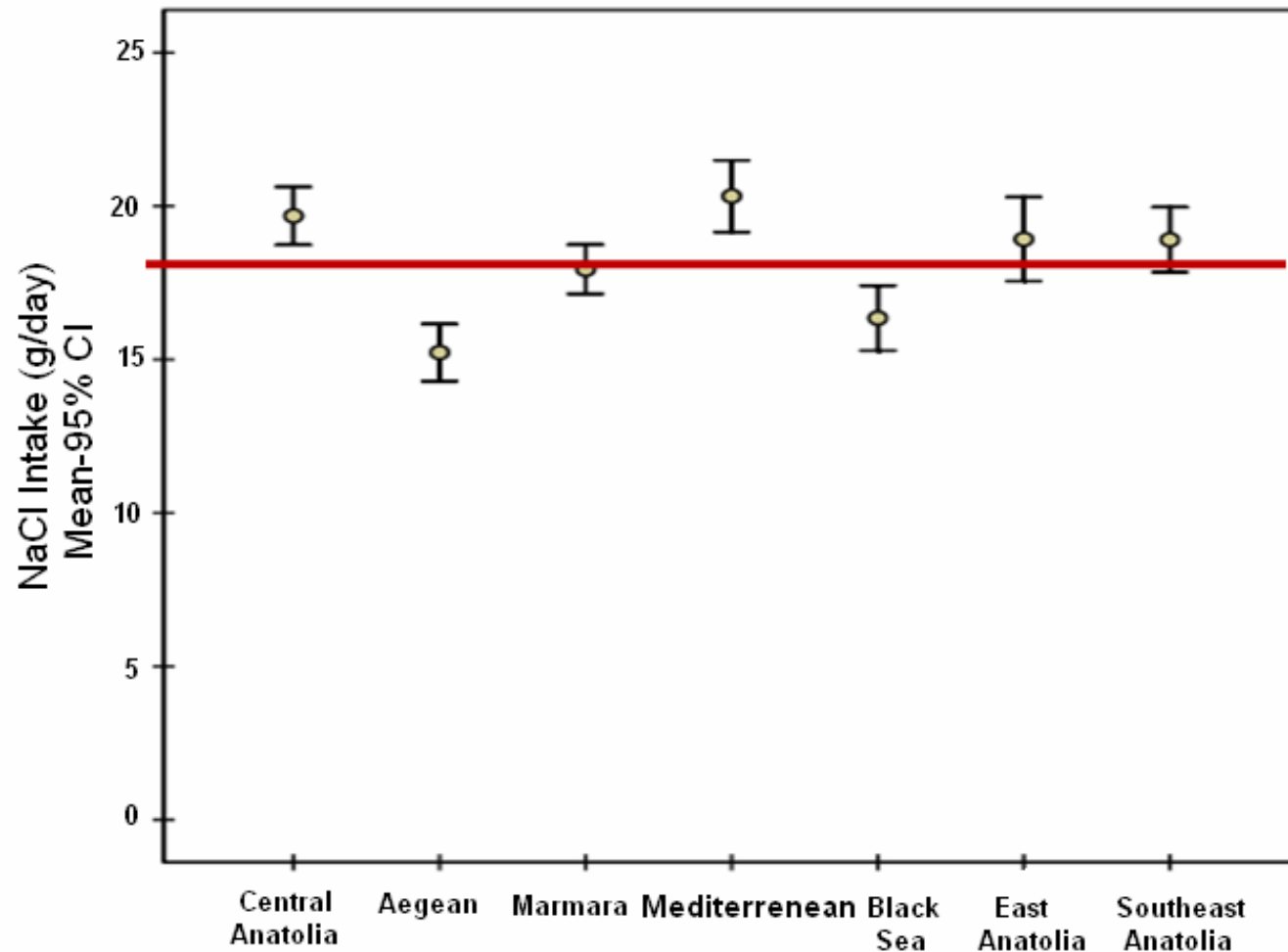
Turkey: Education level & NaCl (g/d)



p=0.002

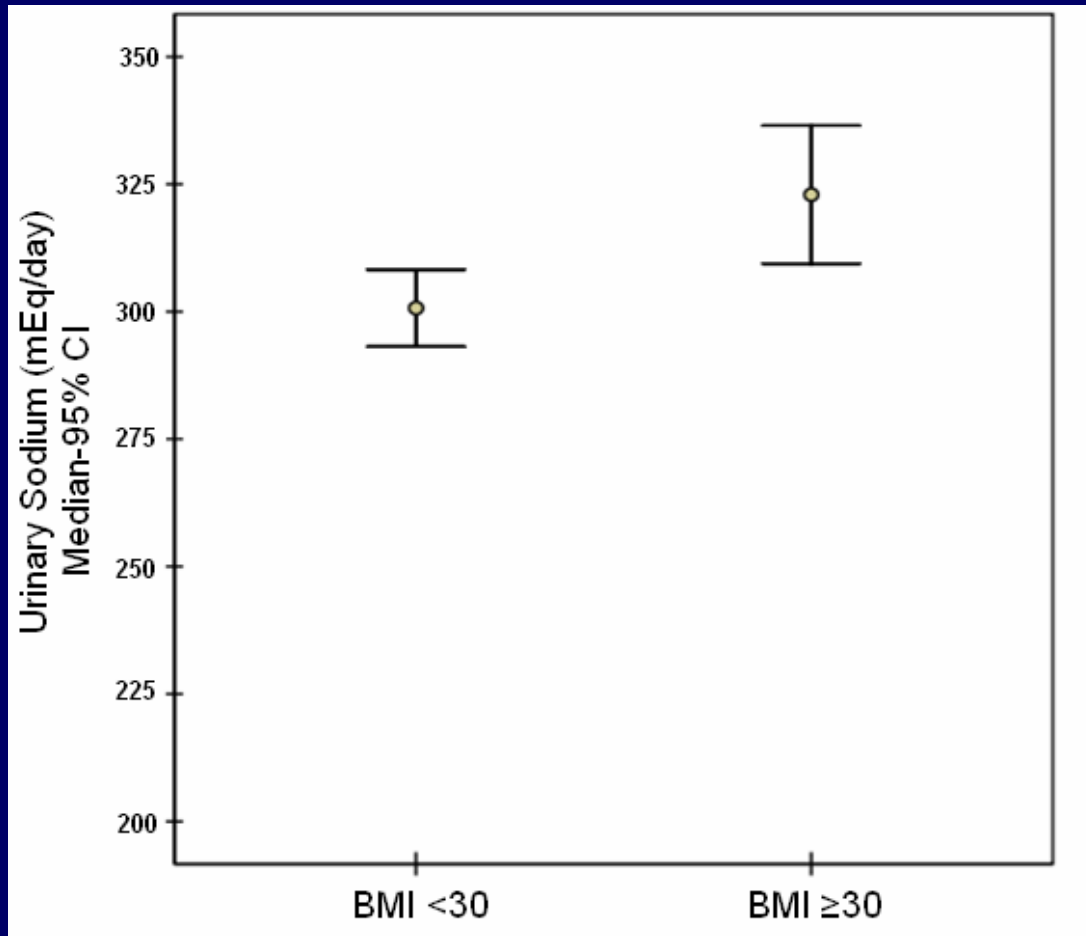
Courtesy: Mustafa Arici, SAL Turk Study, 2008

Turkey: Regions & NaCl Intake (g/day)



*Mean NaCl
Intake in
Turkey*

Turkey: Obesity & Urinary Na⁺ (mEq/d)



*Mean differences=22.24
P=0.003*

Courtesy: Mustafa Arici, SAL Turk Study, 2008

Issues Related to Salt Intake

- How much salt do we need?
- How much salt do we consume?
- Where does it come from?
- Does salt intake vary by weight status?

Obligatory Losses of Sodium

(How much salt do we need?)

<u>Source of Loss</u>	<u>mg/d</u>
Urine	5 to 35
Skin (nonsweating)	25
Feces	<u>10 to 125</u>
<u>Cell functioning</u>	<u>50</u>
Total	90 to 235

Source: Dahl (1958)

Sodium Current consumption & IOM, WHO Recommendations

- Current Consumption: 4-5 g (average worldwide)
- Upper Limit (UL):

2.3 g (100 mmol)/day for adults

Adequate Intake (AI):

1.5 g (65 mmol)/day for most adults and at risk population (67%)

For Children:

Even less

Current salt intake & sources of salt in UK (Similar in USA)

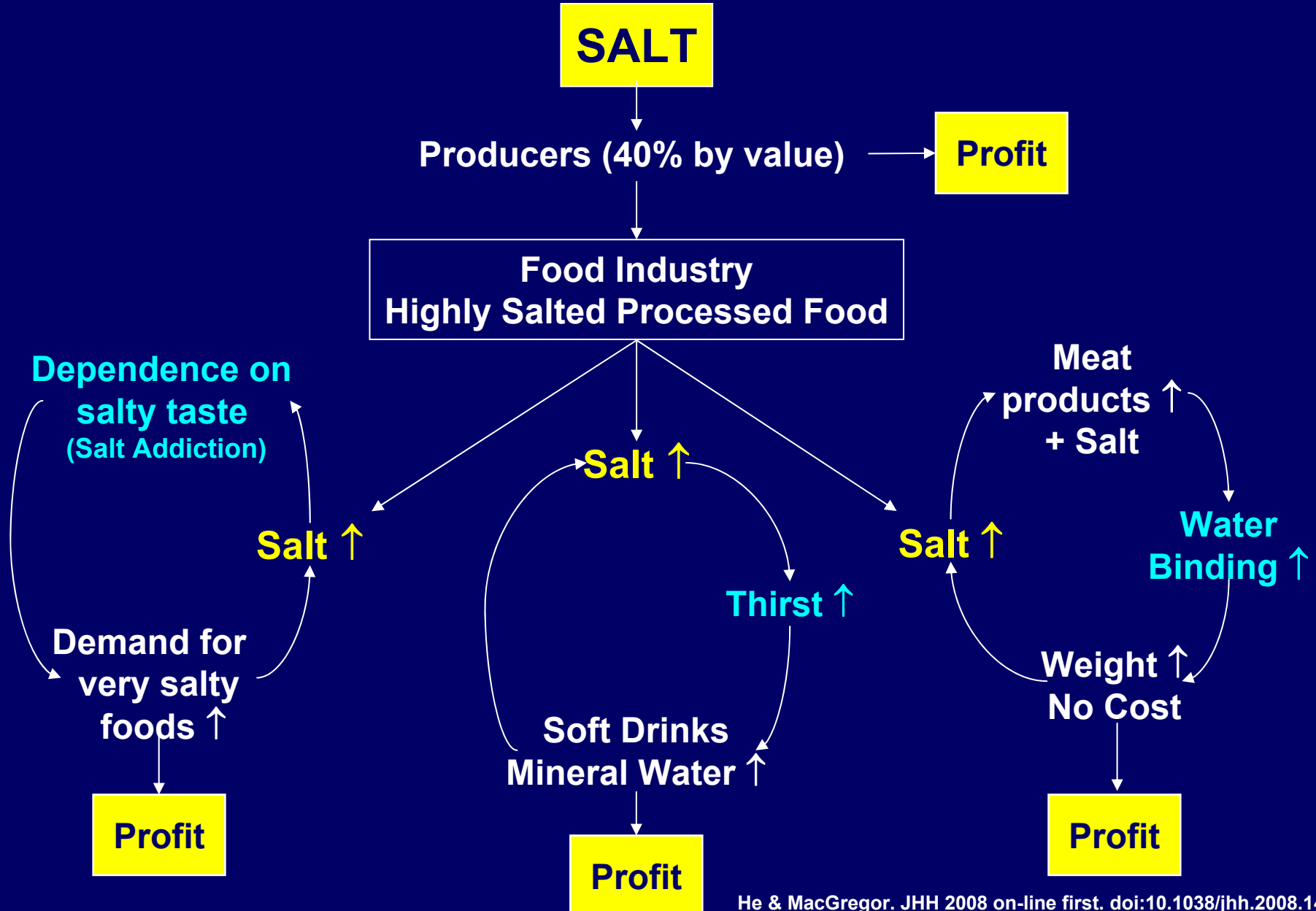
Table / Cooking (15%)	1.4 g/d
Natural (5%)	0.5 g/d
Food industry (80%)	7.6 g/d

Total 9.5 g/d (3.8 g sodium)

- ∴ Consumers have little or no choice over their salt consumption

Why is there so much salt in processed food?

Hidden Salt – Its Commercial Value



Sea Water Comparison

(1.0 g of sodium / 2.5g of salt per 100g)

Pizza	60%	Medium Sliced White	50%
Chicken Curry	60%	Granary Loaf	60%
Processed Cheese	130%	Crumpets	80%
Bacon	200%	Digestive	60%
Sausages	100%	Cream Crackers	60%
Smoked Fish	190%	Cheddar Cheese	70%
Sweet Pickle	170%	Stilton Cheese	90%
Shepherds Pie	40%	Processed Cheese	130%
Frozen Prawns	80%	Branflakes	100%
Crisps/Chips	110%	Cornflakes	110%
Salad Cream	100%	Tomato Ketchup	110%
Savoury Biscuits	70%	Brown Sauce	100%

Most have now been reduced by 10 – 30% (2008) in the UK

KRAFT

dairylea Lunchables

now with pure orange juice & strawberry flavour yogurt

NEW

100% PURE Orange Juice

Yogurt Strawberry Flavour

a good source of CALCIUM

hotdogs

Golden Vale Cheese Co.

STRINGY

STRINGY CHEESE

Bernard Matthews

QUALITY ESTD 1950 GUARANTEED

DINOSAUR

100g

WIN A SONY

INSTANTLY

25 TOP PRIZES PLUS LOTS OF RUNNERS UP

Golden Vale

CHEE STRINGS

THE FREEZABLE STRINGY CHEESE

A Glass* of Milk in every tin

Swsster

of Milk

SMOKY BACON

FLAVOUR

4 INDIVIDUALLY WRAP

MEDIUM FAT HARD

Bernard Matthews

30% EXTRA FREE

85p

65.4p/100g

MORRISONS

BST054801

2 308838 100854

QUALITY ESTD 1950 GUARANTEED

SOCCER SLICES

RL B099901

Japan

1960 Government campaign to reduce salt intake

Overall: 13.5 → 12.1 g/day (**1.4 g/day ↓**)

Akita (North): 18 → 14 g/day (**4 g/day ↓**)



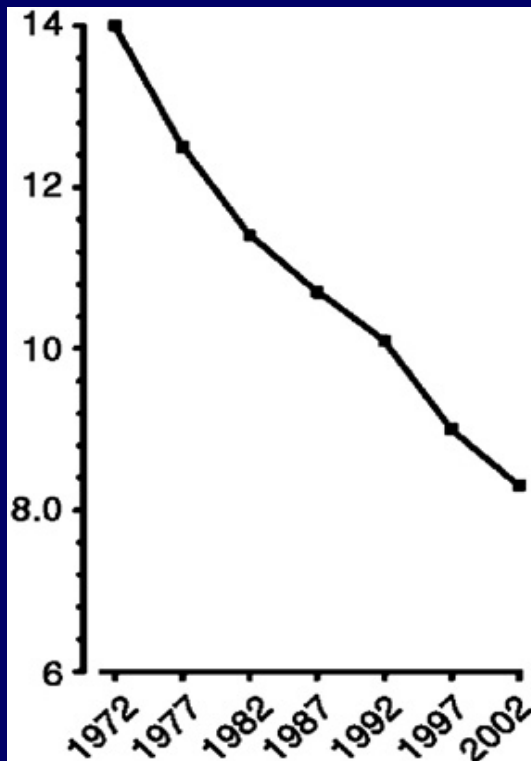
BP ↓

80% ↓ in stroke mortality

At this time Japan rapidly Westernised
e.g. ↑ saturated fat, ↑ smoking, ↑ weight, ↓ exercise

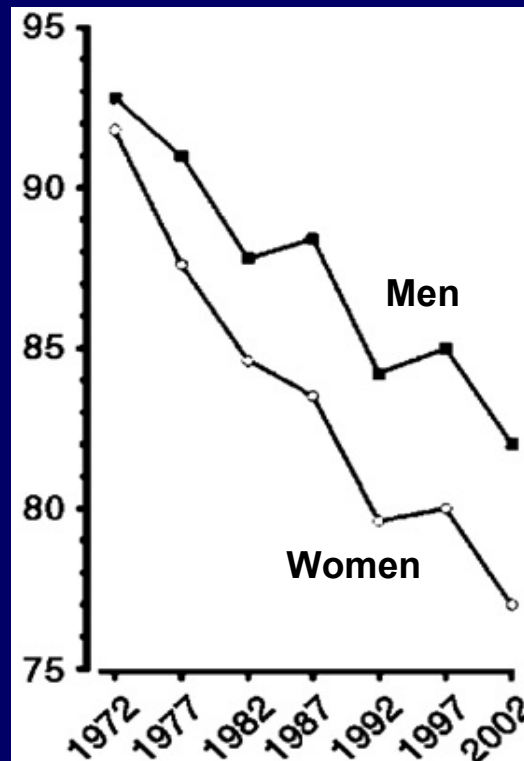
Finland

**Salt intake
(g/day)**



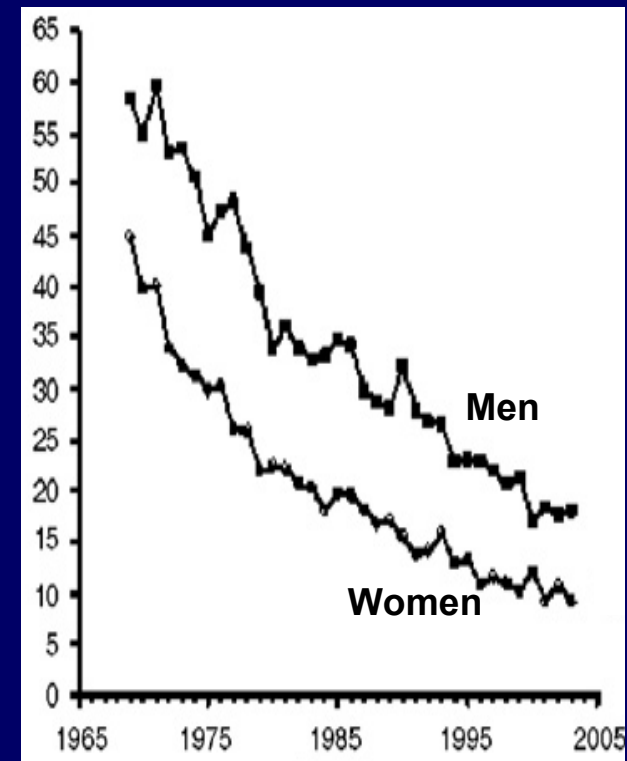
Year

**Diastolic BP
(mmHg)**



Year

**Stroke mortality
(1/100000)**



Year

National Policy Intervention

“The experience of Finland, which has had a salt reduction program running since the late 1970s, shows that population-wide reduction of dietary salt leads to population-wide reductions in blood pressure and parallel reductions in deaths from stroke and heart disease.”

--- Professor Graham MacGregor, Chairman of WASH, 1996

Action in the UK

Consensus Action on Salt & Health

- Members all experts on salt and BP
- Set up **1996** in response to rejection of salt reduction recommendations by UK Dept. of Health

Aims

- Change Department of Health policy ✓
- Ensure Food Standards Agency adopted salt reduction & labeling ✓
- Media publicity to the public and food industry ✓
- Persuade retailers and food company's to reduce salt added to food ✓

CASH Strategy for Reducing Salt in UK

Source	Salt intake g/day	Reduction needed	Target intake g/day
Table/Cooking (15%)	1.4 g	40% reduction	0.9 g
Natural (5%)	0.5 g	No reduction	0.5 g
Food industry (80%)	7.6 g	40% reduction	4.6 g
Total 9.5 g			Target 6.0 g

∴ the food industry needs to reduce salt content of all foods by 40% over the next 5 years

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Sean C

Killing them softly with salt

Strokes, heart attacks, high blood pressure. It's not good news, especially for the young who are consuming up to six times more than they should.

Hugh Davies reports

Feed children you condemn blood pressure. That's the from a pro specialists campaign for mess about the harm high-salt diet.

Salt causes the body fluid, and is thought to volume over time, the hypertension. According Action on Salt and scientific evidence suggests should consume 6 grams, or a teaspoon daily (our bodies only 2 grams). For children of the target intake drop while children aged 0 have no more than 2 should have no added.

However, recent shown not only that a summing between 10 an salt a day — twice the maximum and three ti need — but that children even less, are actually same amount. This is due to their high intake salty snacks and even als, some of which an Atlantic sea water.

According to Graham professor of cardio-vas at St George's Hospit dion, and chair of both Blood Pressure Associ intake at an early age is serious consequences it

"If you feed salt to y you tend to get irrevs that make it much m will develop higher bl he says. "If we didn't e and humans didn't ha until about 5,000 years us would have high b Which is why we aim i down in children from are born."

A big stumbling bloe sor MacGregor, has i industry (75 per cent of comes from processed ing bread). He doesn't when laying the blame squarely at its door.

"The food industry i the way it markets rubs to children," he says. "etely useless foods are They then add lots of s and spend huge amou

Food Standards Agency (UK)

- **Gradual repeated reductions in salt added to foods by 15%-25%**
- **Processed foods divided into 80 categories with targets set to be reached by the food industry in 2010 and 2012.**
- **Aim: To reduce salt intake to less than 6 g/d (adults) by 2012**

I'VE ALWAYS KNOWN IT
TOO MUCH SALT IS
BAD FOR YOUR HEART

Sid the slug



FOOD
STANDARDS
AGENCY

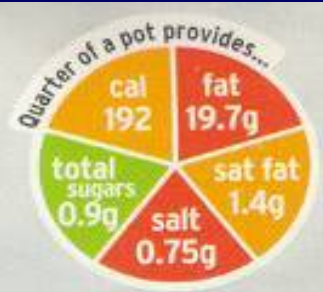
www.salt.gov.uk



Traffic Light Label

Sainsbury's Garlic & herb dip

Try stuffing into mini jacket potatoes and sprinkle with chives.



Produced in the UK



Vegetarian

Nutrition information

Typical values	Per 100g	Per 1/4 pot	% based on GDA for women
Energy	1584 kJ 384 kcal	792 kJ 192 kcal	9.6%
Protein	1.1g	0.6g	1.3%
Carbohydrate	6.3g	3.2g	1.4%
of which sugars	1.7g	0.9g	1.0%
of which starch	4.6g	2.3g	-
Fat	39.4g	19.7g	28.1%
of which saturates	2.8g	1.4g	7.0%
mono-unsaturates	23.4g	11.7g	-
polyunsaturates	11.5g	5.8g	-
Fibre	0.3g	0.2g	0.8%
Salt	1.50g	0.75g	12.5%
of which sodium	0.60g	0.30g	12.5%

Guideline daily amounts

Women	Men	Children (5-10 years)
2000 kcal	2500 kcal	1800 kcal
45g	55g	24g
230g	300g	220g
90g	120g	85g
-	-	-
70g	95g	70g
20g	30g	20g
-	-	-
-	-	-
24g	24g	15g
6g	6g	4g
2.4g	2.4g	1.4g

GDA Label



Each 1/2 can serving contains

117 calories	10.7g sugar	0.4g fat	Trace saturates	1.9g salt
6%	12%	<1%	<1%	32%

of your guideline daily amount

vegetarian



weight

410g

Nutrition Information

TYPICAL VALUES	Per 1/2 Can As Sold	Per 100g As Sold
ENERGY	496kJ (117 kcal)	242kJ (57 kcal)
PROTEIN	3.5g	1.7g
CARBOHYDRATE of which sugars	24.8g 10.7g	12.1g 5.2g
FAT of which saturates	0.4g Trace	0.2g Trace
FIBRE	0.8g	0.4g
SODIUM	0.74g	0.36g
SALT EQUIVALENT	1.9g	0.9g

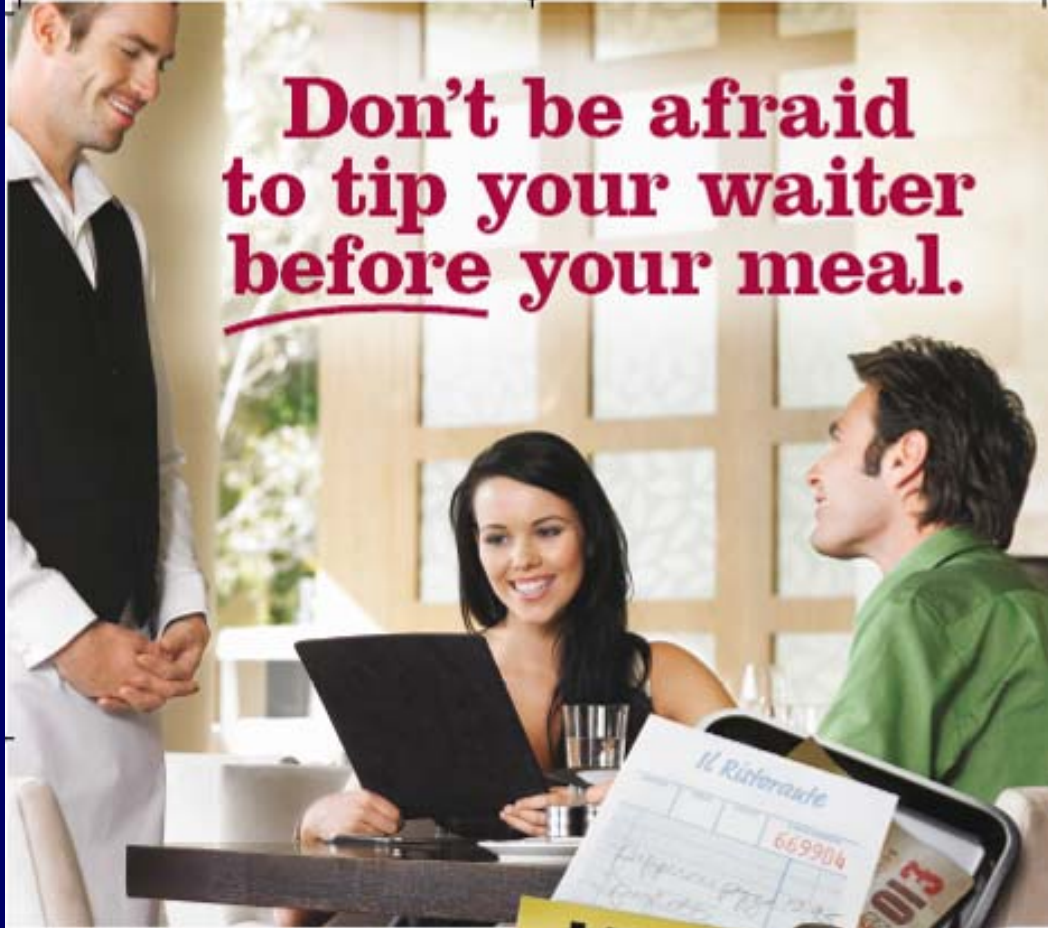
Guideline Daily Amounts

Official Government Figures for average adults

Calories	Sugar	Fat	Saturates	Salt
2000 kcal	90g	70g	20g	6g

Actions so far: UK

- Most processed foods have or will be reduced by 20-30% by 2010
- More challenging targets have been set to be achieved by 2012
- Foods eaten outside the home are now being addressed (e.g. canteens, restaurants, fast foods, takeaways, etc.)
- **Aim: To reduce salt intake to less than 6 g/d (adults) by 2012 [sodium: 2.3 g/d]**



**Don't be afraid
to tip your waiter
before your meal.**

Pass it on to the chef!

We don't expect sugar in our coffee so please let us choose how much salt we'd prefer. Eating too much salt puts up your blood pressure and can lead to other medical problems.



National Salt Awareness Week

February 2nd - February 8th 2009

www.actiononsalt.org.uk

Success so far UK

24h urinary sodium in a random sample of adult population has been reduced

from the start of the program in 2003 to 2008

from 9.5 to 8.6 g/d of salt (10% ↓)

www.food.gov.uk

(NB: on the background of an increasing salt intake)

Approx. 6000 deaths - strokes, CHD prevented / yr

World Action on Salt & Health



366 members from 80 countries worldwide

- **Worldwide**

- Highlight foods high in salt
- Implement salt reduction
- Clear labeling system (traffic light)

- **Individual countries**

- Facilitate expert groups similar to CASH
- Convince government and health dept. & ensure action by food industry
- Public health campaign to ↓ salt consumption

Target: ↓ Salt intake worldwide to 5g/d (WHO)

Example sodium content around the world



- McDonalds 'Big Mac'
(Sodium (mg) per portion)

USA Canada UK Australia

1,040 1,020 840 960



- Subway 'Italian BMT Sub'
(Sodium (mg) per portion)

1,770 1,670 1,700 1,470



- KFC 'Fillet Burger'
(Sodium (mg) per portion)

1,230 1,250 1,200 1,265



- Kellogg's 'Rice Krispies'
(Sodium (mg) /100g)

667 821 650 720

WHO and EU Actions

WHO set up a Salt Action Network (SAN)

- To implement the EU framework for National Salt Initiatives
- The goal → ↓ salt intake less than 6 g/day
- Initial activity - 12 food categories, e.g. bread, ready meals, breakfast cereals

24 countries now pledged to make a
16% salt reduction over 4 yrs

Examples of actions in other countries

- Australia AWASH's Public Health campaign starting to show results
- Bangladesh National reduction supported by the National Heart Foundation
- Bulgaria Monitoring and evaluating programme for salt reduction initiatives
- Canada The Canadian Stroke Network has a full scale public health campaign
- Croatia CRASH: full national awareness campaign
- Kenya Forming a Kenyan arm on WASH following a successful campaign
- Malta Launched a salt reduction initiative
- Turkey Initiated SAL Turk Study
- USA
 - Have had strong recommendations since 1980s, with no results
 - » Salt Institute opposed any action (similar to Tobacco Manufacturers Association)
 - » FDA Petition for salt as 'Generally recognised as safe' to an 'additive' has so far proved ineffective.
 - » **NEW YORK CITY: Major Actions – Great Results!!**

Achievements in UK

1. ↓ Salt intake → ↓ BP →

- ↓ Stroke
- ↓ Heart Attacks
- ↓ Heart Failure
- ↓ Kidney Diseases
- ↓ Stomach Cancer & Osteoporosis

2. ↓ Salt intake → biggest improvement in public health since clean water and drains (19th Century)

He & MacGregor. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. JHH 2008 on-line first. doi:10.1038/jhh.2008.144.

Useful Conversions

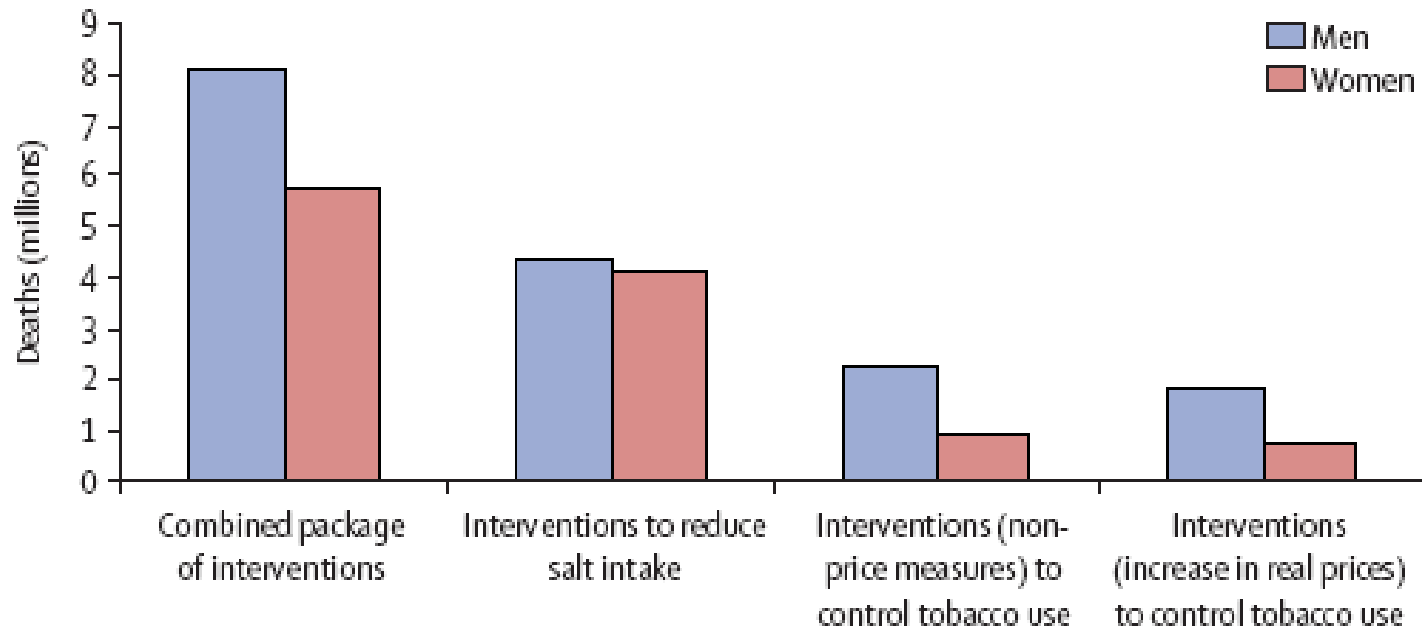
	Adequate Intake (AI)	Upper Level (UL)
Sodium (mg)	1,500	2,300
Sodium (mmol)	65	100
Sodium Chloride (g) [Salt]	3.75	5.75

Conversion: 1000 mg salt = 400 mg Sodium or 40%

Sodium Reduction Stands Apart As An Effective Public Health Intervention

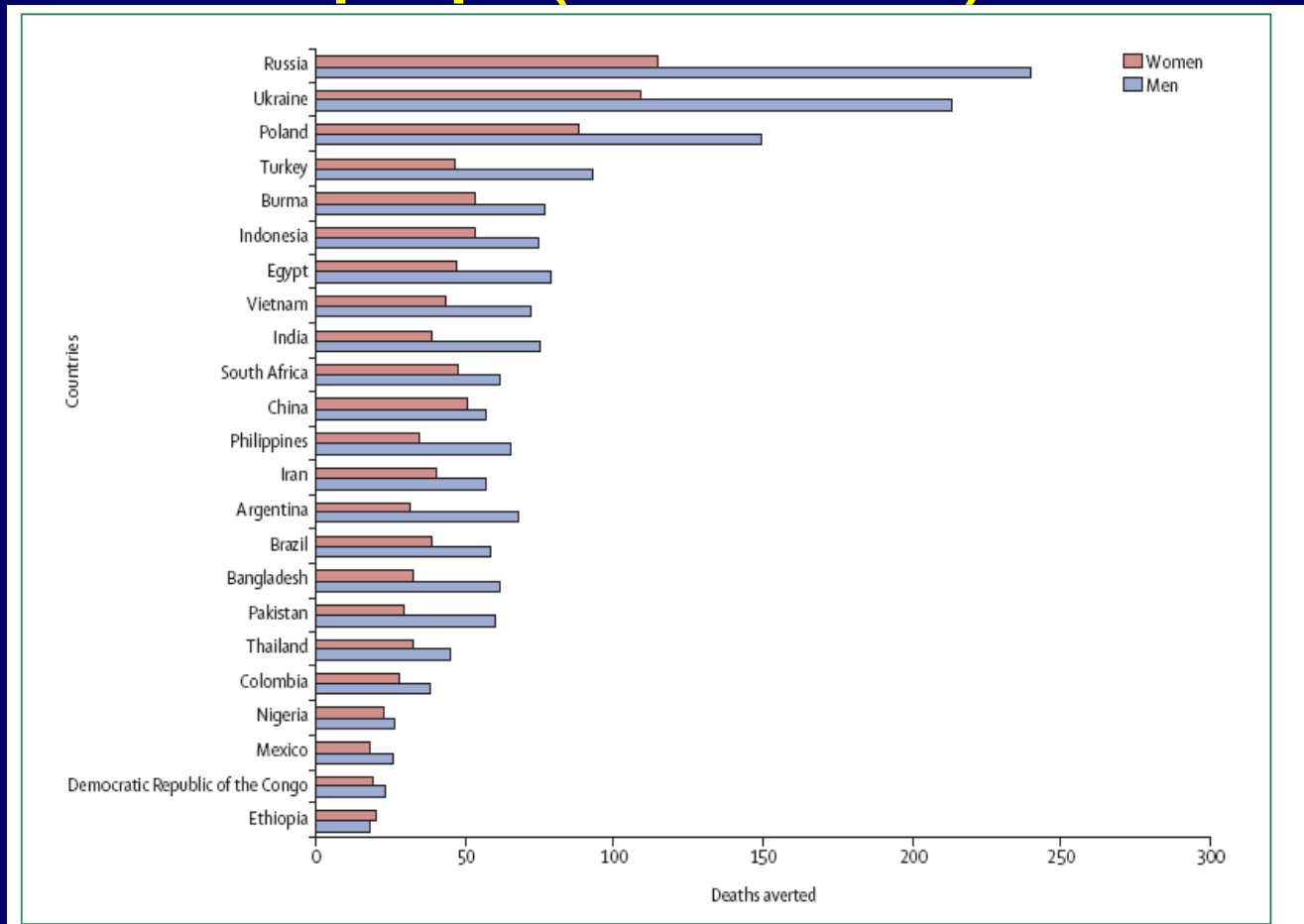
- Principal cause of elevated blood pressure
- Amenable to intervention without substantial:
 - Behavioral change
 - Massive educational campaign
- Low cost to implement

Deaths averted by population-level intervention



Asaria et al. Lancet 2007; 370: 2044-53

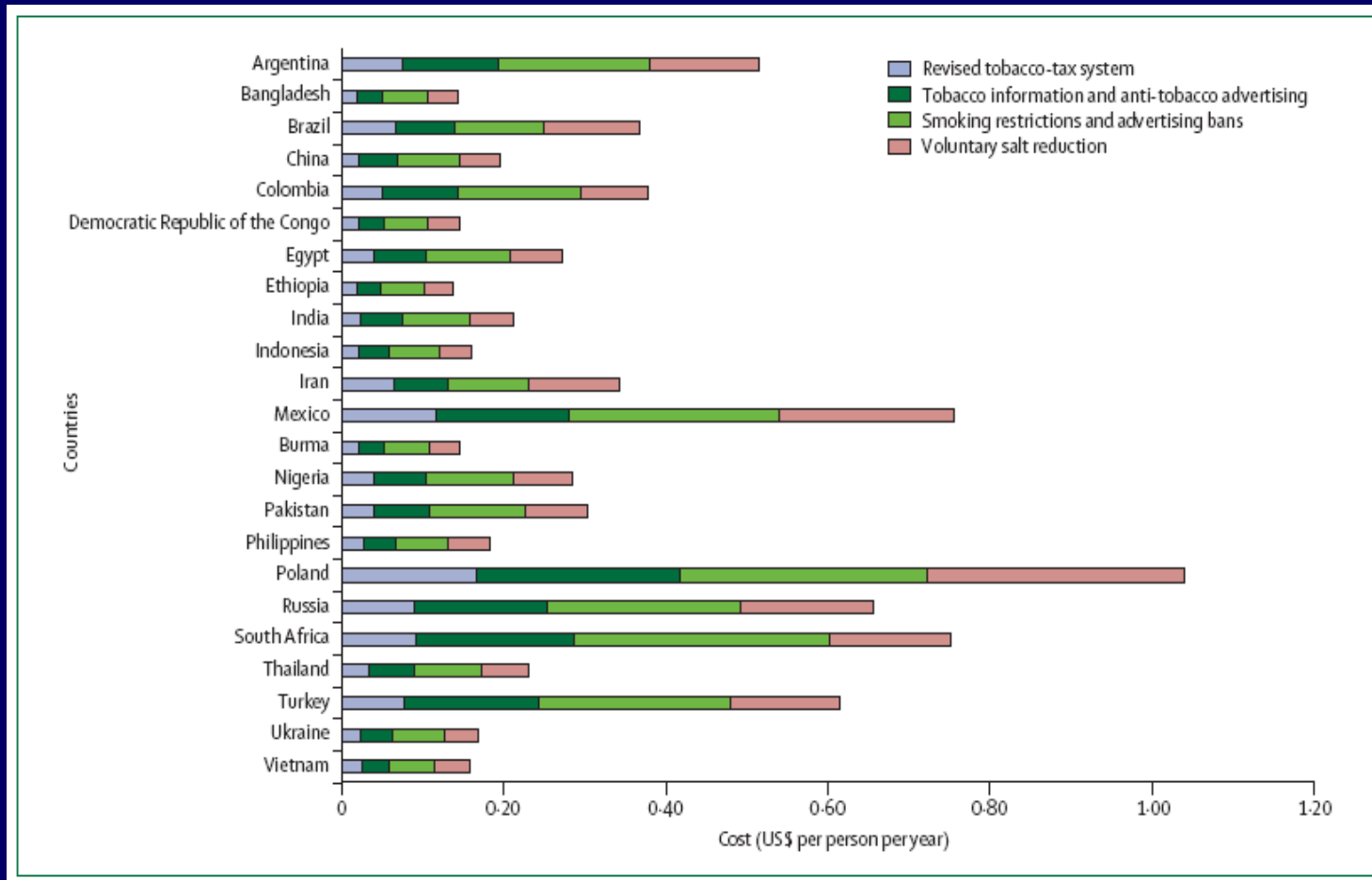
Salt & tobacco reduction: Estimated Deaths averted/100K pop (2006-15)



Asaria et al. Lancet 2007; 370: 2044-53

Population older than 30 yrs of age

Cost to implement the package of intervention



Key messages

- 23 countries have 80% of burden of CNCD in LMI regions of the world.
- In these countries 13.8 m deaths could be averted over 10 yrs (8.5 m by salt reduction and 5.5 by implementing FCTC)
- Most deaths averted would be from CVD (75.6%) followed by Resp dis (15.4%) and cancer (8.7%).
- Cost to implement both strategies would be \$ 0.4 in LMIC and \$ 0.5-1.0 in UMIC (as of 2005).

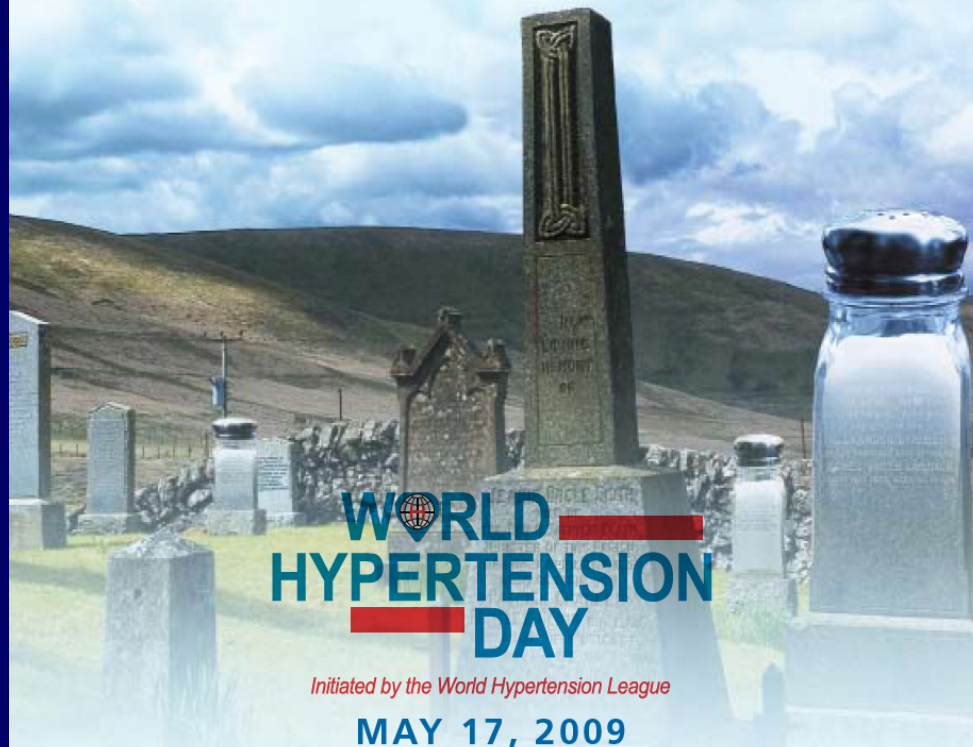
Summary

- Worldwide, elevated blood pressure is the leading cause of mortality
- A reduced salt intake lowers blood pressure
- The estimated benefits of salt reduction are substantial and warrant major public health efforts to reduce salt intake



Sodium and High Blood Pressure

**TWO SILENT KILLERS
GET INFORMED. LIVE LONG.**



**WORLD
HYPERTENSION
DAY**

Initiated by the World Hypertension League

MAY 17, 2009

For More Information

www.worldhypertensionleague.org • www.hypertension.ca • www.hypertension.qc.ca • www.heartandstroke.ca • www.sodium101.ca

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Thank YOU

Thank YOU