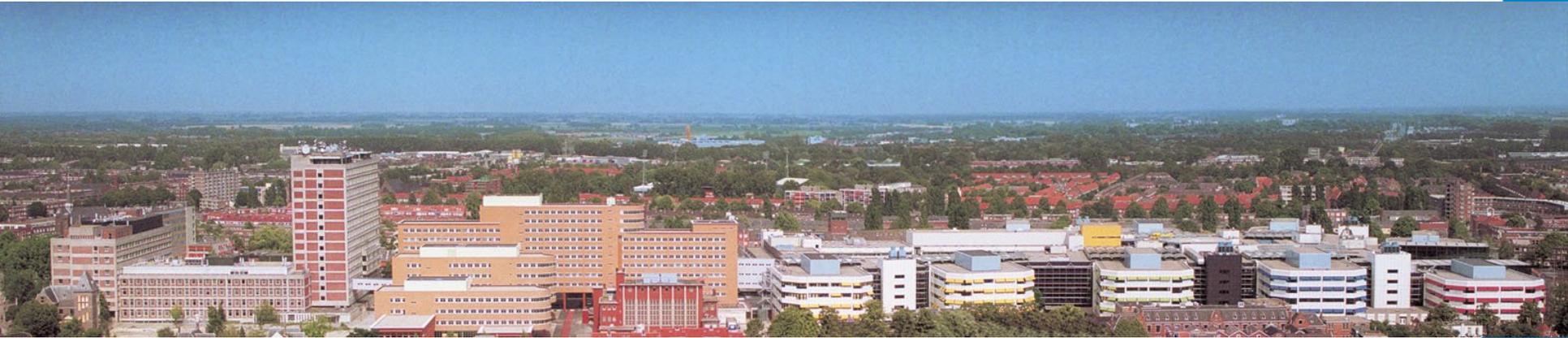


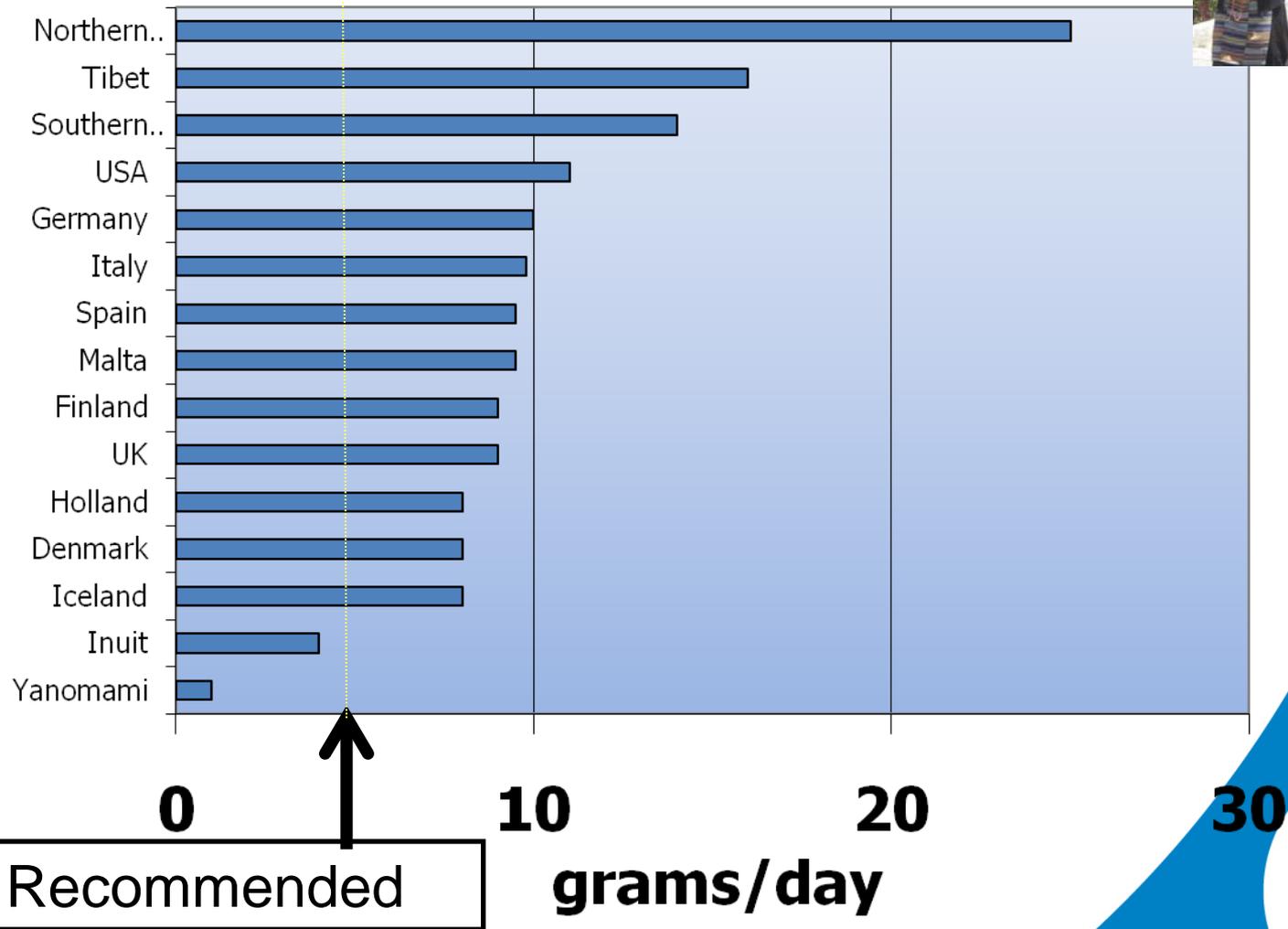
Health benefits of salt restriction.



Gerjan Navis
UMCG
Groningen
The Netherlands
g.j.navis@umcg.nl

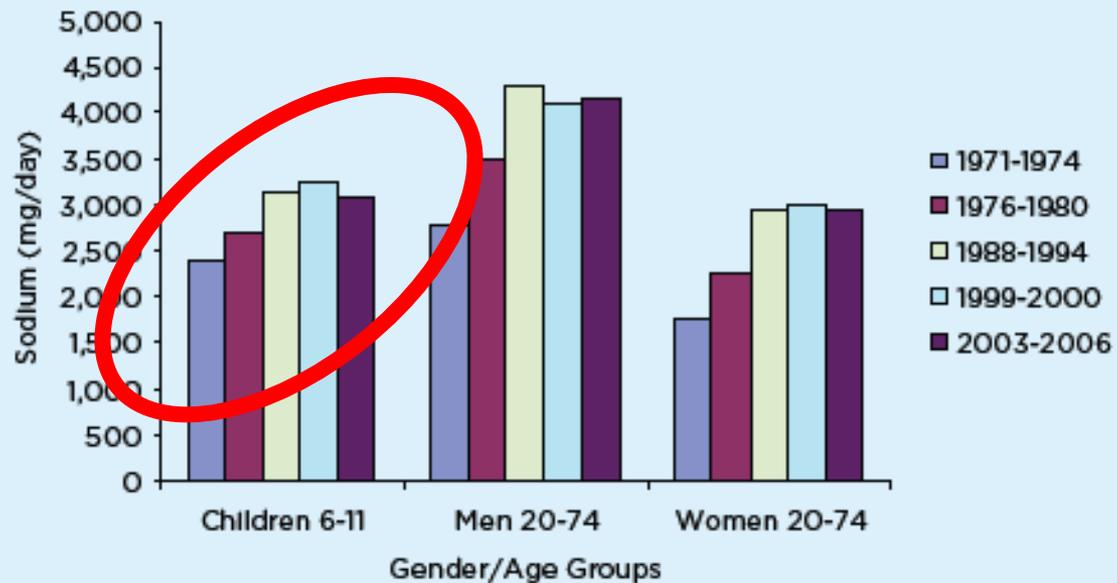


Saltintake around the world



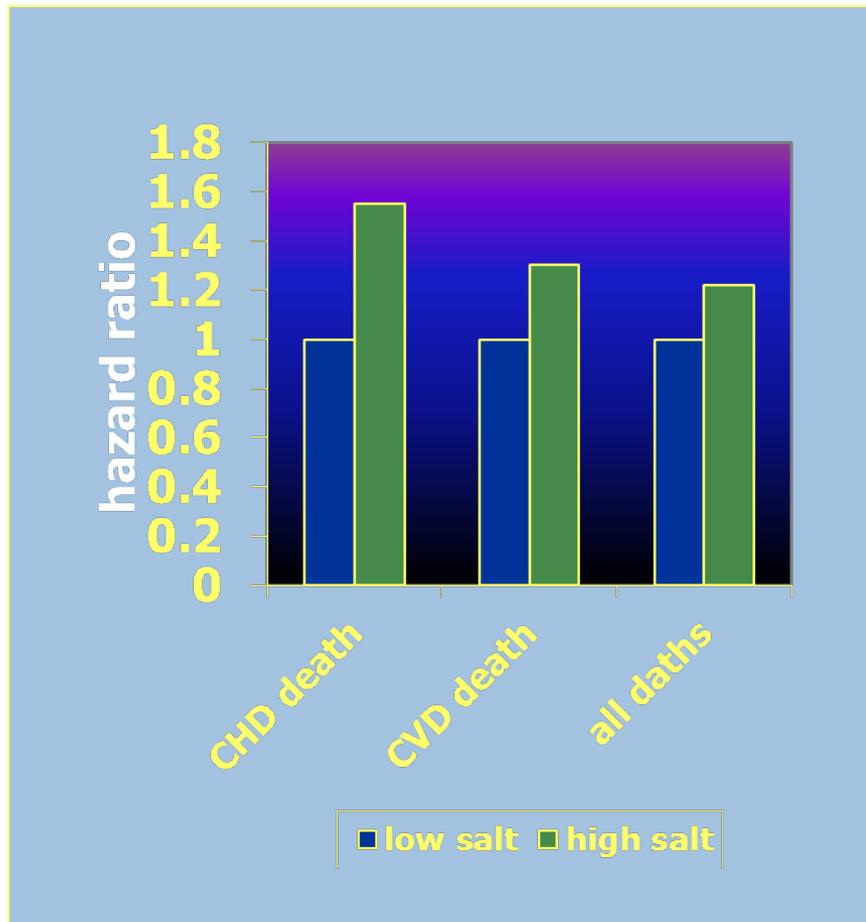
Sodium intake over time

Figure 1: Trends in Mean Sodium Intake from Food for Three Gender/Age Groups, 1971-1974 to 2003-2006



Source: Briefel and Johnson (2004) and NHANES (2003-2006)

High salt intake: independent predictor mortality general population



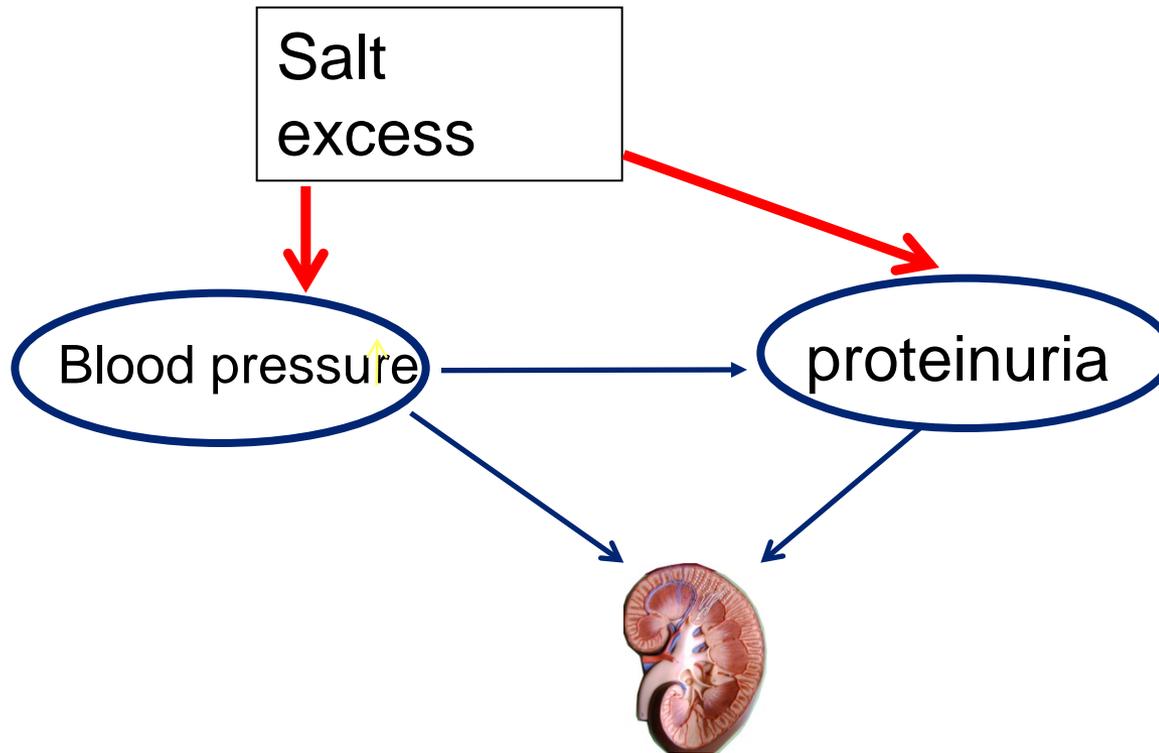
- ⦿ Increased mortality risk per 6 gr rise in salt intake
- ⦿ Interaction with BMI > 27
 - ⦿ HR normal weight: 0,98 ns
 - ⦿ HR overweight : 1,56
- ⦿ Salt-associated risk only in overweight subjects!

Tuomilehto, Lancet 2001; 357:848-51

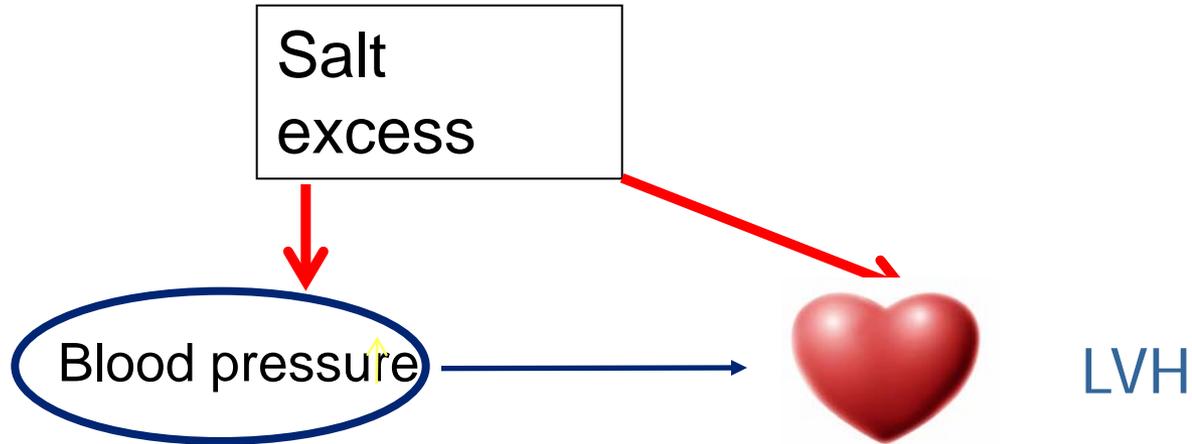
Salt excess and health damage

- ⊙ Blood pressure
- ⊙ Direct effect on target organs (heart, blood vessels, kidney)
- ⊙ Combination of the above
- ⊙ Blocks therapeutic efficacy of RAAS-blockade

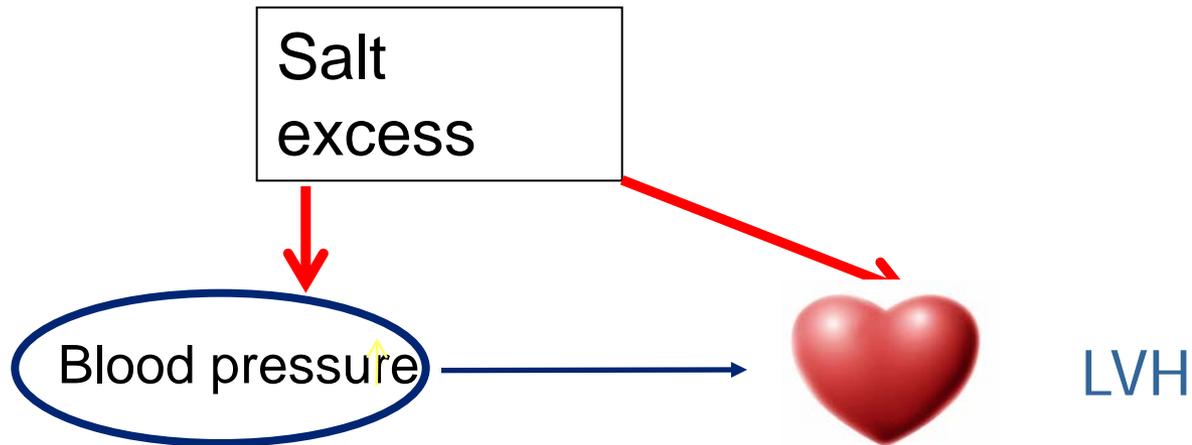
Salt excess and progressive end organ damage: kidney



Salt excess and progressive end organ damage: heart

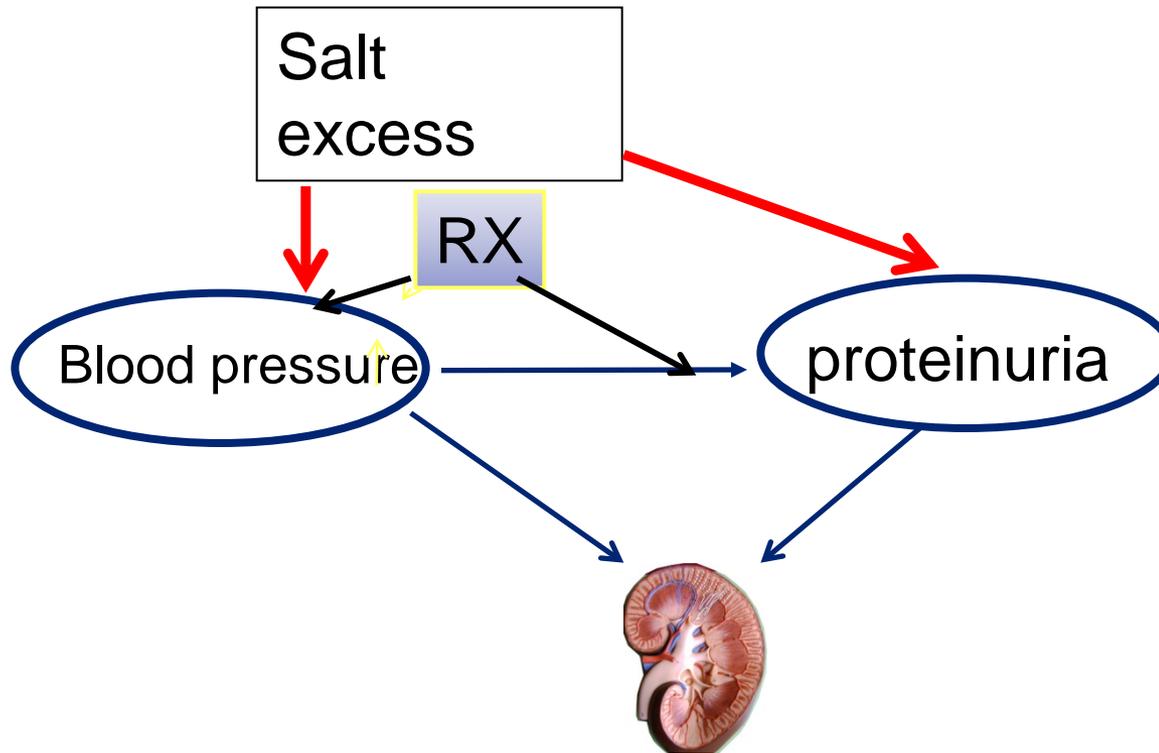


Salt excess and progressive end organ damage: heart

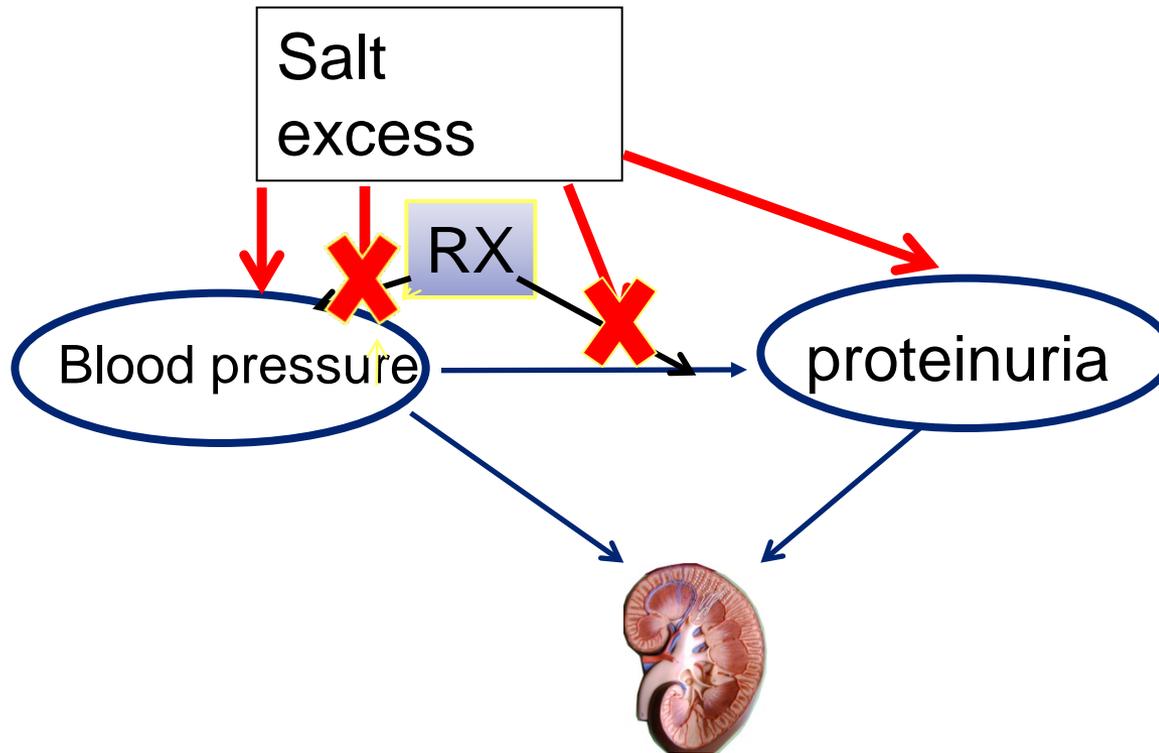


Effect of salt excess on target organs is only partly blood pressure-dependent

Salt excess and progressive CKD



Salt excess and progressive CKD



de Volkskrant

22 september 2012 zaterdag

Voorgescreven maar te licht
bevonden Geneeskunde;
Reportage medicijnen ter discussie

Bloeddrukverlagers : Aantal gebruikers 4 miljoen.

Gebruik in een jaar met 5 procent gestegen.

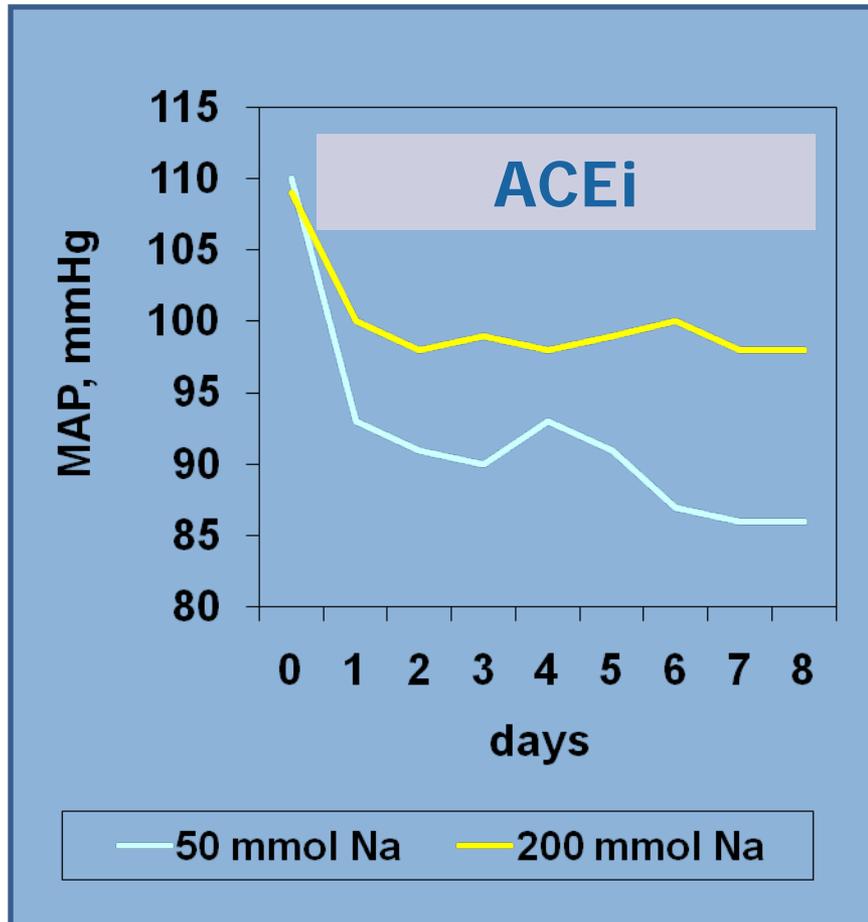
Kosten 390 miljoen euro.

Bij gezonde mensen met licht verhoogde bloeddruk: 5 jaar lang 80 tot 160 mensen om 1 voorval te voorkomen.

Bij hartpatiënten en patiënten met een zeer hoge bloeddruk is het effect van een bloeddrukverlager onbetwist. **Hoewel Rotterdams onderzoek heeft vastgesteld dat een bepaald medicijn, zogeheten ACE-remmers, bij een kwart van de hartpatiënten niet werkt.** Bijna een miljoen Nederlanders gebruiken zo'n ACE-remmer

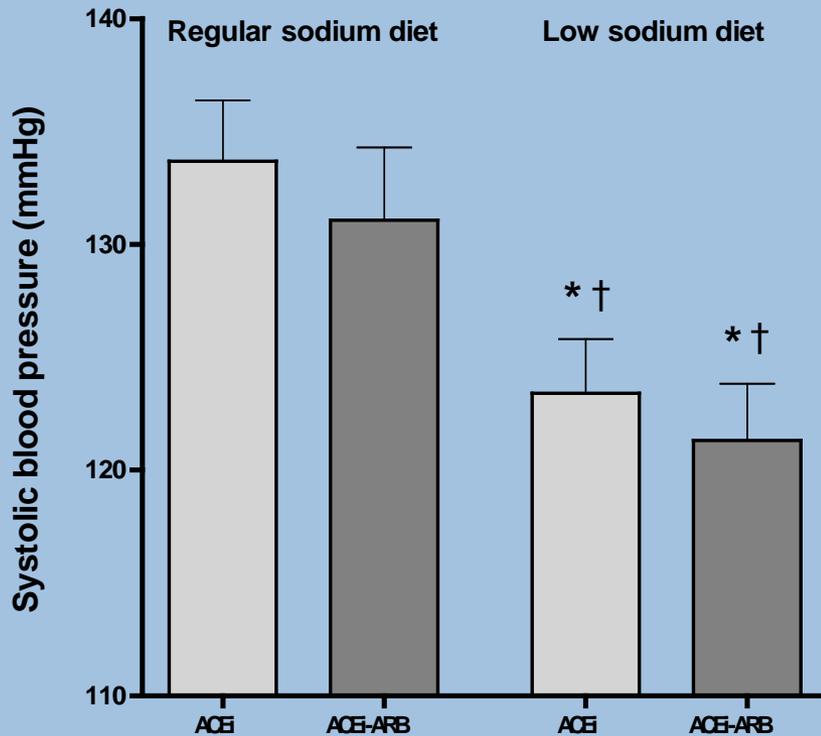
Twee miljoen Nederlanders gebruiken 'raas-remmers'.

Sodium restriction and ACEi in essential hypertension: rotation design



- ⦿ High salt blunts efficacy of RAAS-blockade in all patients
- ⦿ RAAS-blockade makes blood pressure sodium sensitive in all patients!

Less salt: less need for antihypertensives !



Moderate salt reduction beats adding extra drugs in renal patients

10-12 gram salt/day 6 gram salt/day

Slagman et al, BMJ 2011, 343:d4366

REIN trial by mean salt excretion/2 yrs

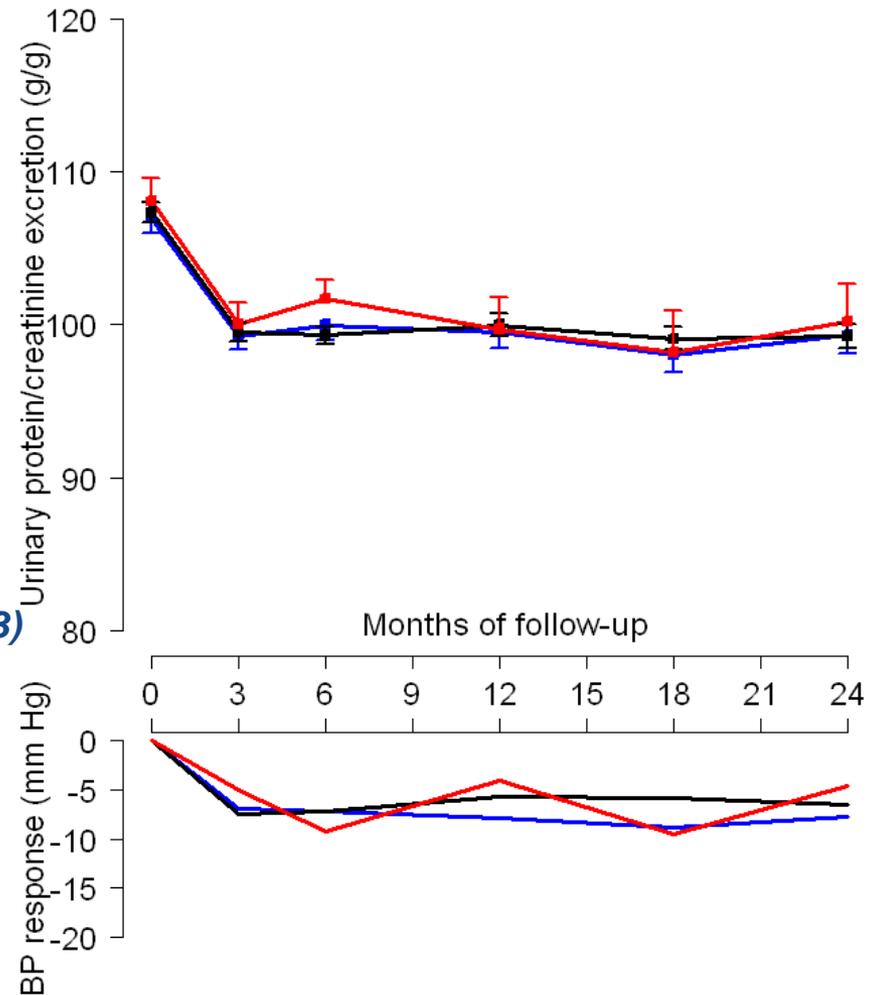
LSD: plm 5-7 g/d
MSD: plm 10-12 g/d
HSD: plm 15 g/d
(

Short-term BP response:

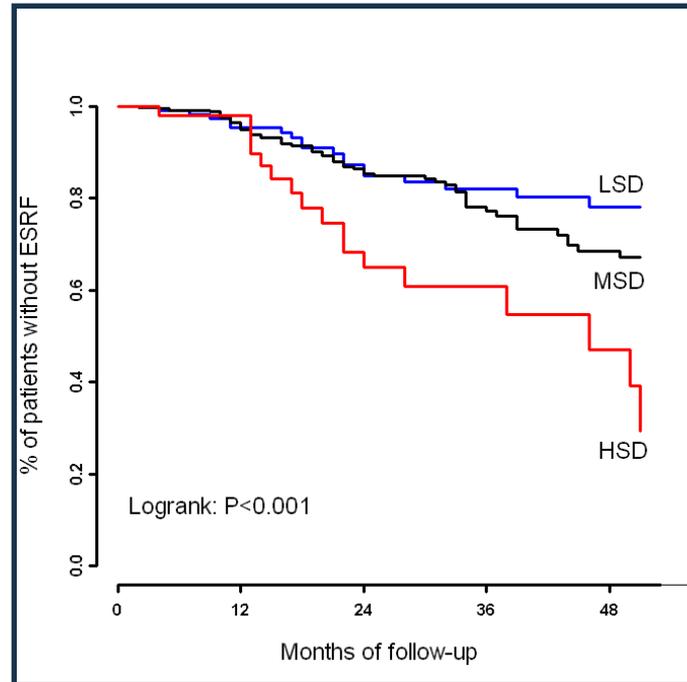
LSD: -6.9 mmHg
MSD: -7.5 mmHg (NS)
HSD: -5.0 mmHg (NS)
(*Wilcoxon rank sum test*)

Long-term response:

No changes (NS)
No difference between groups (NS)
(*Joint modelling, J Stat Soft 2010; 35:1-33*)



REIN TRIAL: hard renal end points by salt intake in CKD



LSD: 5-7 g/d
MSD: 10-12 g/d
HSD: 15 g/d

Excessive salt intake is associated with worse renal outcome, **DESPITE** well-controlled blood pressure !

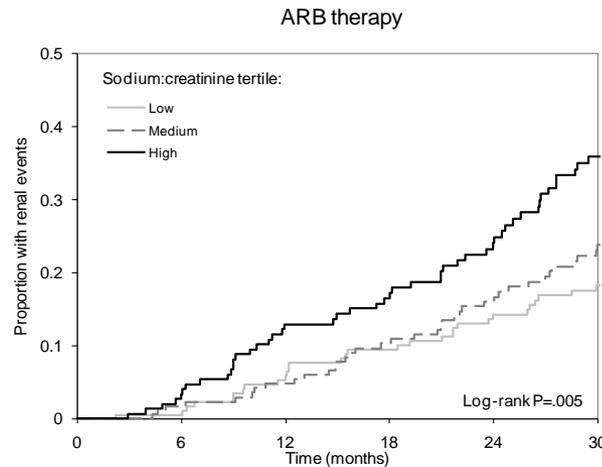
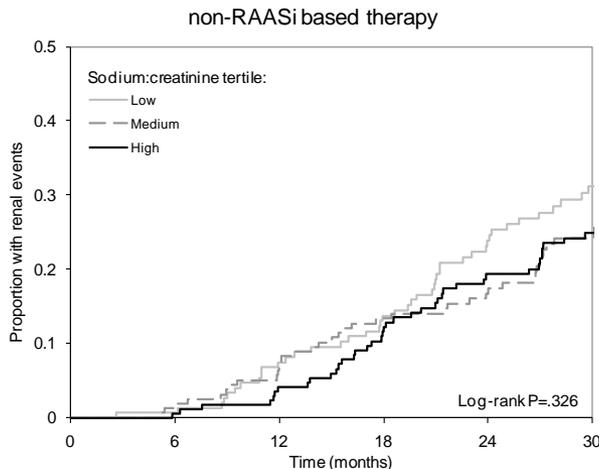


umcg

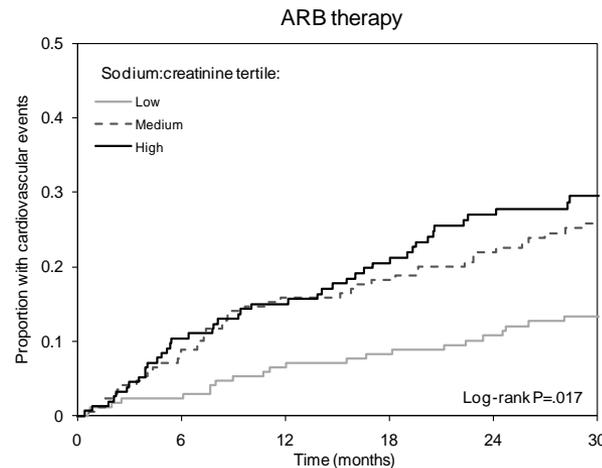
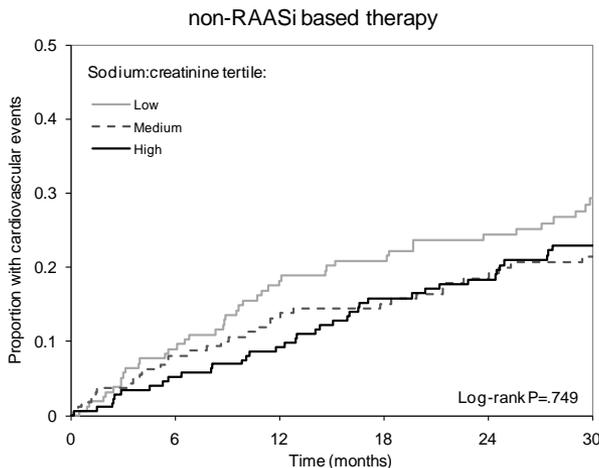
Vegter, JASN 2012; 23: 165-73

RENAAL-IDNT: Effect of sodium status on outcome in diabetic nephropathy

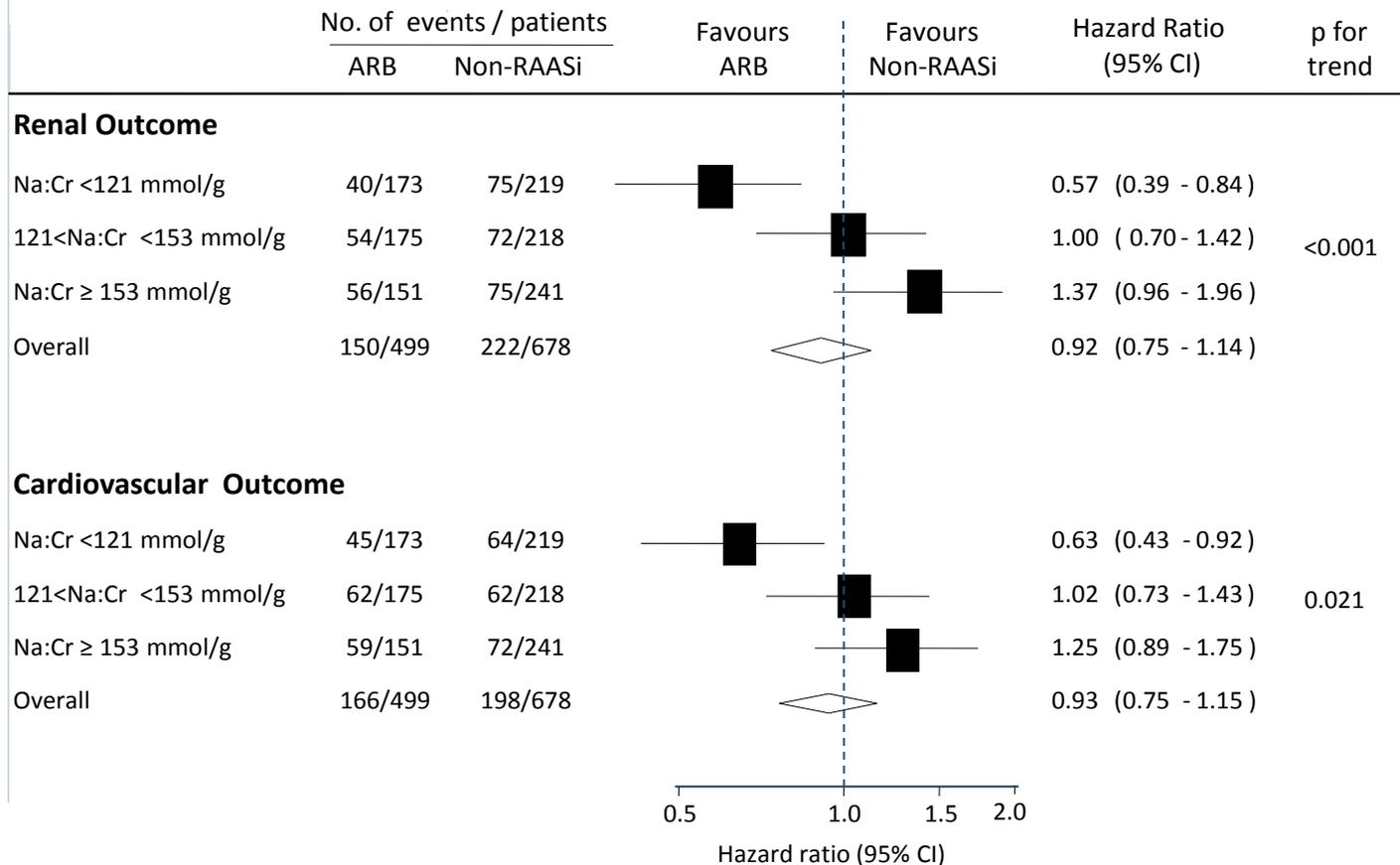
A: Renal events



B: Cardiovascular events



RENAAL-IDNT: salt excess annihilates renal and CV protection by RAAS-blockade



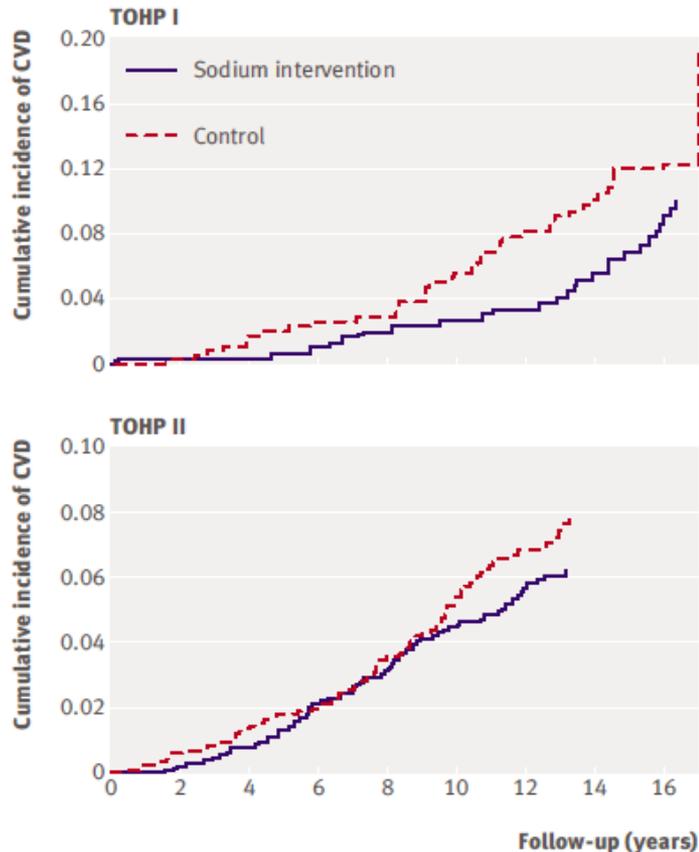
Lambers Heerspink *Kidney Int* 2012; 82: 330-337.



Salt excess and health damage

- ⦿ Blood pressure
- ⦿ Direct effect on target organs (heart, blood vessels, kidney)
- ⦿ Combination of the above
- ⦿ Blocks therapeutic efficacy of RAAS-blockade
- ⦿ Health effects clearly present during moderately lower salt intake.

Effect reduction in salt intake on hard end points:



TOHP I and TOHP II
744 and 2382 pre-hypertensives
Counseling for salt restriction
(18 & 36-48 mo)

Reduction UNaV by 44 and 33
mmol/day, from baseline 155 and 182

BMI: 27.1 and 30.9
(90% > 25)

25 % reduction long time CV events.

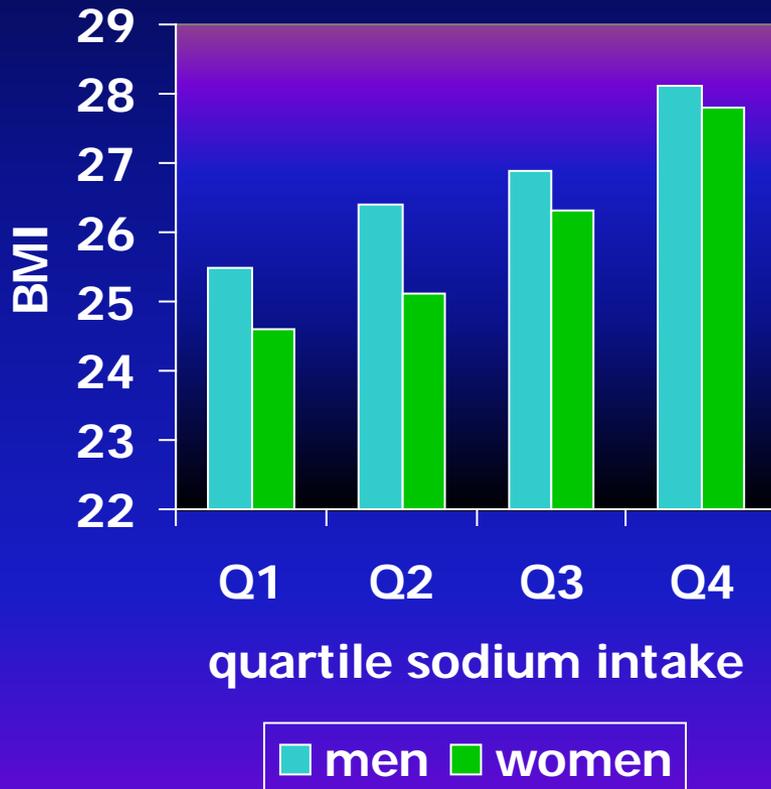
Cook, BMJ, 20 april 2007

Why sodium excess is an emerging pathogenetic factor



THE DEADLY TWINS: SODIUM EXCESS AND WEIGHT EXCESS

Salt excess & weight excess are usually associated

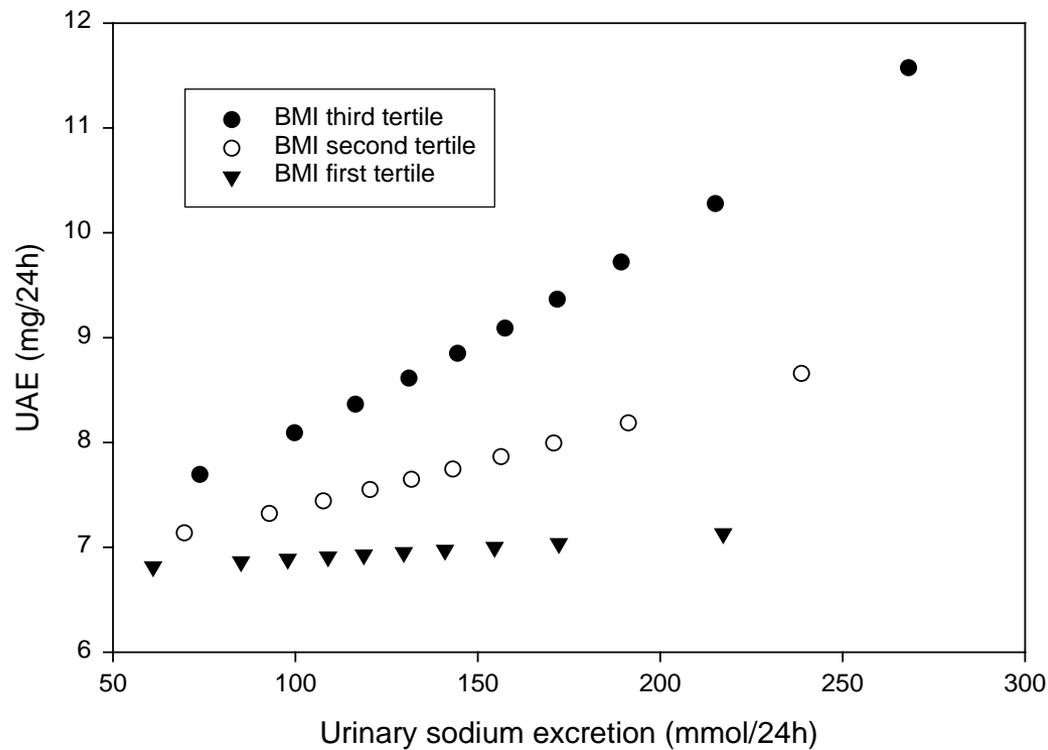


- Association between sodium intake and fluid intake/soft drink consumption in children

(He, Marrero and MacGregor, Hypertension 2008;51: 629)

- Overall intake: calories plus salt
- Salt induces drinking, many drinks contain calories

Salt status: associated with albuminuria independent of BP, but dependent on BMI (n=7913, Prevend population)

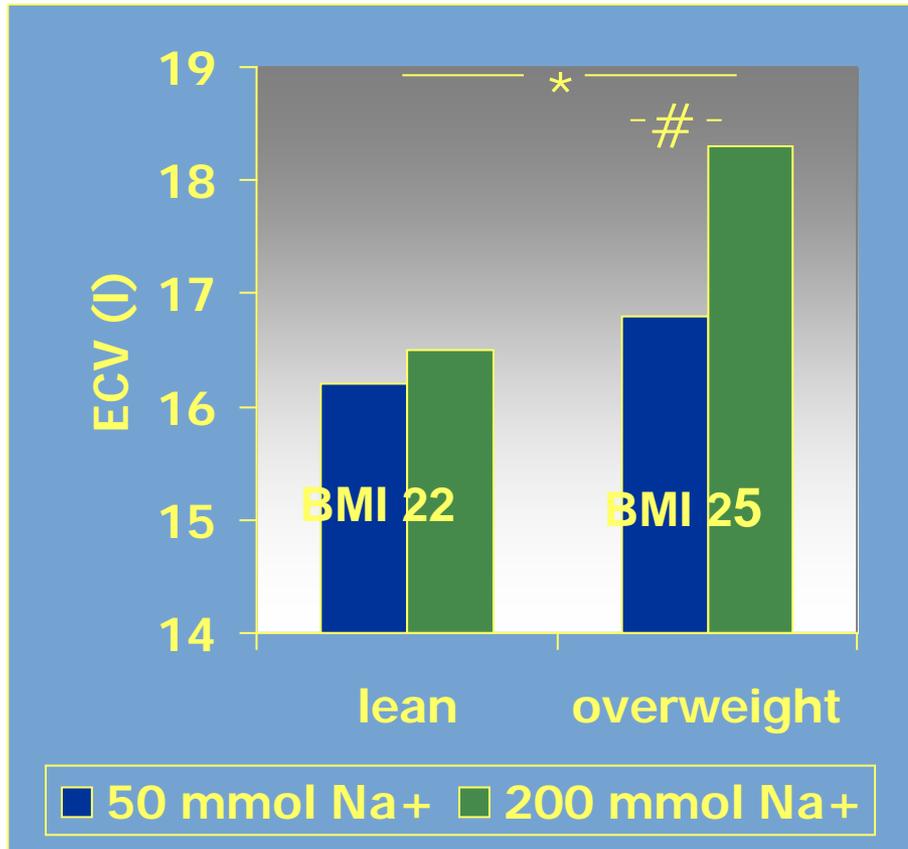


BMI:
27,3-67

24-27,3

16,3-24

Overweight impairs sodium excretion in healthy young men



Overweight potentiates rise in ECV induced by high salt !

ECV higher in overweight than in lean subjects :
ONLY DURING HIGH SALT

No differences in BP

Salt excess and health damage

- ⦿ It is not only blood pressure !
- ⦿ Salt excess and weight excess are deadly twins.
- ⦿ Drugs cannot replace salt reduction
- ⦿ Small reductions in salt intake have large health effects
- ⦿ Measurement of salt excretion is a must to achieve improvement !!!



Center for Information Based
Decision Making & Marketing Research