HTA : quelles recommandations nutritionnelles ont réellement un effet ?

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Thèmes abordés

1. Sodium – sel
2. Potassium
3. Café-thé
4. Fibres
5. Oléagineux
6. Chocolat
7. Autres

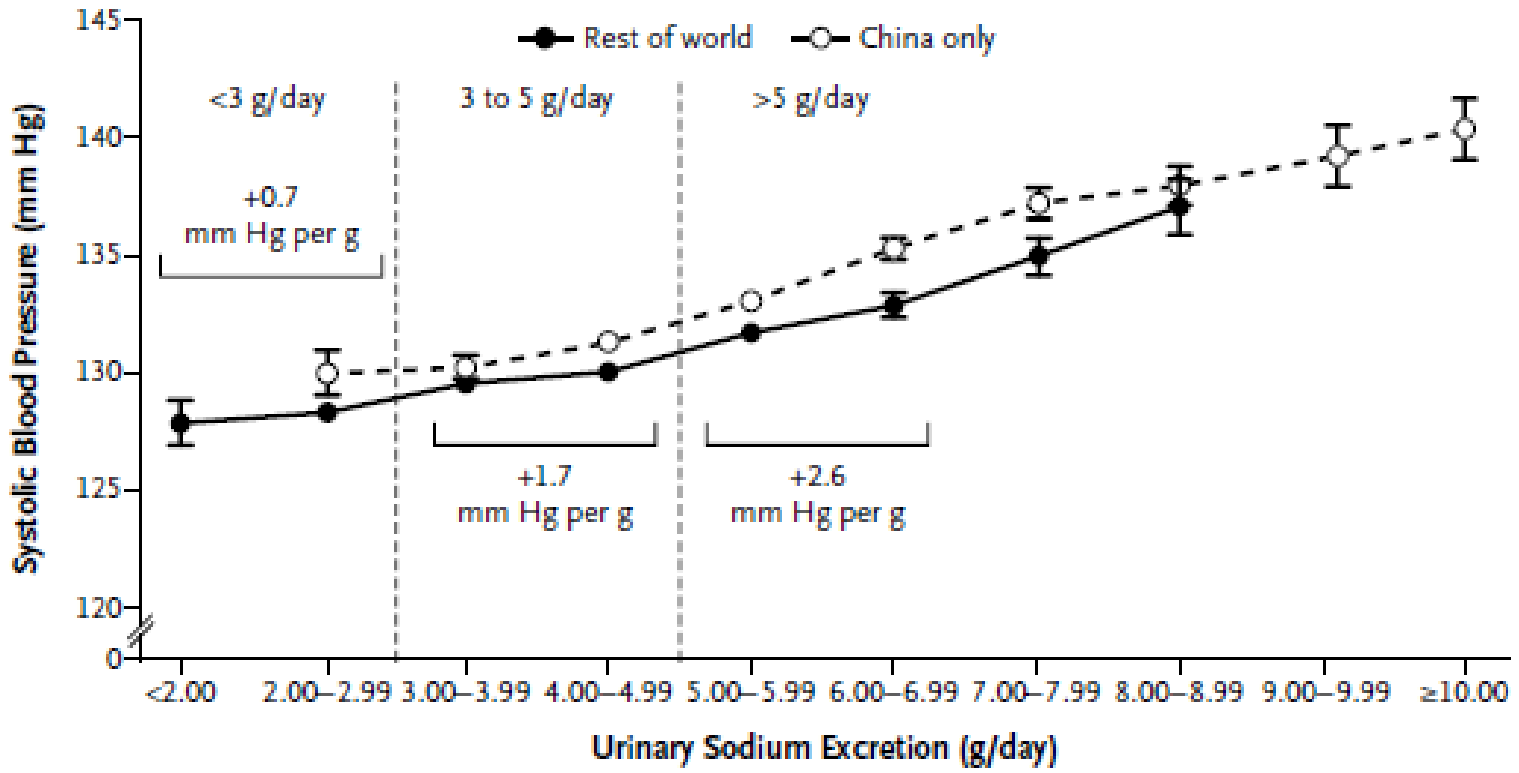
Le sel- NaCl

Evidences des effets bénéfiques d'une baisse des apports en sodium ?

	RCT	Cohort studies	Ecological studies	Exper. studies
↓ Age effect on BP			X	X
↓ BP and improve drug effect	X			X
↓ CV risk		X		X
↓ Risk of stroke		X	X	X
↓ Risk of LVH	X			X
↓ Risk of albuminuria	X			X
↓ Arterial rigidity	X			
↓ Risk of renal stone	X	X		
↓ Risk of stomach cancer		X	X	

The American Journal of Medicine (2012) 125, 433-439

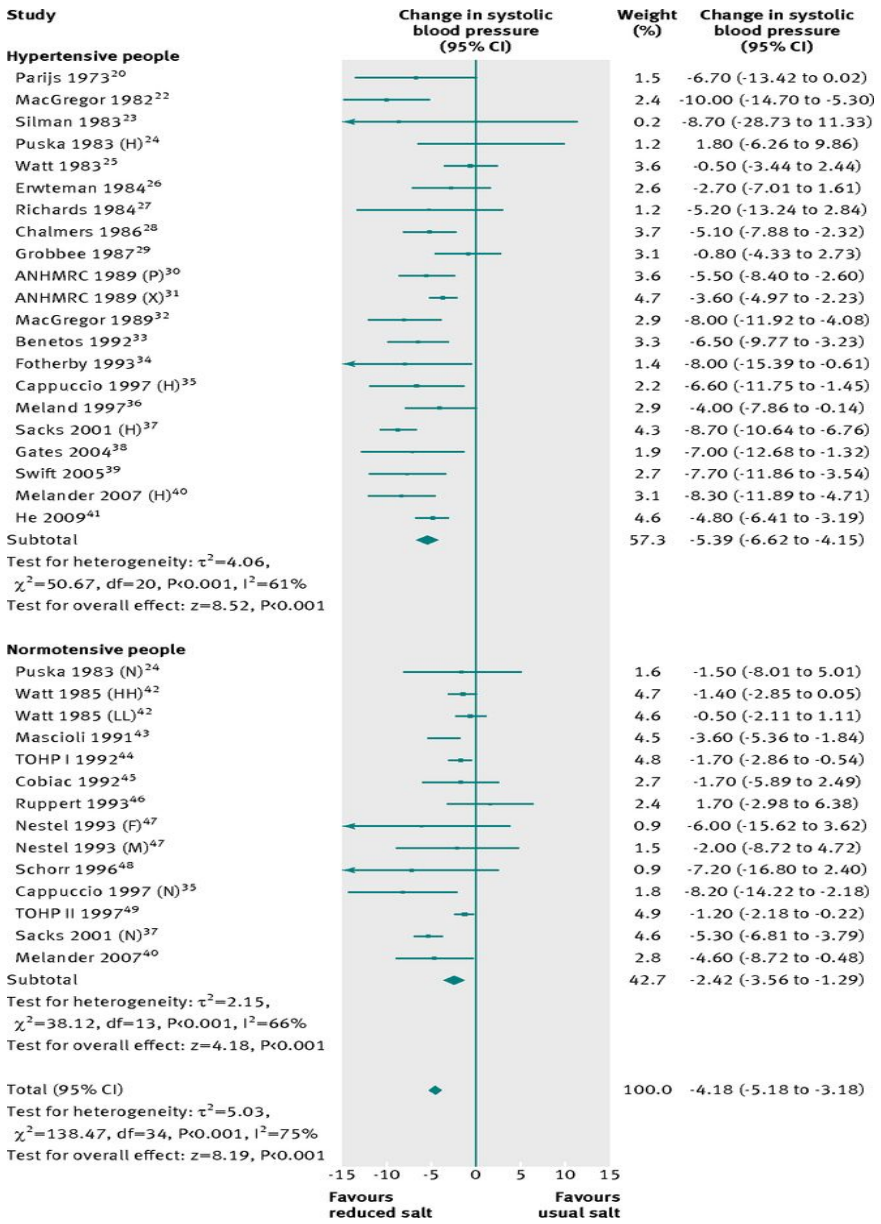
Pression artérielle systolique moyenne en fonction de l'excrétion urinaire de sodium dans l'étude PURE



No. of Participants										
China		1876	6,012	9,794	10,101	7177	4093	2035	1002	952
Other countries	1613	7384	15,101	16,015	10,810	5211	2048	992		

Mente et al, N Engl J Med 2014;371:601-11

Variations de la pression artérielle systolique chez les individus après restriction en sel

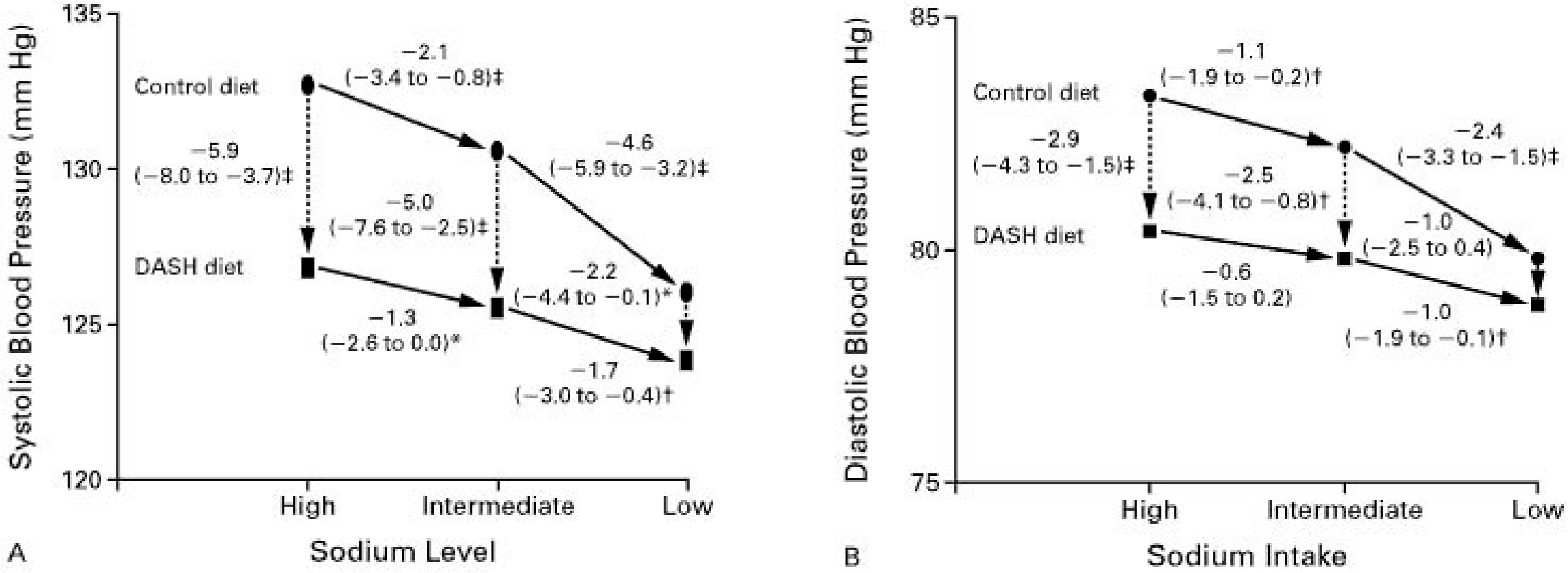


Hypertension: -5.39 mmHg (p<0.001)

Normotension: -2.42 mmHg (p<0.001)

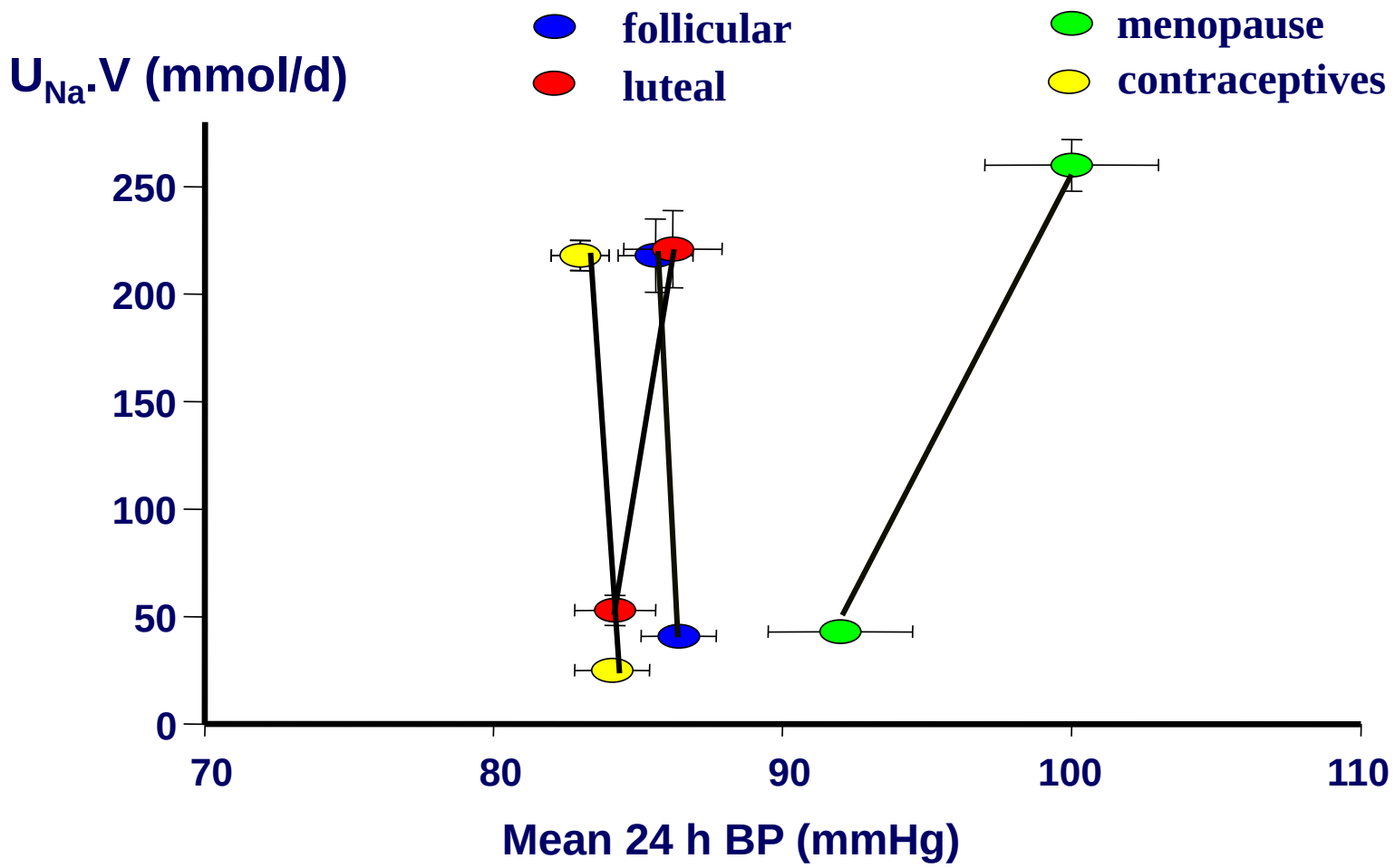
Feng J He et al. BMJ 2013;346:bmj.f1325

Effet d'une réduction de la consommation de sel sur la PA
L'étude DASH



Sacks et al, NEJM, 2001; Jan 4;344(1):3-10

Les femmes deviennent sensibles au sel avec l'âge et la ménopause



Péchère-Bertschi A, Clin Sci 2000, Kidney Int 2004, et Am J Hypertens, 2005

Sous-groupes de personnes particulièrement sensibles au sel en terme de pression artérielle

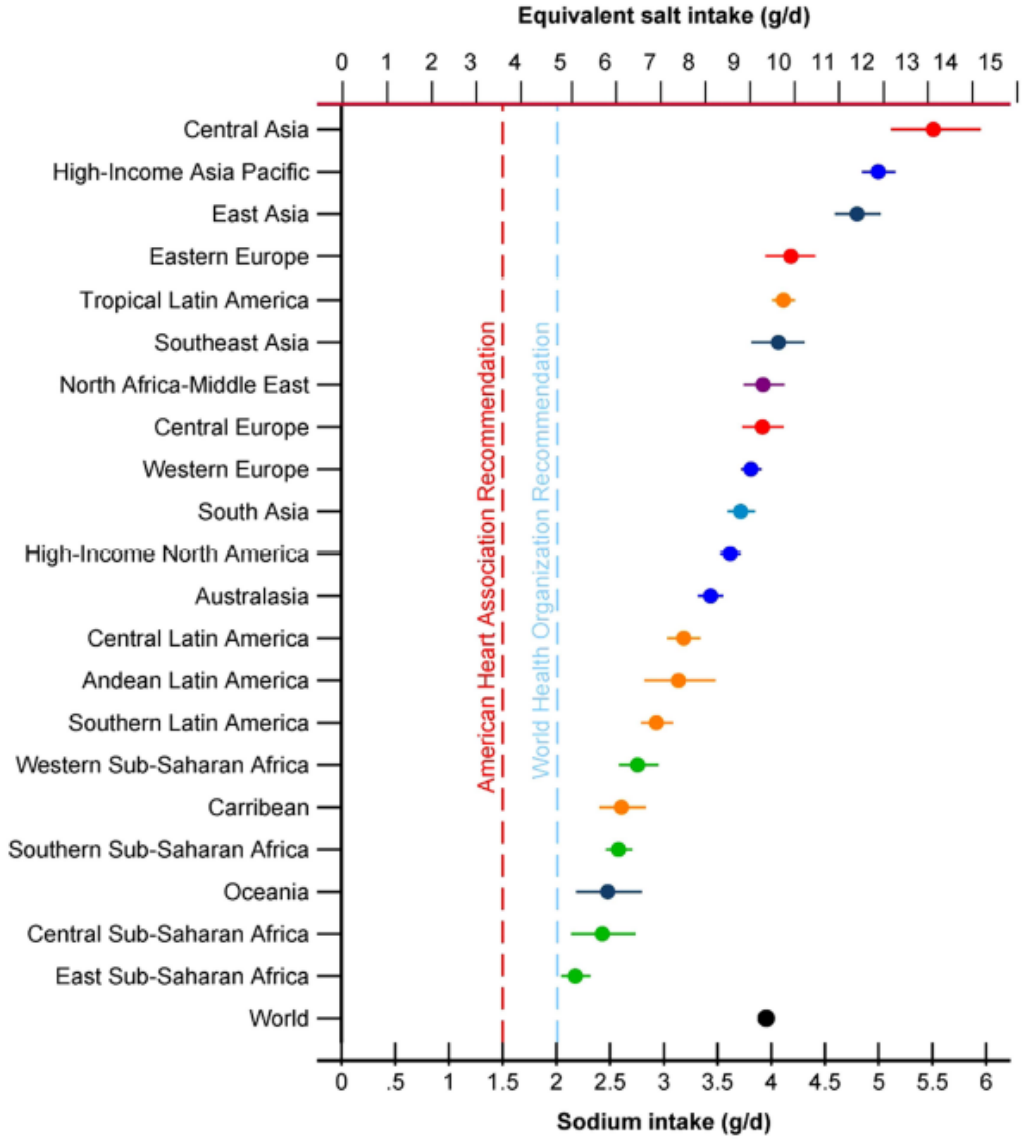
- Pression artérielle élevée, hypertendus (>50%)
- Personnes âgées
- Surpoids et obésité
- Fonction rénale diminuée
- Personnes d’origine africaine ou afro-américaine
- Facteurs génétiques sélectifs

Recommandations internationales pour la consommation de sodium

World Health Organization	<2g Na/d (<5g NaCl/d)
American Heart Association	< 1.5g Na/d (<3.75 g NaCl/d)
US FDA	< 2.3g Na/d (6g NaCl/d)
ESH guidelines 2023	<2g Na/d (<5g NaCl/d)

Dans la plupart des pays les apports de sel varient entre 10 g et 15 g par jour!

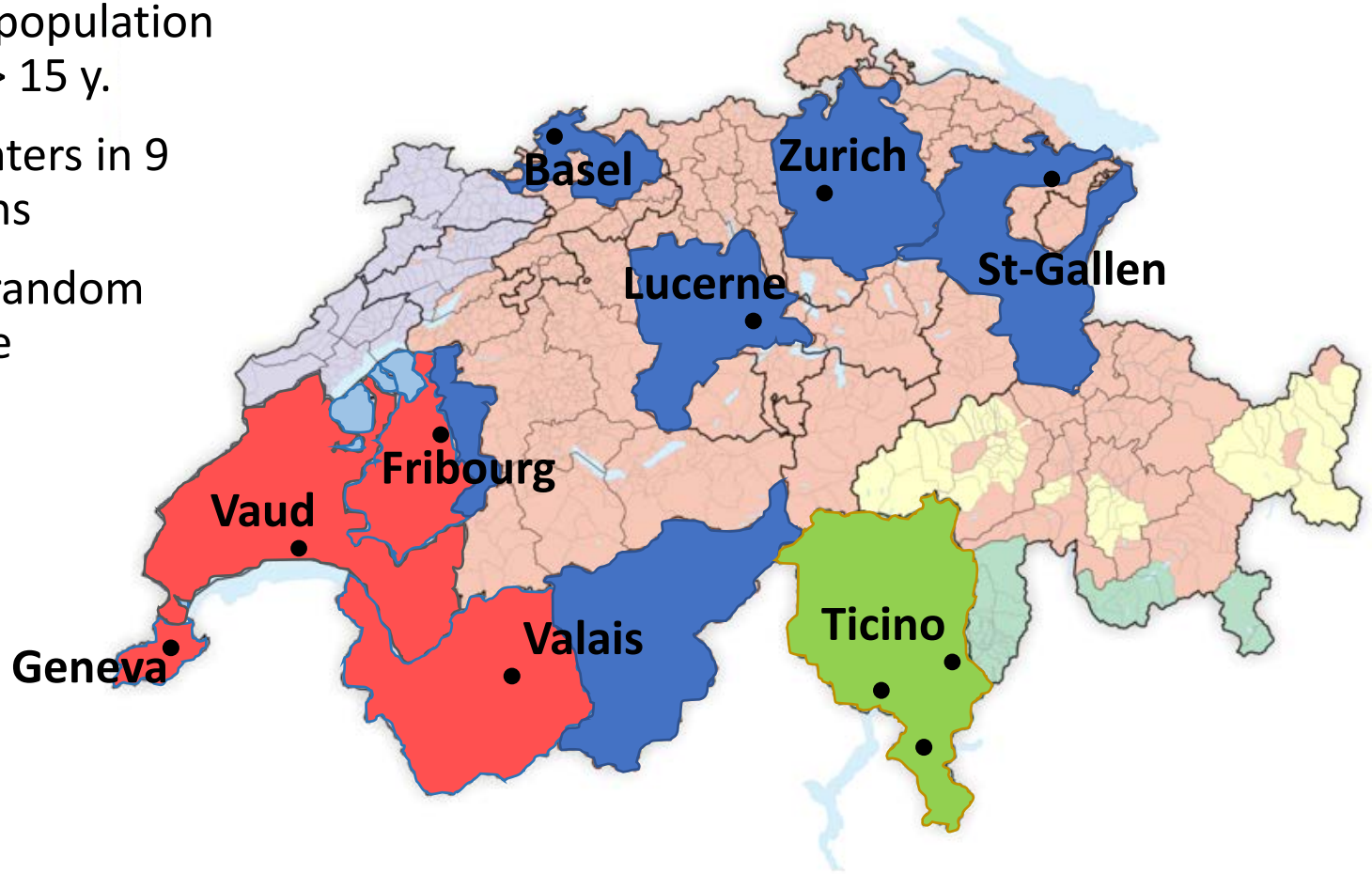
Consommation de sodium dans le monde en 2010



Powles et al, BMJ Open 2013;3:e003733

L'étude suisse sur le sel

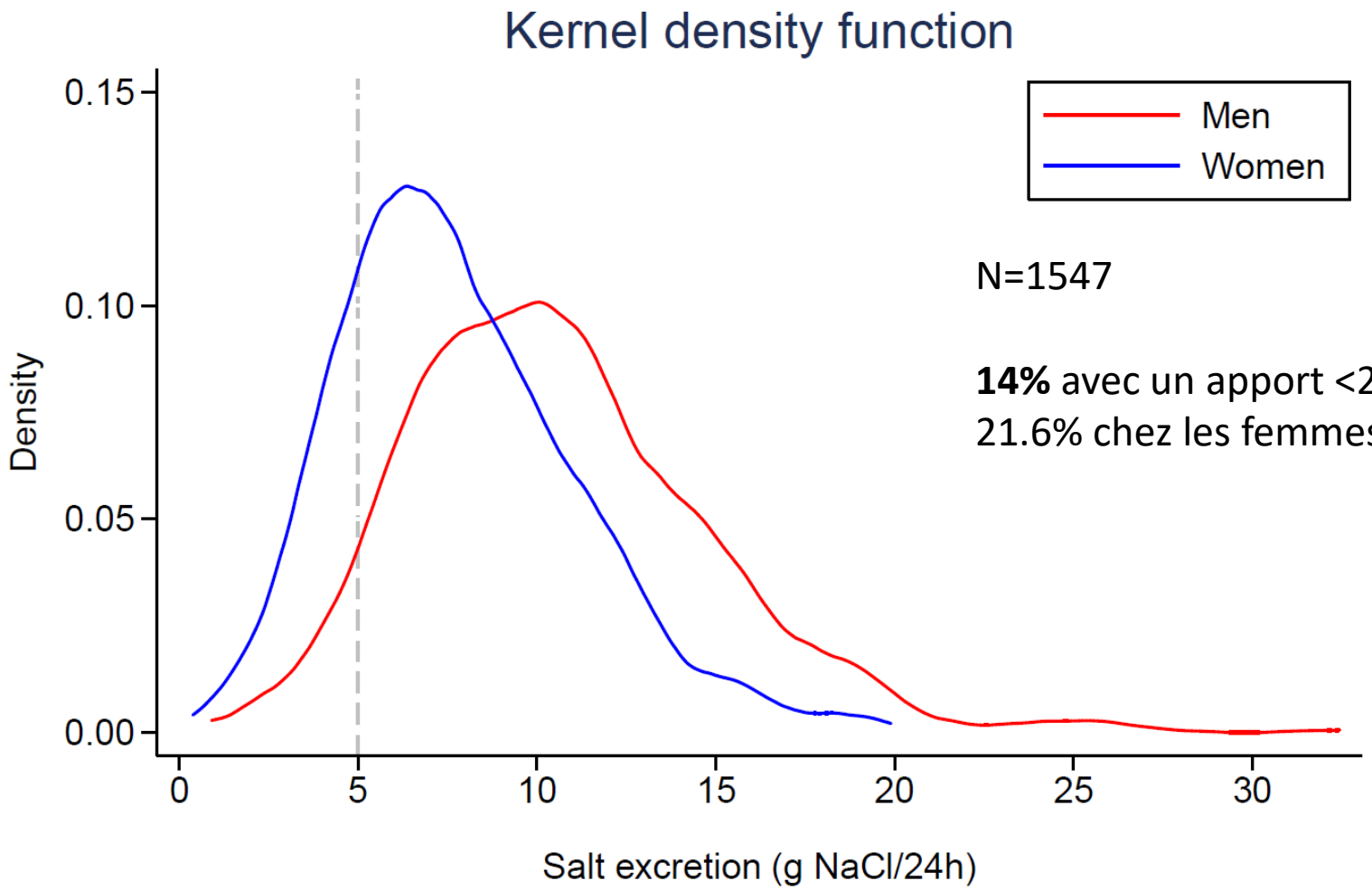
- Swiss population aged > 15 y.
- 11 centers in 9 cantons
- 1500 random people



M Bochud et M Burnier

Source: *Chancellerie fédérale ChF, La Confédération en Bref 2011 (www.bk.admin.ch)*

Distribution de l'excrétion urinaire de sel par sexe dans la population suisse: the Swiss Salt Study (SSS)



N=1547

14% avec un apport <2g/d (<5g NaCl/d)
21.6% chez les femmes et 6% chez les hommes

Source: OFSP

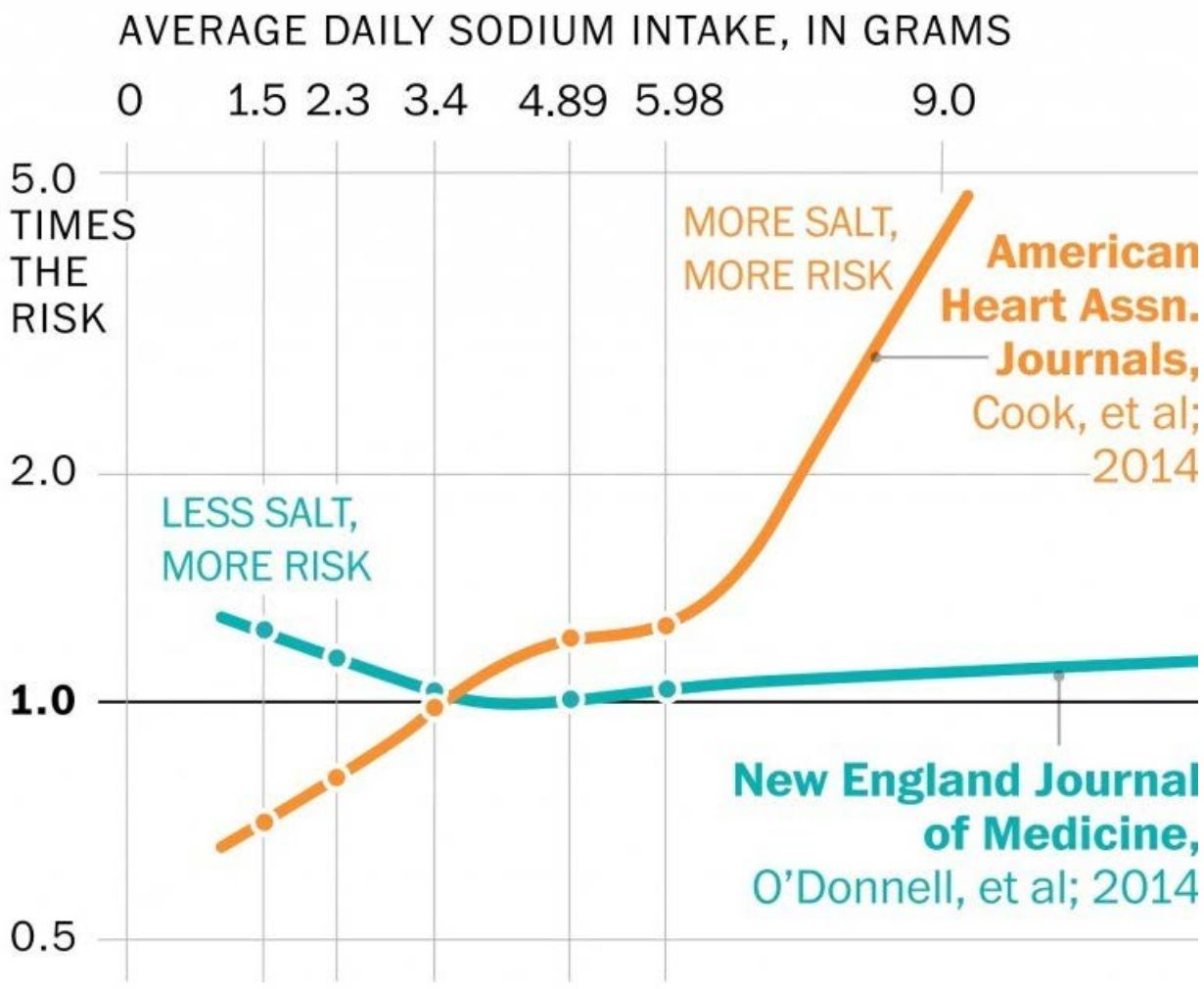
Qui sont les gens qui mangent moins de 5g de sel/j en Suisse

N=1379	OR	95%CI	P value
Age, years	1.006	0.996;0.016	0.231
Sex (being women)	**1.73**	**1.10;2.72**	**0.018**
Current smoking (yes=1)	**0.62**	**0.36;1.04**	**0.072**
BMI < 25	1 (ref)		
Overweight	0.81	0.53;1.25	0.343
Obesity	**0.36**	**0.17;0.76**	**0.008**
French-speaking	1 (ref)		
German-speaking	0.60	0.40;0.91	0.015
Italian-speaking	0.61	0.35;1.07	0.085
Estimated protein intake (10g/day)	**0.56**	**0.47;0.65**	**<0.001**
Urinary K excretion (10 mmol/24h)	0.87	0.77; 0.98	0.026
Urinary Ca excretion (mmol/24h)	0.87	0.77;0.98	0.024
Urine volume (L/24h)	0.69	0.53;0.90	0.005

Age and sex were forced into the model.
The other variables needed to have P<0.10 to stay in the model.

M Burnier, M Bochud, Nutrients

Risque de maladies cardiovasculaires en fonction de la consommation de sel: la controverse



Etude PURE

Questions concernant les résultats de l'étude PURE

Qu'en est-il de la causalité inverse?

1) Apports faibles en sel → ↑ mortalité totale et CV

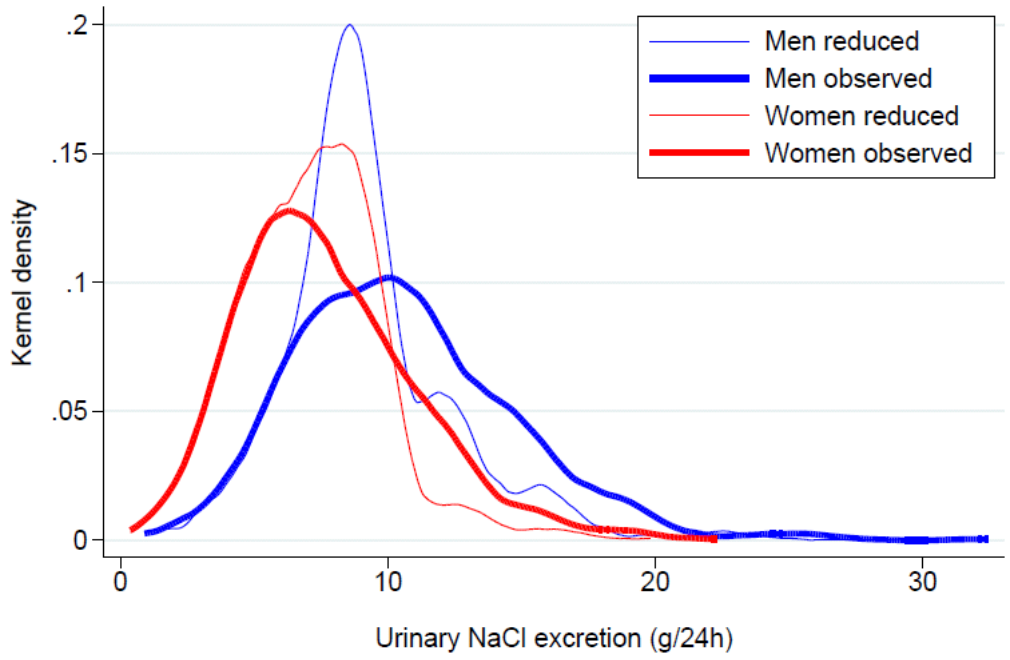
2) Maladie de base → apports faibles en Na et excrétion faible

↑ mortalité totale et CV

Qui sont les personnes avec moins de 2 g de sodium par jour et qui sont à haut risque cardiovasculaire ?

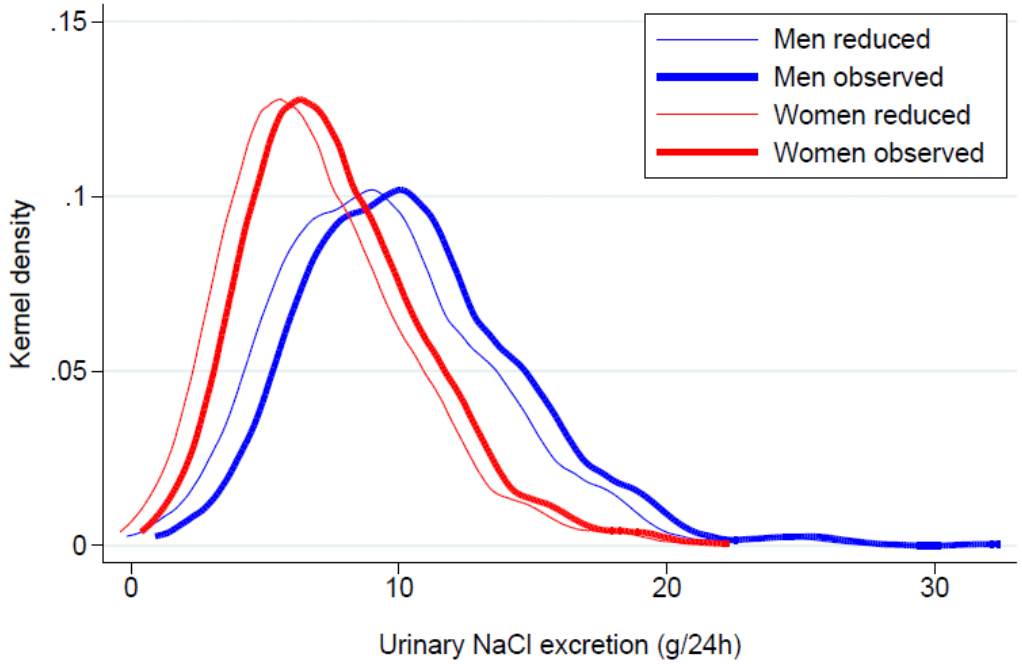
Politiques de réduction non-personnalisée des apports en sel.

Stratégie des hauts-risques



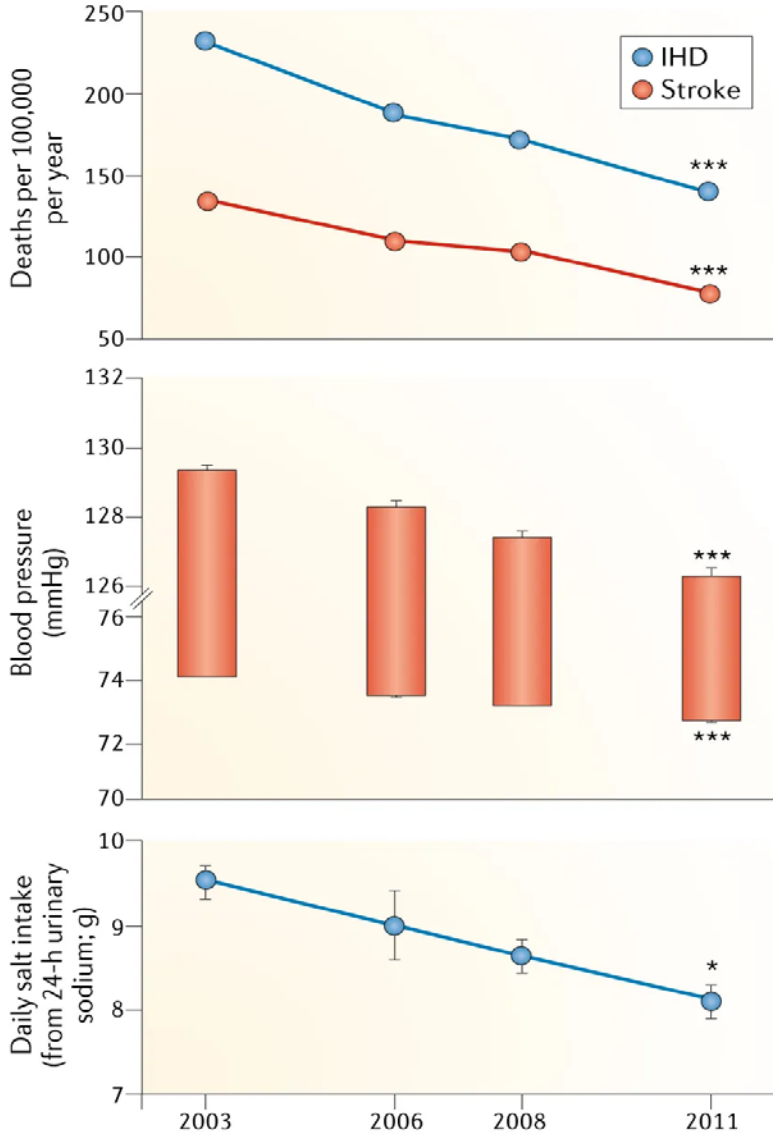
Swiss Survey on Salt, N=1500, 25% reduction if urinary Nacl>=10g/24h

Stratégie populationnelle



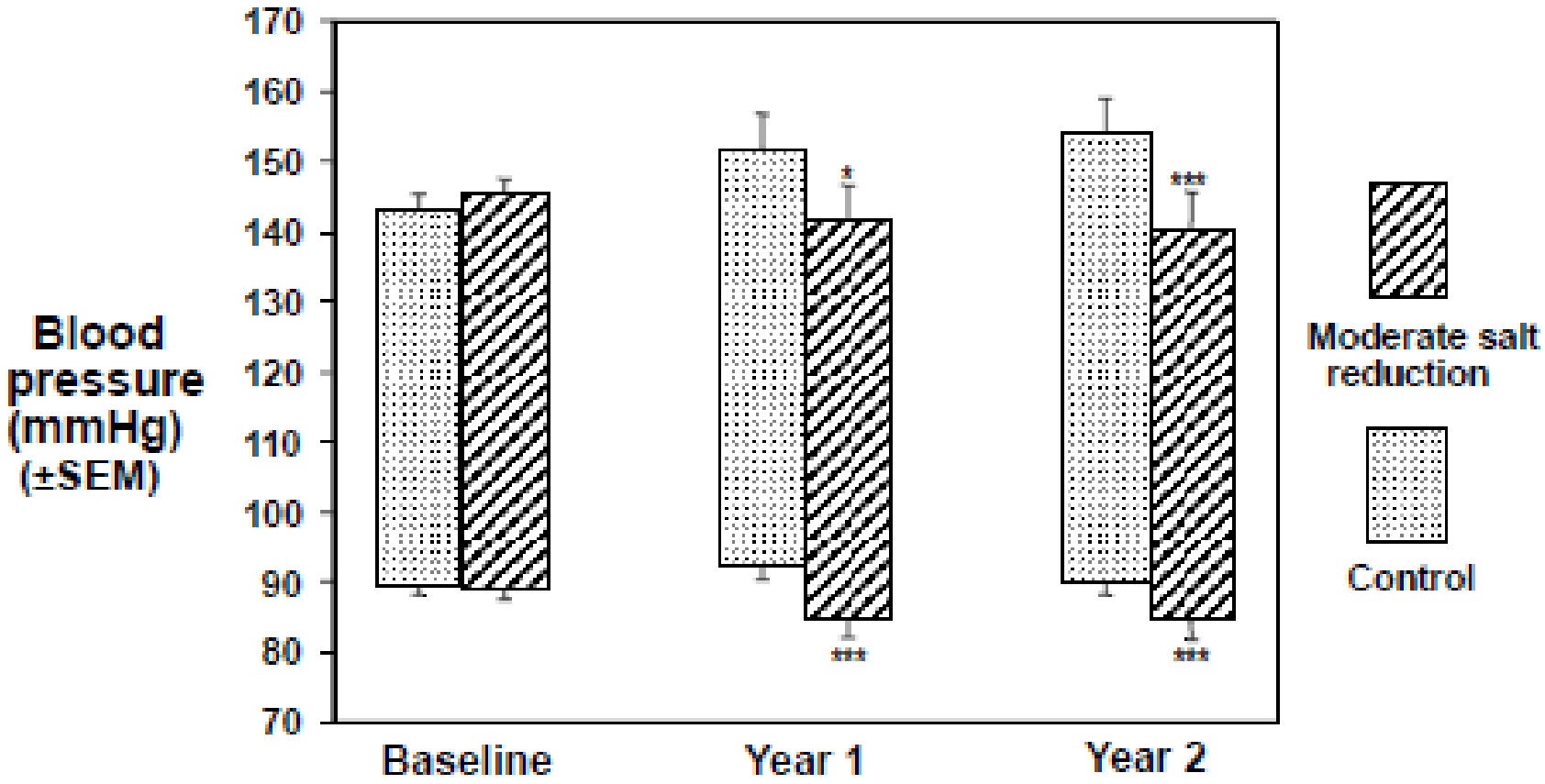
Swiss Survey on Salt, N=1500; 9.1 ==> 8.2, 10% reduction in everyone

Changements des apports en sel, pression artérielle et mortalité en Angleterre de 2003 à 2011



He and McGregor.
*Nature Reviews Cardiology 2018;***15**, 371–377

Intervention study in two Portuguese villages



* P<0.05, *** P<0.001 compared to control group.

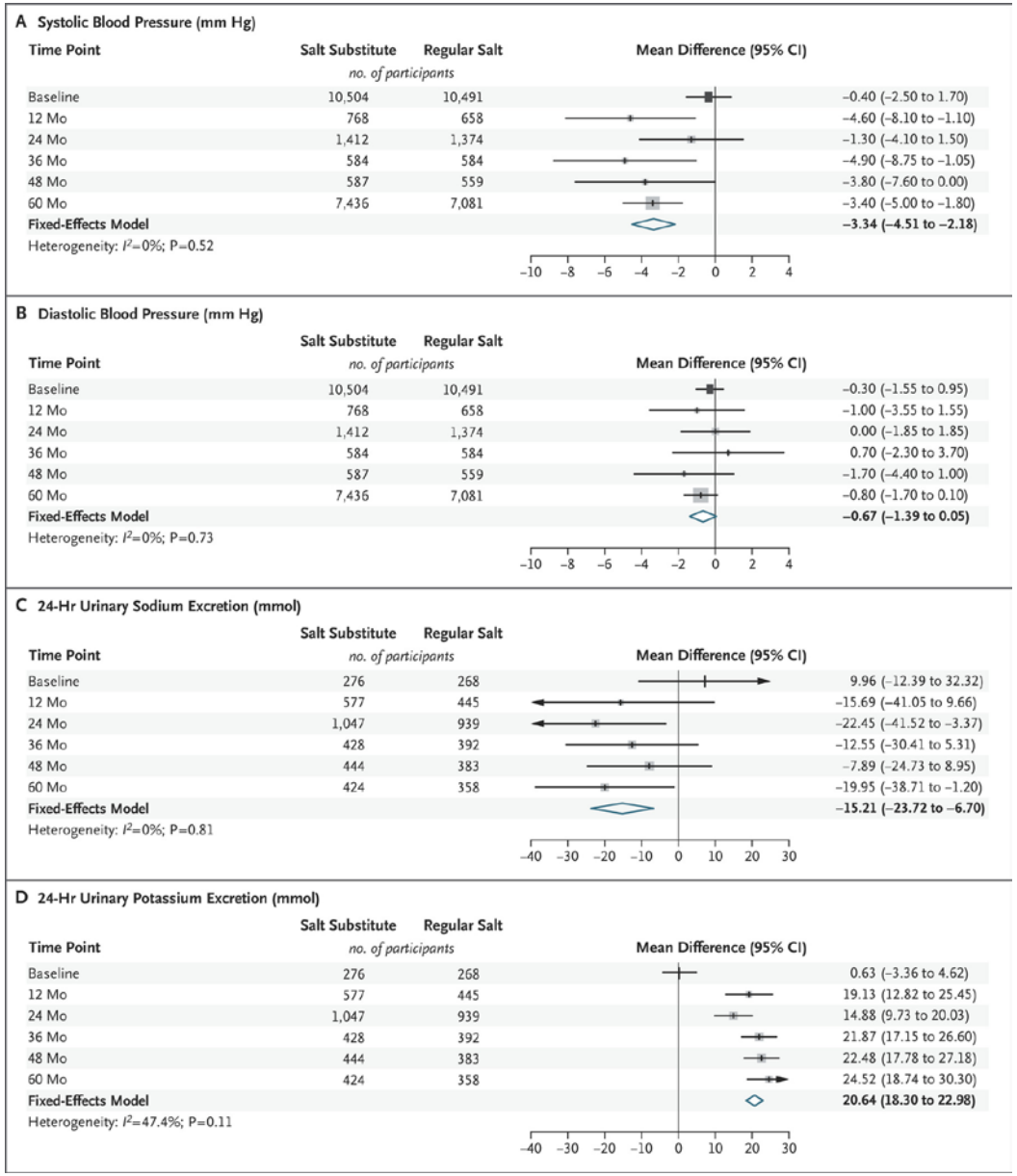
Forte JG et al, J Human Hypertens, 1989

Substitution du sel, pression artérielle et évènements cardiovasculaires en Chine

Outcomes	Salt Substitute	Regular Salt	Rate Ratio (95% CI)	P Value
	no. of events per 1000 person-yr			
Stroke	29.14	33.65	0.86 (0.77–0.96)	P=0.006
Major Adverse CV Events	49.09	56.29	0.87 (0.80–0.94)	P<0.001
Death from Any Cause	39.28	44.61	0.88 (0.82–0.95)	P<0.001
Hyperkalemia	3.35	3.30	1.04 (0.80–1.37)	P=0.76

Neal et al. N Engl J Med 2021; 385:1067-1077

Substitution du sel, pression artérielle et évènements cardiovasculaires en Chine



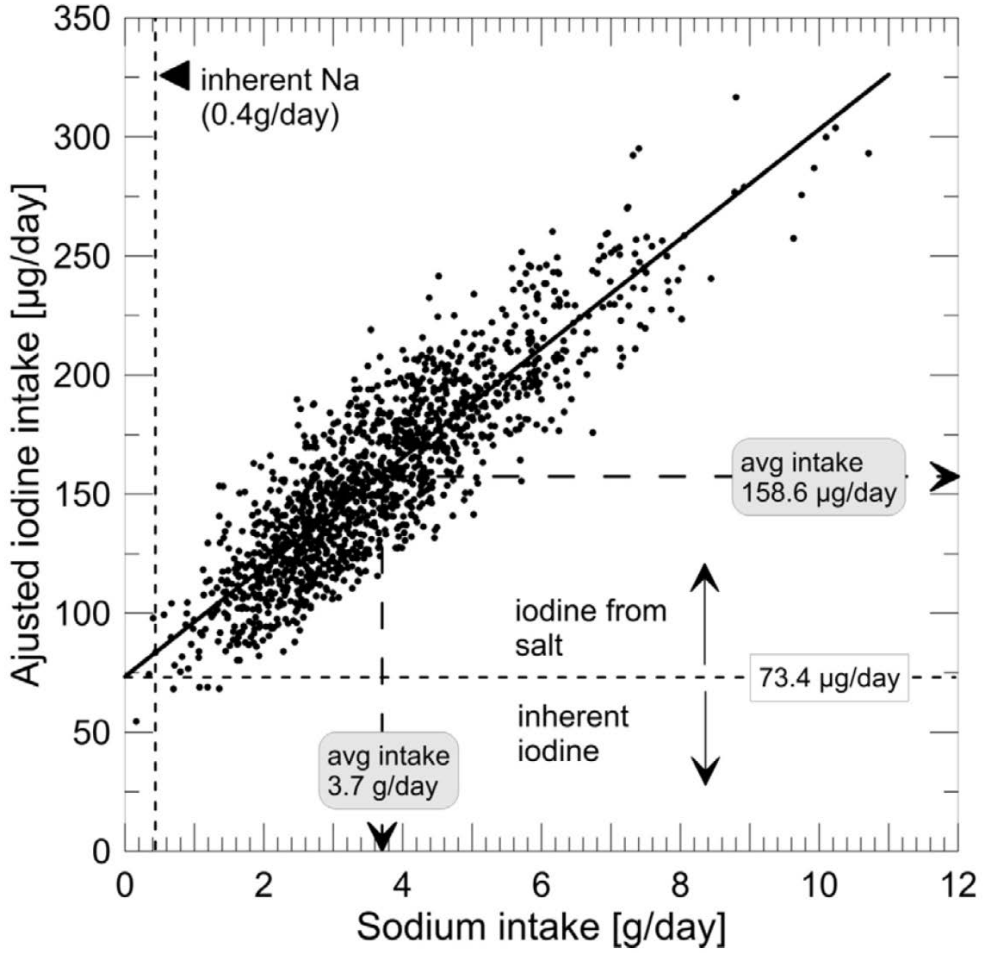
Neal et al. N Engl J Med 2021; 385:1067-1077

Iodisation de sel en Suisse

- In Switzerland, the legal implementation of salt iodization began in1922 with gradual increases:
  - 3.75 mg/kg in 1922
  - 7.5 mg/kg in 1962
  - 15 mg/kg in 1980
  - 20 mg/kg in 1998
  - 25 mg/kg in 2014.
- The Swiss Federal Office of Public health has launched a strategy to reduce dietary salt intake in the general population (2008-2012), extended for 2013-2016.
- This strategy may affect the iodine supply of the population.

Relation entre consommation de sel et de iode dans la population suisse.

In Switzerland, 54% of the dietary iodine intake can be attributed to iodized salt



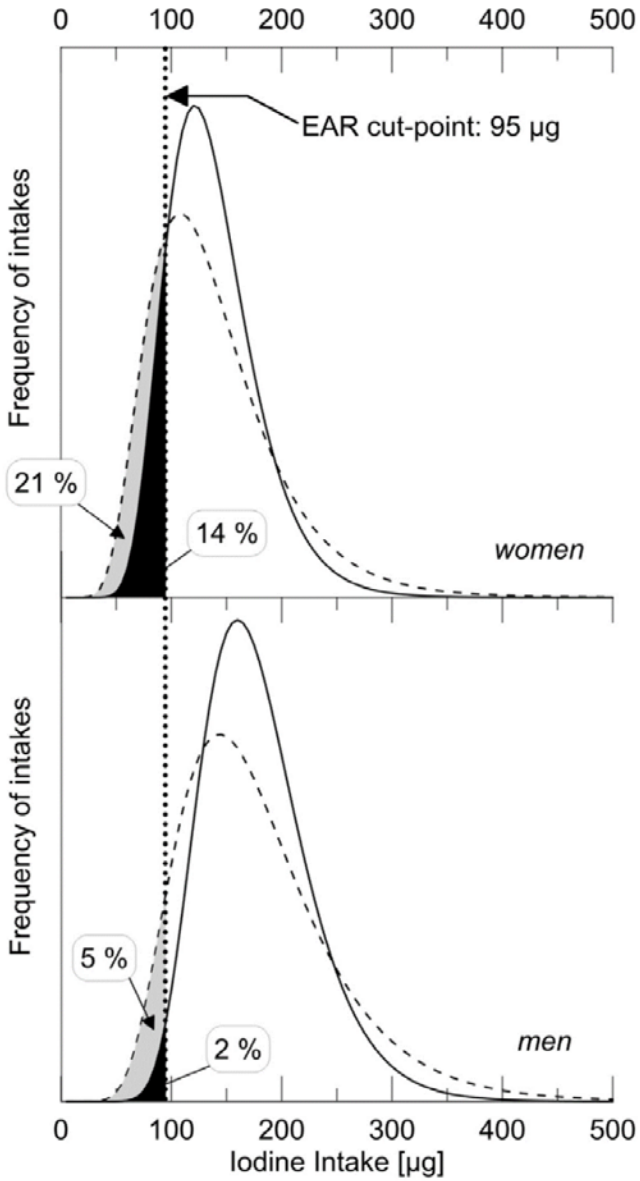
Haldimann et al, Public Health Nutrition, 2015; 18(8), 1333–1342

Estimation de la prévalence d'un apport inadéquat de iode chez les adultes suisses

- 14% des femmes
- 2% des hommes

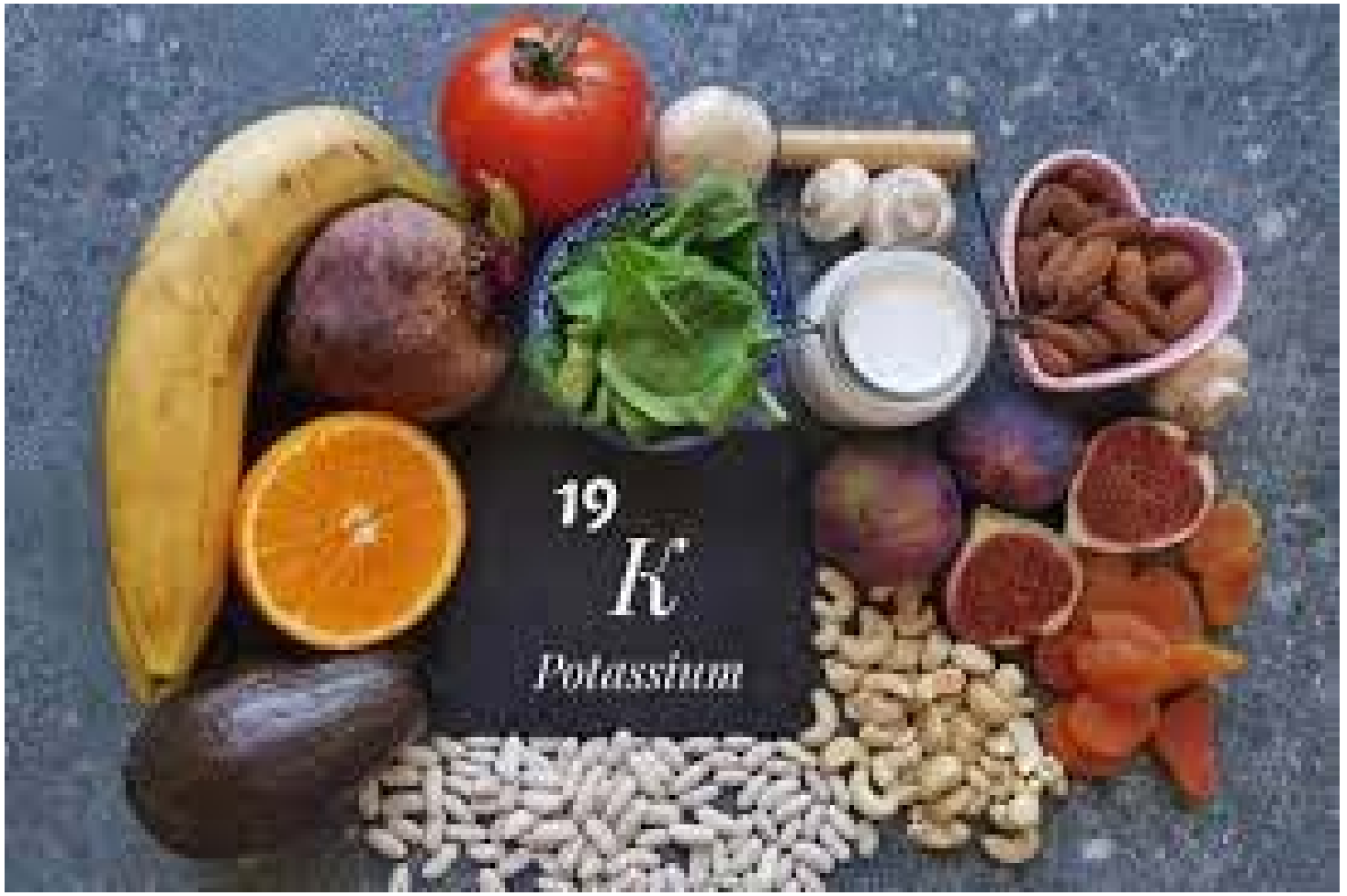
- The usual intake distributions (solid line) of iodine were obtained from single-day intake data (broken line) and adjusted with replicate intake data.

- The fractions below the estimated average intake (EAR) of 95 µg/d correspond to the prevalence of inadequacy.



Haldimann et al, Public Health Nutrition, 2015; 18(8), 1333–1342

2. Potassium



Potassium et pression artérielle
Une vieille histoire revisitée!

Am J Med. 1958 Nov;25(5):713-25.
Experimental epidemiology of chronic sodium chloride toxicity and the protective effect of potassium chloride.
MENEELY GR, BALL CO.

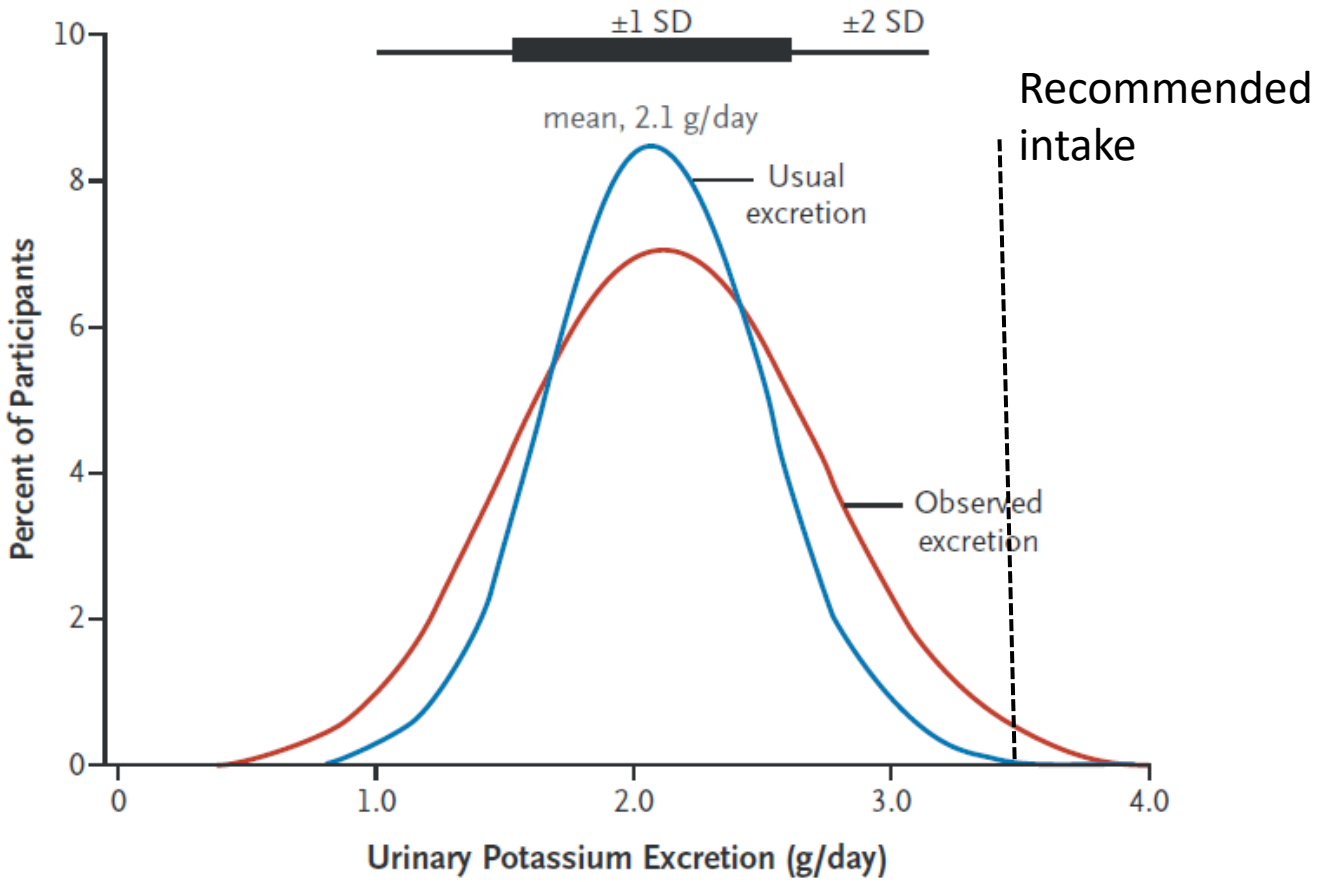
Recommandations de l'OMS pour la consommation de potassium

WHO recommends an increase in potassium intake from food for reduction of blood pressure and risk of cardiovascular disease, stroke and coronary heart disease in adults (*strong recommendation*[1]). WHO suggests a potassium intake of at least **90 mmol/day (3.510 g/day)** for adults (*conditional recommendation*).

The molar ratio of sodium to potassium would be approximately one to one.

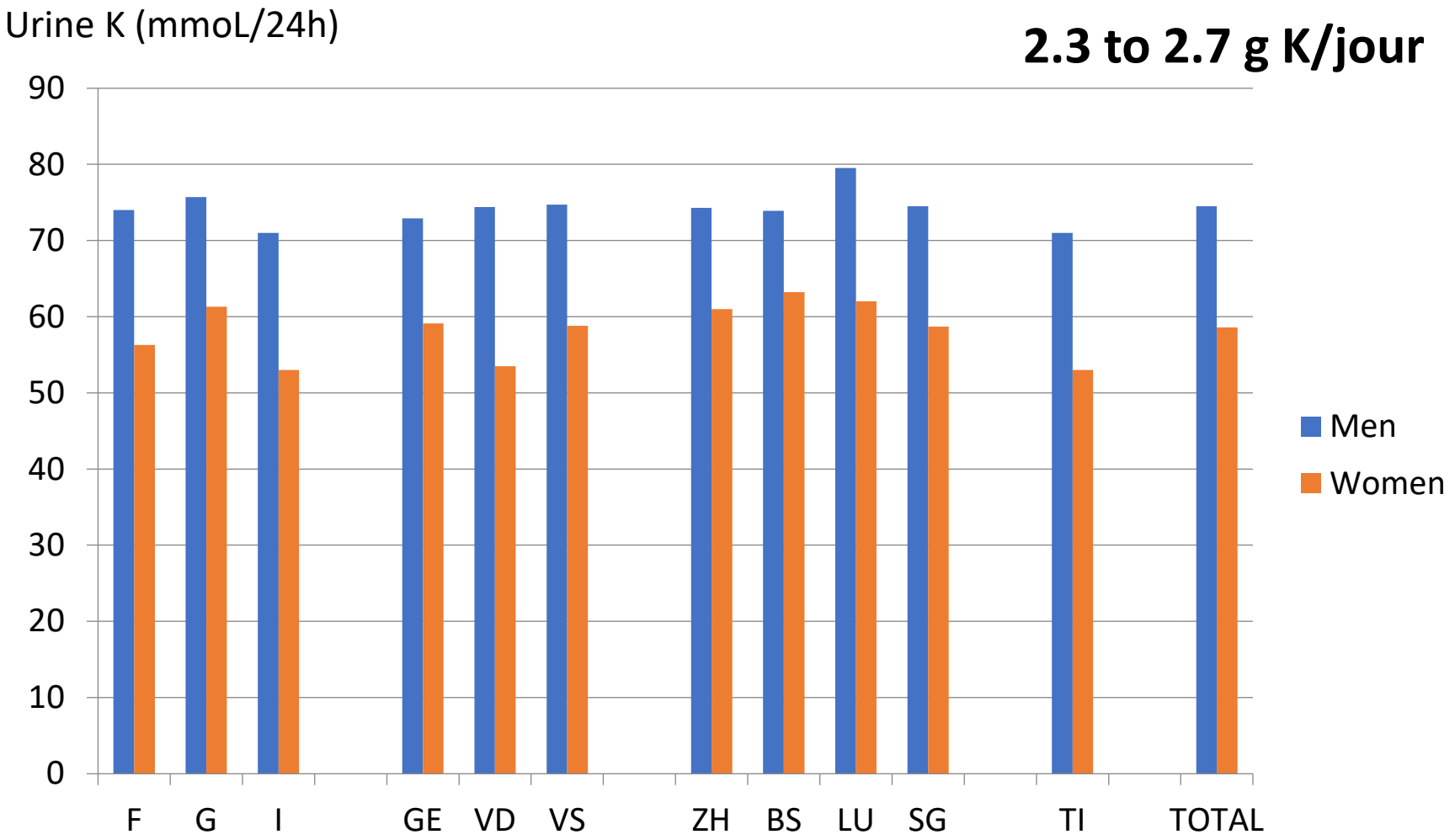
WHO recommendations 2012

Distribution de l'excrétion urinaire de potassium dans l'étude PURE (n=102'216)

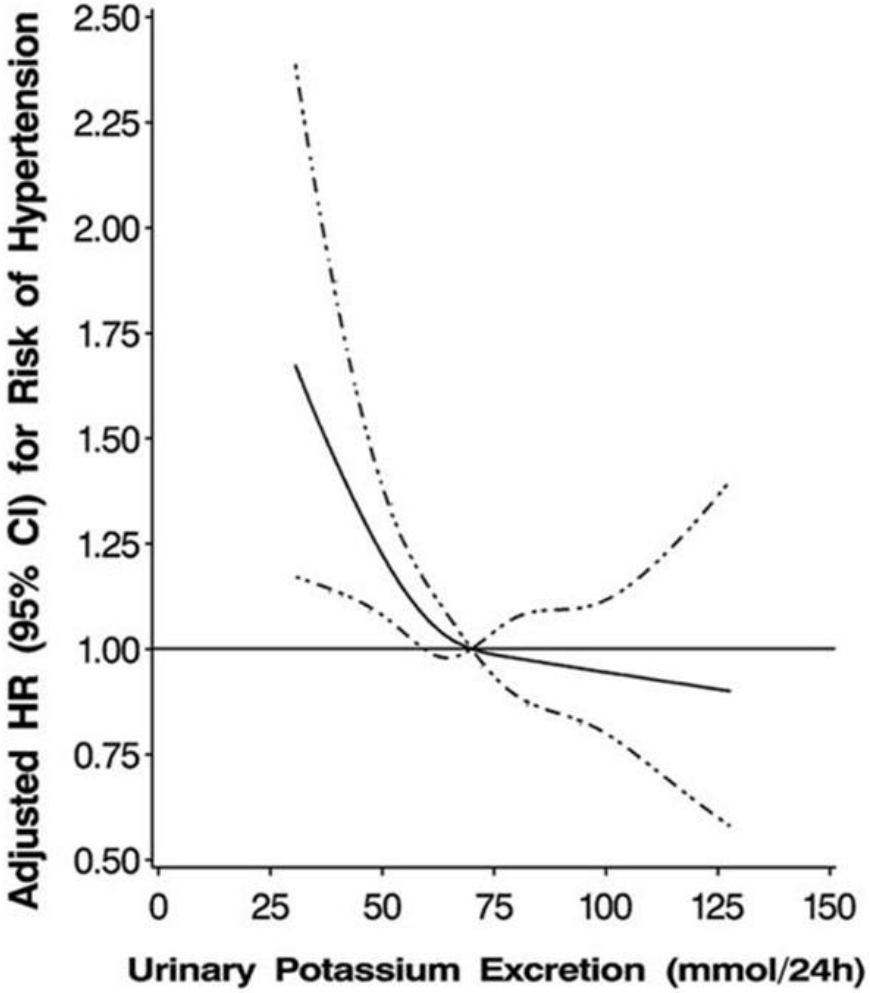


Mente et al, NEJM 2014

Excrétion urinaire de potassium en Suisse: l'étude Suisse sur le Sel (SSS)

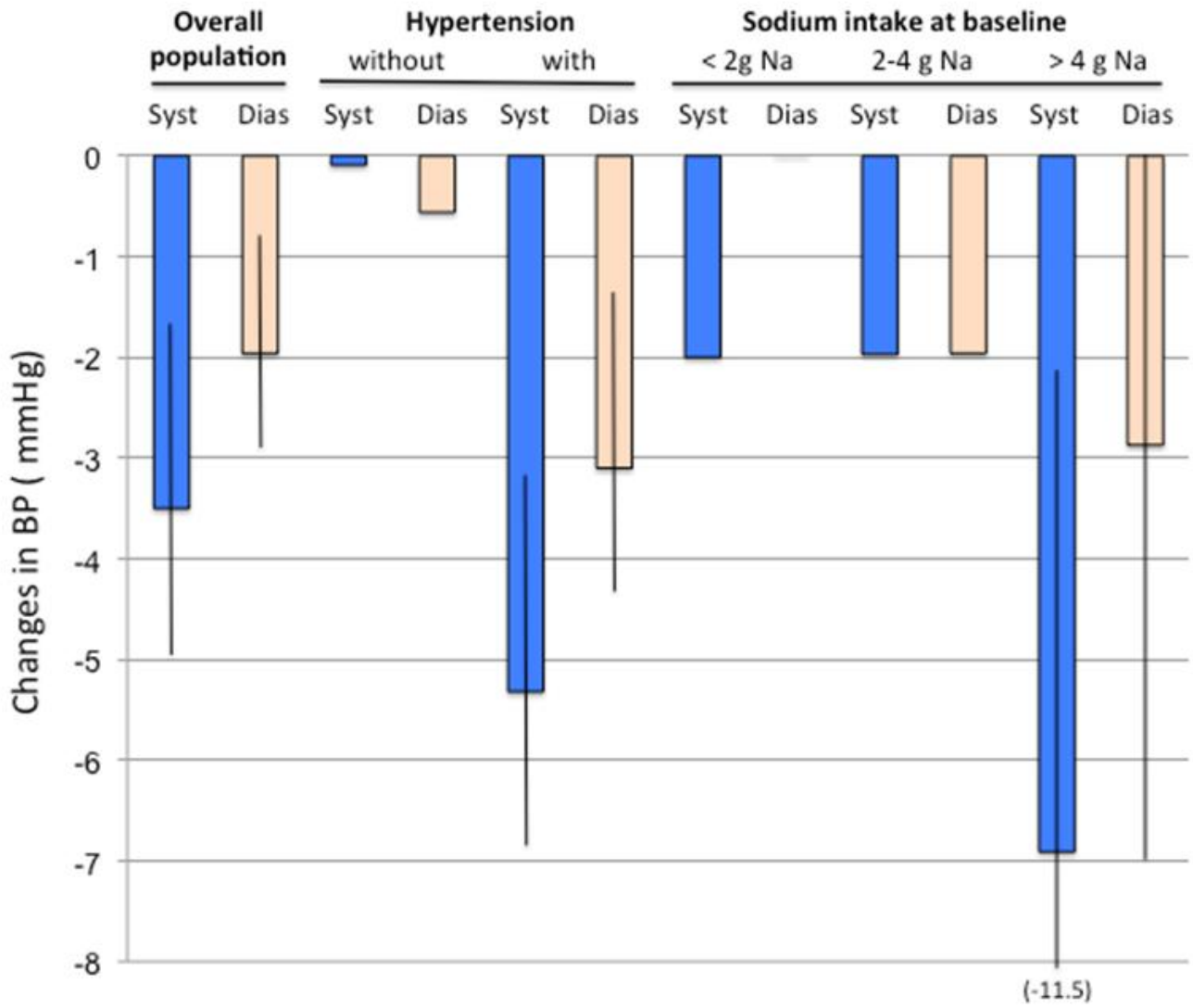


Association entre l'excrétion urinaire de potassium et le risque de développer une hypertension dans l'étude PREVEND (NL)



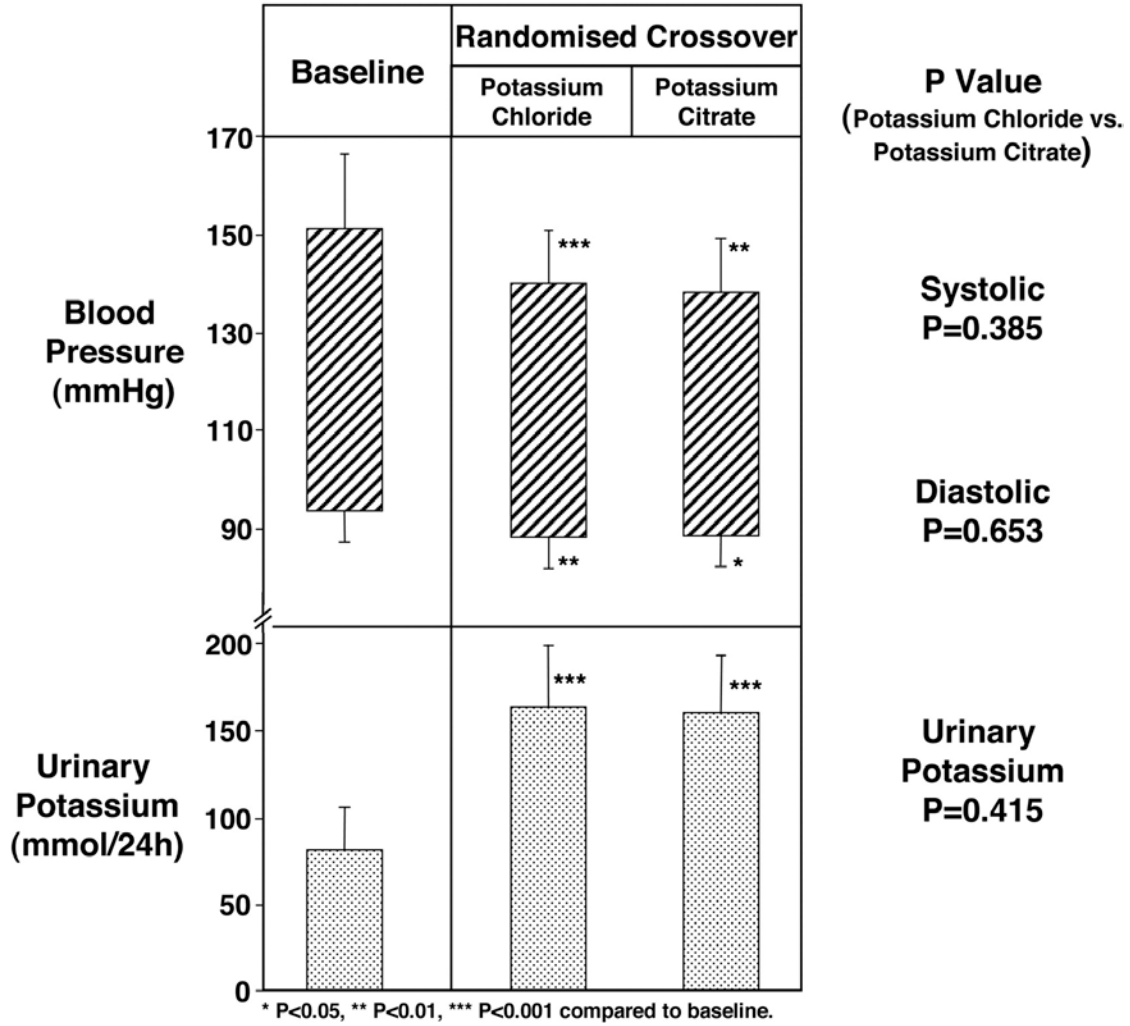
Kieneker et al; Hypertension. 2014;64(4):769-776.

Estimation de l'effet d'une augmentation du potassium sur la pression artérielle chez les adultes par sous-groupes



Aburto et al. BMJ. 2013;346:f1378

Pression artérielle et excrétion urinaire de potassium après 7 jours de KCl ou de citrate de K chez des patients hypertendus



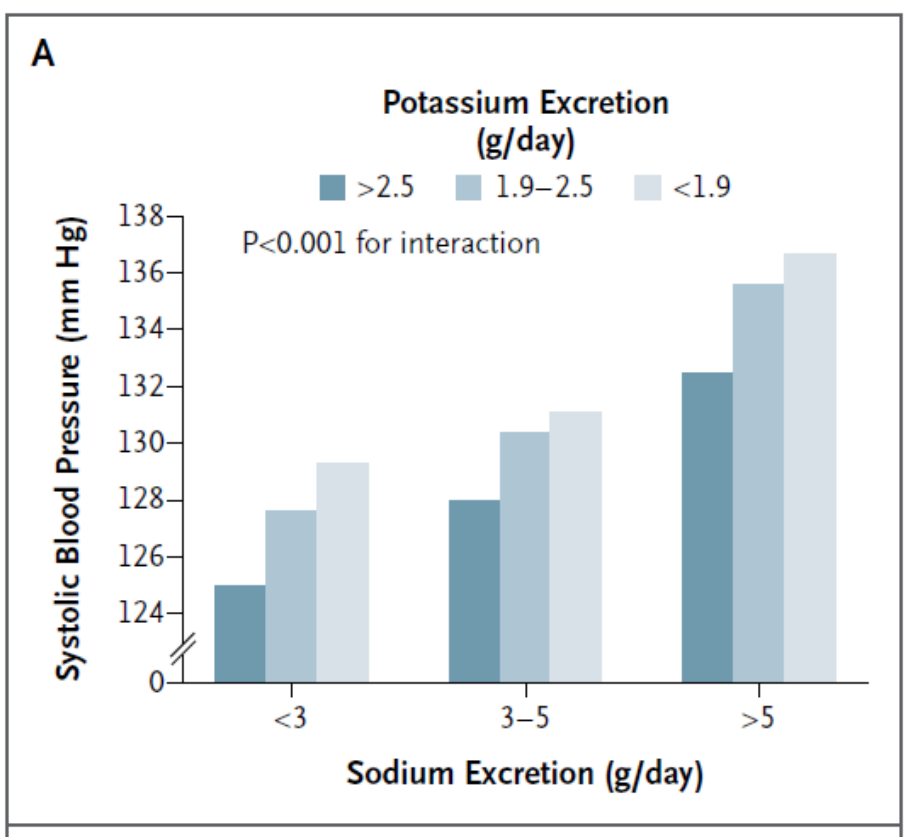
He, F. J. et al. Hypertension 2005;45:571-574

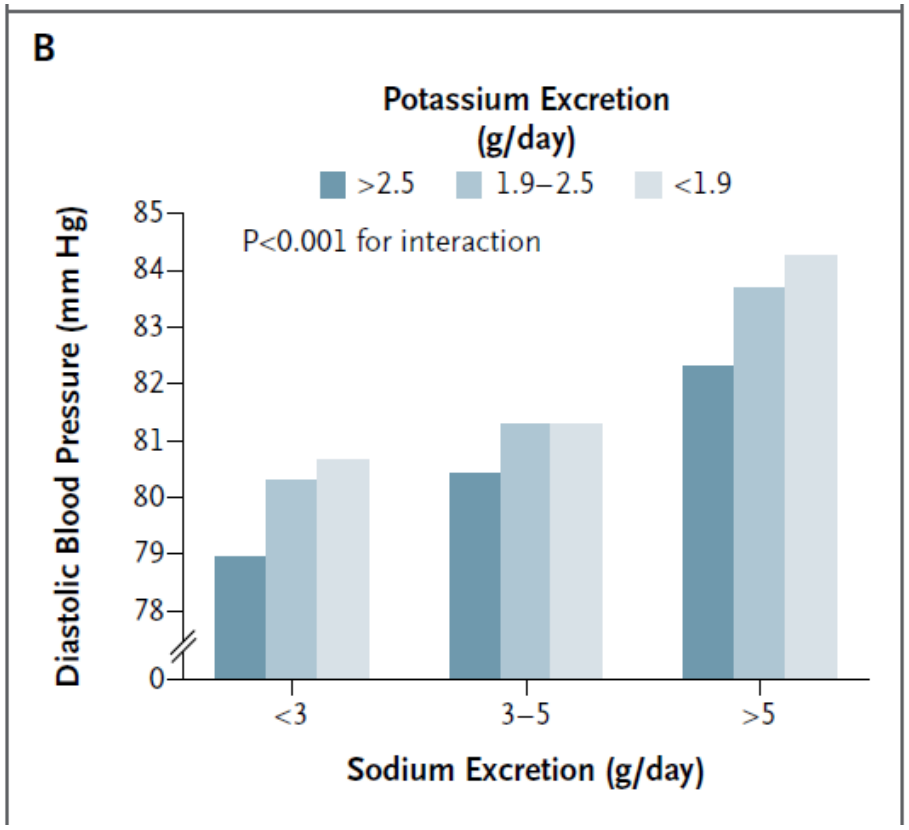
Réponse de la pression artérielle à des changements des apports de potassium: Une analyse des études randomisées

	Sodium	*Potassium*
No. of trials (no. of strata)	40 (47)	27 (30)
Duration (week)[a]	4 (2–156)	6 (2–114)
Age (year)	48 ± 15	45 ± 12
Men (%)	61 ± 23	60 ± 35
Initial body weight (kg)[b]	76 ± 6	75 ± 8
Change in body weight (kg)[a,b]	−0.5 (−3.0 to 4.5)	−0.2 (−1.0 to 1.6)
Initial urinary electrolyte excretion (mmol/24 h)		
Sodium	153 ± 33	157 ± 30
Potassium	66 ± 11	60 ± 11
Change in urinary electrolyte excretion (mmol/24 h)		
Sodium	−91 ± 52[c]	3 ± 16
Potassium	−0.5 ± 5	51 ± 26[d]
Initial blood pressure (mmHg)		
Systolic	144 ± 17	143 ± 21
Diastolic	88 ± 12	89 ± 14
Change in blood pressure (mmHg)		
Systolic	−4.1 ± 4.1	−3.3 ± 4.0
Diastolic	−2.5 ± 2.9	−2.1 ± 3.6

Geleijnse et al , J Human Hypertension, 2003

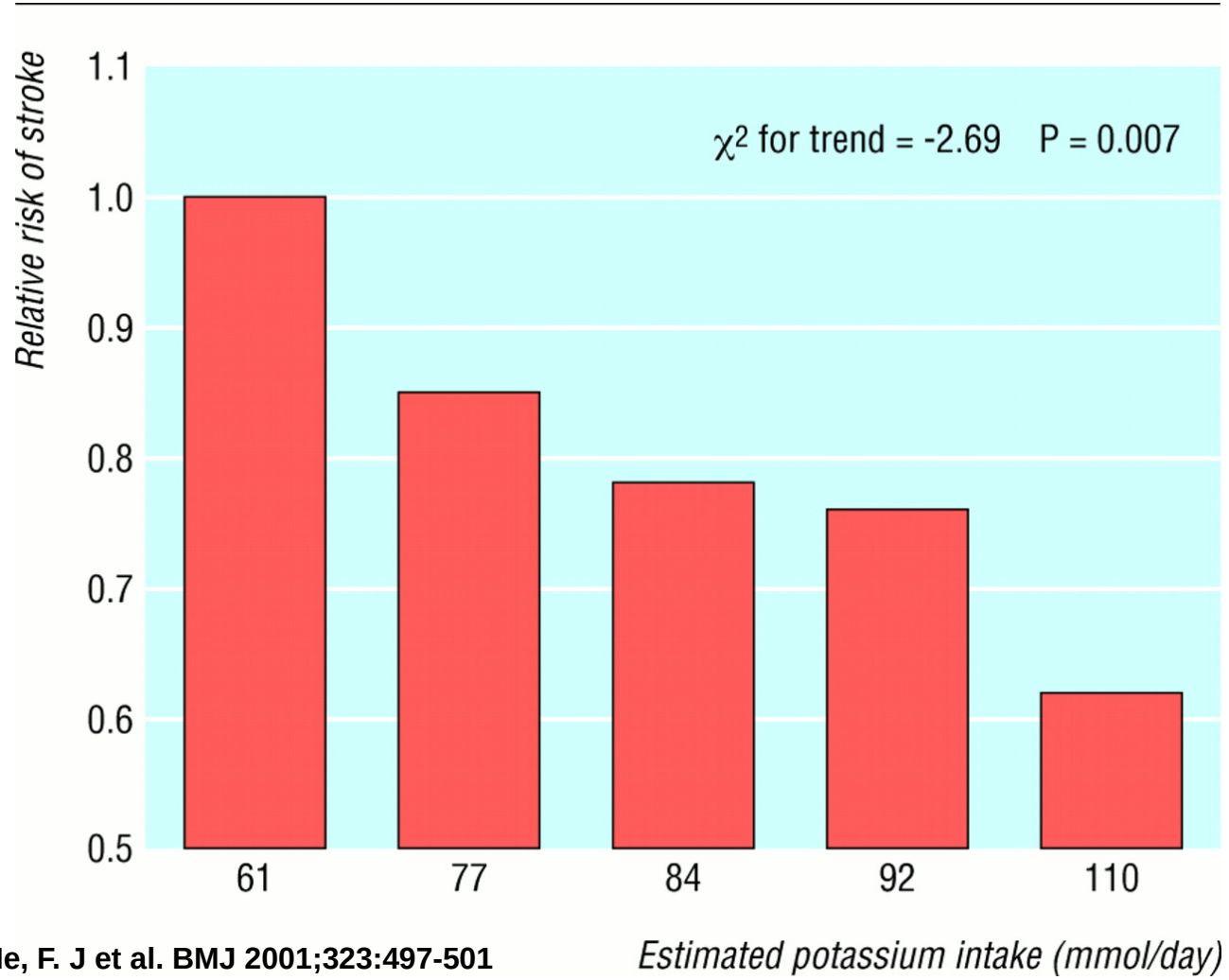
Pression artérielle en fonction de l'excrétion urinaire de sodium et de potassium dans l'étude PURE





Mente et al, NEJM, 2014

Apports de potassium et risque d'accident vasculaire cérébral chez 43'738 hommes âgés de 40 à 75 ans suivis pendant 8 ans.



He, F. J et al. BMJ 2001;323:497-501

bmj.com

Aliments riches en potassium

Cacao en poudre (3800 mg/100 g)

Café en poudre (3700 mg/100 g)

Fruits secs (700-1400 mg/100 g)

Viandes et poissons (env. 400 mg/100 g)

Fruits et légumes (châtaignes, avocat…, bananes..) (env. 400 mg/100 g)

Féculents (pommes de terre) (env. 400 mg/100 g)

Epices (persil, cumin,..) Mais apports faibles

Café et pression artérielle et hypertension

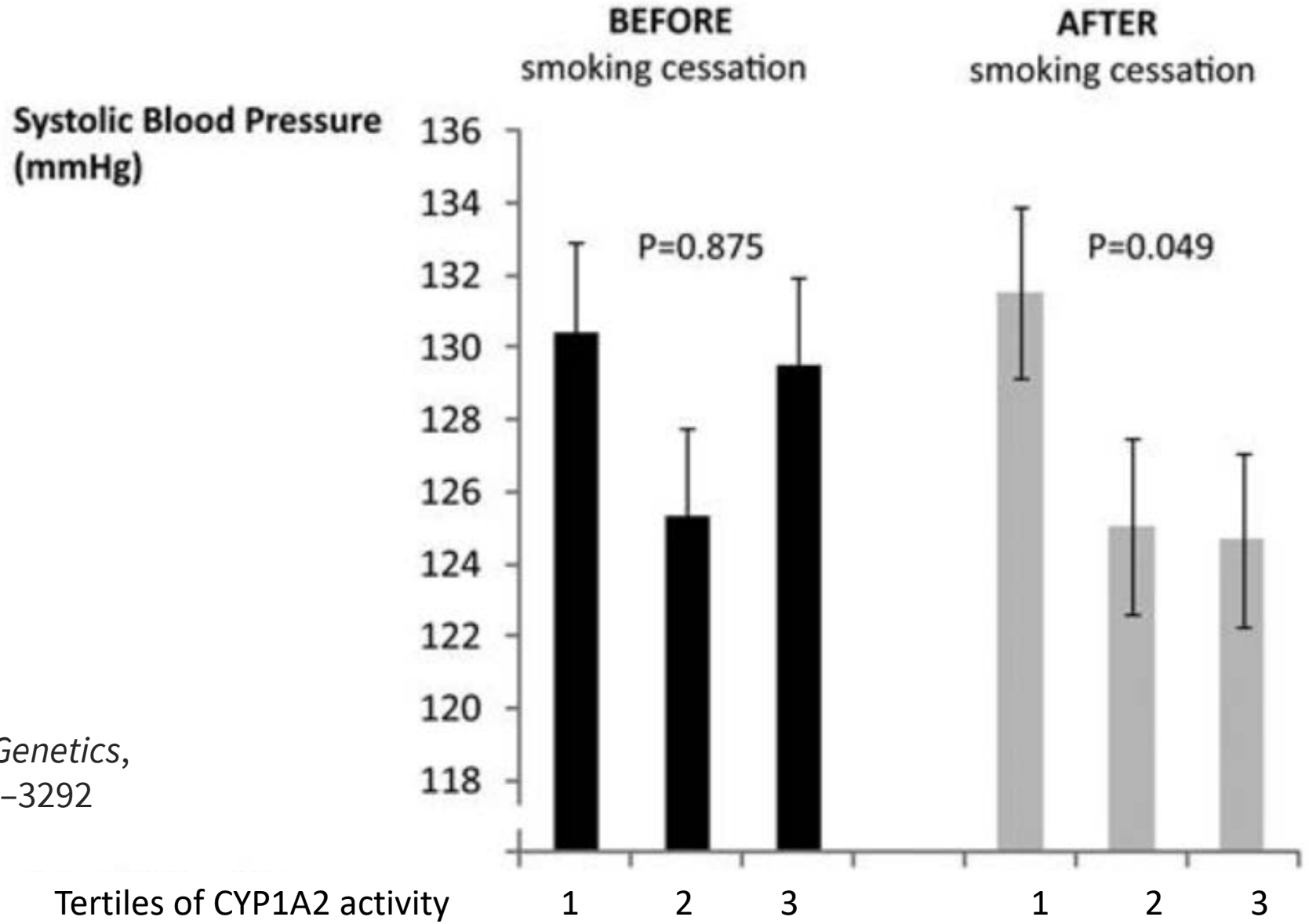
Etudes ayant démontré un effet positif du café sur la pression artérielle

Table 1. Summary of studies investigating the effects of coffee and caffeine on blood pressure and prevalence of hypertension.

Author	Substance	Dose	Population	Outcome
Nurminen et al. Eur J Clin Nutr, 1999	Caffeine	200–250 mg/ single dose	Normotensive	SBP/DBP: −3-14/−4-13 mmHg
Jee et al. [9], Hypertension, 1999	Coffee	Various doses	Metanalysis	SBP/DBP: −2.4/1.2 mmHg
Klag et al. Arch Int Med 2022 [10]	Coffee	Various doses	Habitual drinkers vs. non drinkers	New onset HTN: 28.8% vs. 18.8%
Lane et al. Psychosom Med 2002 [11]	Caffeine	500 mg vs. placebo	Global population	Mean BP: −3-4 mmHg
Steffen et al. J Hypertens, 2012	Coffee	Various doses	Metanalysis (mix)	No excess in prevalence HTN
Xie et al. J Hum Hypertens 2018	Coffee	Various doses	Metanalysis (mix)	2% reduction of HTN/cup /day
Zhang et al. Am J Clin Nutr 2011	Coffee	$\geq$ 4 cups/day	Global population	No excess in prevalence HTN
Winkelmayer et al. JAMA 2011	Coffee	1–6 cups/day	Women (NHS)	No excess in prevalence HTN
Guessous M et al. Hypertension 2015	Caffeine	Various doses	Global population	Potential protective effects of caffeine on BP

Claudio Borghi (2022) Coffee and blood pressure: exciting news!,
Blood Pressure, 31:1, 284-287

High caffeine intake protect non-smokers from hypertension depending on genetics



Guessous et al
Human Molecular Genetics,
2012; 21 (14): 3283–3292

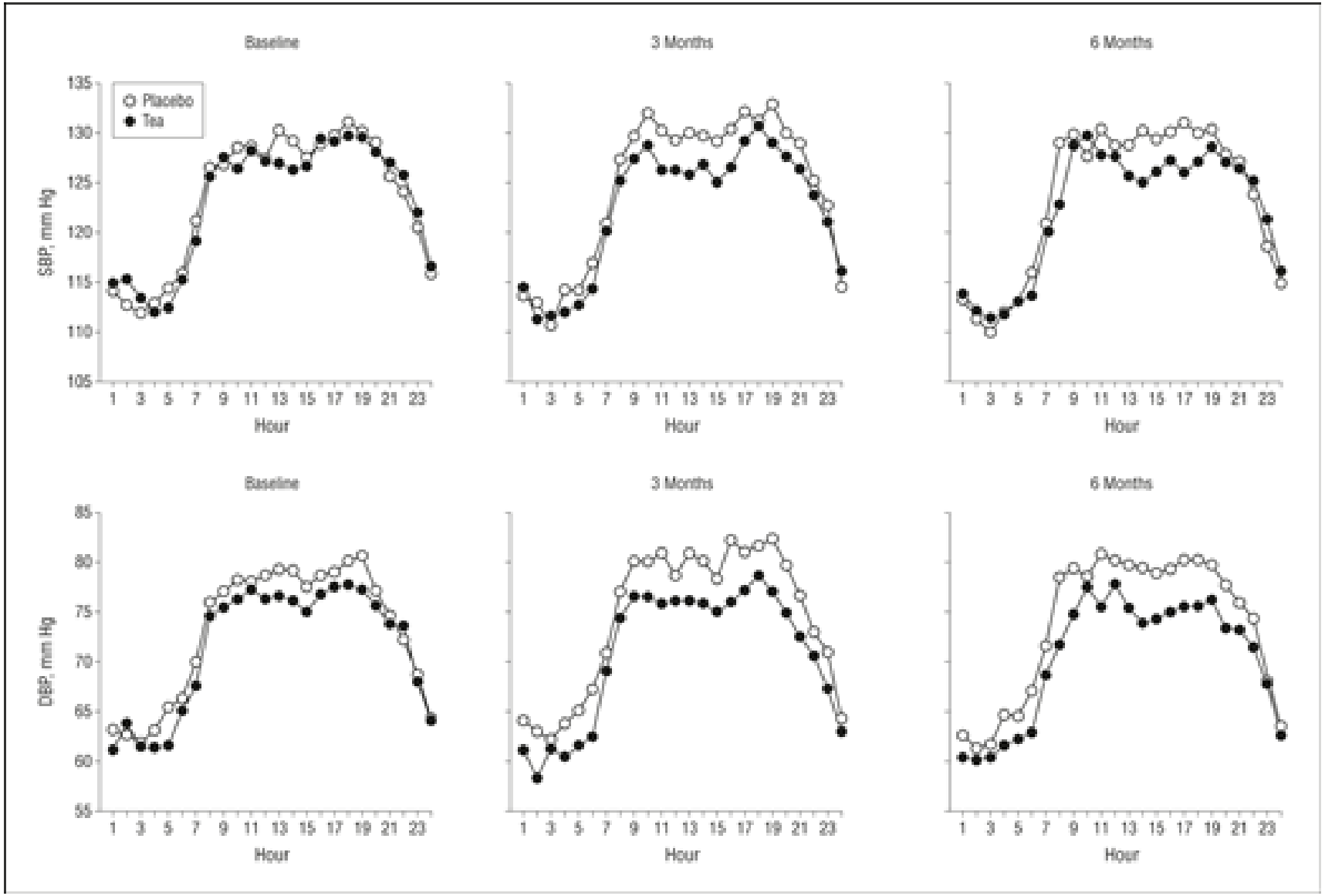
Recommandations pour la consommation de café

Moderate regular coffee consumption (3-4 cups per day) does not adversely affect BP and the cardiovascular system and can be moderately beneficial.

ISH. J Hypertension 2023, September

Et le thé ?

3 tasses de
thé noir par jour
pendant 6 mois
versus placebo



Arch Intern Med. 2012;172(2):186-188.

Chocolat et pression artérielle

Mineral content of cocoa beans

Low Na **High K**

Pod storage (days)	Fermentation condition	Mineral content (mg/100 g)							
		Fe	Cu	Mg	Zn	Na	Ca	P	K
0	Unfermented	2.7±0.04	11.1±0.03	286.8±3.19	9.7±0.06	3.4±0.01	140.2±0.60	236.6±23.08	2313.1±6.04
	Fermented	2.2±0.02	8.8±0.01	364.2±1.82	10.6±0.07	2.5±0.16	170.8±0.74	195.8±0.02	2557.9±11.01
7	Unfermented	2.5±0.02	11.5±0.13	318.6±7.27	9.3±0.06	2.5±0.04	141.1±0.60	264.4±184.62	2325.4±12.3
	Fermented	1.8±0.01	13.2±0.05	262.7±3.68	8.2±0.01	3.0±0.01	143.5±0.08	210.5±23.08	2164.2±10.26
14	Unfermented	2.2±0.02	13.7±0.02	331.5±6.89	9.3±0.05	3.3±0.08	158.2±0.38	292.1±23.08	2433.7±16.23
	Fermented	1.5±0.03	15.5±0.06	271.3±1.16	7.5±0.02	2.6±0.06	150.3±0.68	203.9±23.08	2095.6±6.98
21	Unfermented	1.4±0.01	15.3±0.12	349.2±2.98	9.4±0.25	2.7±0.04	142.8±0.07	381.9±46.16	2318.7±3.62
	Fermented	1.2±0.02	17.3±0.07	322.3±5.59	15.6±0.52	2.0±0.06	148.5±0.41	355.7±00	2070.7±5.71

Results presented are mean values of triplicate analysis±standard deviation

Afoakwa, J Food Tech Science, 2013

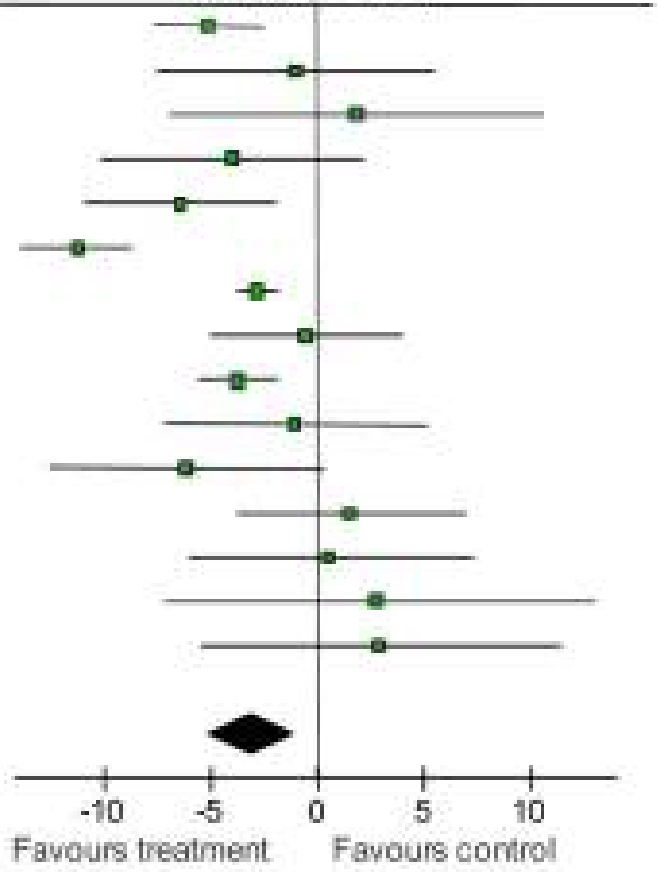
Est-ce que le chocolat fait baisser la pression? Une meta-analysis.

A) SBP all studies

	Treatment			Control				Mean Difference	Mean Difference
Study	N	ΔSBP	SD	N	ΔSBP	SD	Weight	Random, 95% CI	Random, 95% CI
Taubert 03	13	-4.7	3.28	13	0.4	3.28	10.1%	-5.10 [-7.62, -2.58]	
Murphy 03	13	2	10.04	15	3	6.86	5.1%	-1.00 [-7.47, 5.47]	
Engler 04	11	-1	13.18	10	-2.8	6.5	3.4%	1.80 [-6.97, 10.57]	
Fraga 05	14	-6	8.23	14	-2	8.23	5.5%	-4.00 [-10.10, 2.10]	
Grassi 05a	15	-7	6.29	15	-0.5	6.21	7.3%	-6.50 [-10.97, -2.03]	
Grassi 05b	20	-12	4.28	20	-0.7	4.07	10.0%	-11.30 [-13.89, -8.71]	
Taubert 07	22	-2.9	1.6	22	-0.1	1.6	11.9%	-2.80 [-3.75, -1.85]	
Crews 08	45	-3.6	10.81	45	-3.1	10.88	7.3%	-0.50 [-4.98, 3.98]	
Grassi 08	19	-3.8	3.01	19	-0.1	2.76	11.0%	-3.70 [-5.54, -1.86]	
Muniyappa 08	20	-2	9.84	20	-1	9.84	5.5%	-1.00 [-7.10, 5.10]	
Davison 08a	12	-1.9	6.85	11	4.2	8.62	5.2%	-6.10 [-12.50, 0.30]	
Davison 08b	13	1.1	5.31	13	-0.5	8.29	6.3%	1.60 [-3.75, 6.95]	
Shiina 09	20	4.6	10.16	19	4	11	5.0%	0.60 [-6.06, 7.26]	
Ried 09a	11	-2	9.71	10	-4.9	13.42	2.8%	2.90 [-7.20, 13.00]	
Monagas 09	42	0	19.14	42	-3	20.08	3.7%	3.00 [-5.39, 11.39]	
Total (95% CI)	290			288			100.0%	-3.16 [-5.08, -1.23]	

Heterogeneity: Tau² = 7.86; Chi² = 54.06, df = 14 (P < 0.00001); I² = 74%

Test for overall effect: Z = 3.22 (P = 0.001)



Ried K, et al. BMC Med. 2010 Jun 28;8:39.

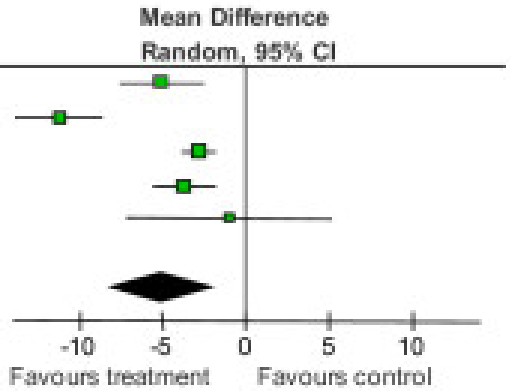
Est-ce que le chocolat fait baisser la pression? Une meta-analysis.

A) SBP hypertensive subgroup (≥ 140 mm Hg)

Study	Treatment N	Treatment ΔSBP	Treatment SD	Control N	Control ΔSBP	Control SD	Weight	Mean Difference Random, 95% CI
Taubert 03	13	-4.7	3.28	13	0.4	3.28	20.9%	-5.10 [-7.62, -2.58]
Grassi 05b	20	-12	4.28	20	-0.7	4.07	20.7%	-11.30 [-13.89, -8.71]
Taubert 07	22	-2.9	1.6	22	-0.1	1.6	23.9%	-2.80 [-3.75, -1.85]
Grassi 08	19	-3.8	3.01	19	-0.1	2.76	22.4%	-3.70 [-5.54, -1.86]
Muniyappa 08	20	-2	9.84	20	-1	9.84	12.1%	-1.00 [-7.10, 5.10]
Total (95% CI)	94			94			100.0%	-5.02 [-7.99, -2.05]

Heterogeneity: $Tau^2 = 9.36$; $Chi^2 = 38.37$, df = 4 ($P < 0.00001$); $I^2 = 90\%$

Test for overall effect: $Z = 3.31$ ($P = 0.0009$)

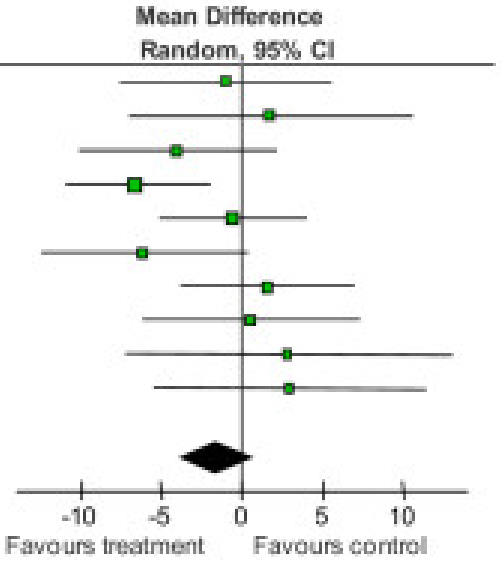


B) SBP normotensive subgroup (< 140 mm Hg)

Study	Treatment N	Treatment ΔSBP	Treatment SD	Control N	Control ΔSBP	Control SD	Weight	Mean Difference Random, 95% CI
Murphy 03	13	2	10.04	15	3	6.86	9.5%	-1.00 [-7.47, 5.47]
Engler 04	11	-1	13.18	10	-2.8	6.5	5.7%	1.80 [-6.97, 10.57]
Fraga 05	14	-6	8.23	14	-2	8.23	10.4%	-4.00 [-10.10, 2.10]
Grassi 05a	15	-7	6.29	15	-0.5	6.21	16.2%	-6.50 [-10.97, -2.03]
Crews 08	45	-3.6	10.81	45	-3.1	10.88	16.1%	-0.53 [-5.01, 3.95]
Davison 08a	12	-1.9	6.85	11	4.2	8.62	9.7%	-6.10 [-12.50, 0.30]
Davison 08b	13	1.1	5.31	13	-0.5	8.29	12.7%	1.60 [-3.75, 6.95]
Shiina 09	20	4.6	10.16	19	4	11	9.1%	0.60 [-6.06, 7.26]
Ried 09a	11	-2	9.71	10	-4.9	13.42	4.4%	2.90 [-7.20, 13.00]
Monagas 09	42	0	19.14	42	-3	20.08	6.2%	3.00 [-5.39, 11.39]
Total (95% CI)	196			194			100.0%	-1.56 [-3.81, 0.68]

Heterogeneity: $Tau^2 = 2.90$; $Chi^2 = 11.62$, df = 9 ($P = 0.24$); $I^2 = 23\%$

Test for overall effect: $Z = 1.37$ ($P = 0.17$)



Ried K, et al. BMC Med. 2010 Jun 28;8:39.

Autre nutriments à considérer

1. L’ail : données souvent insuffisantes. Effet + possible sur la TA

2. Fibres: recommandations = manger environ 30%/j

3. L’alcool : recommandations
   a) Alcohol consumption should be zero for the best cardiovascular outcome.
   However, the recommended daily upper limit for alcohol consumption is two standard drinks for men and 1 for women (10 g alcohol/standard drink).
   b) Binge drinking should be avoided.

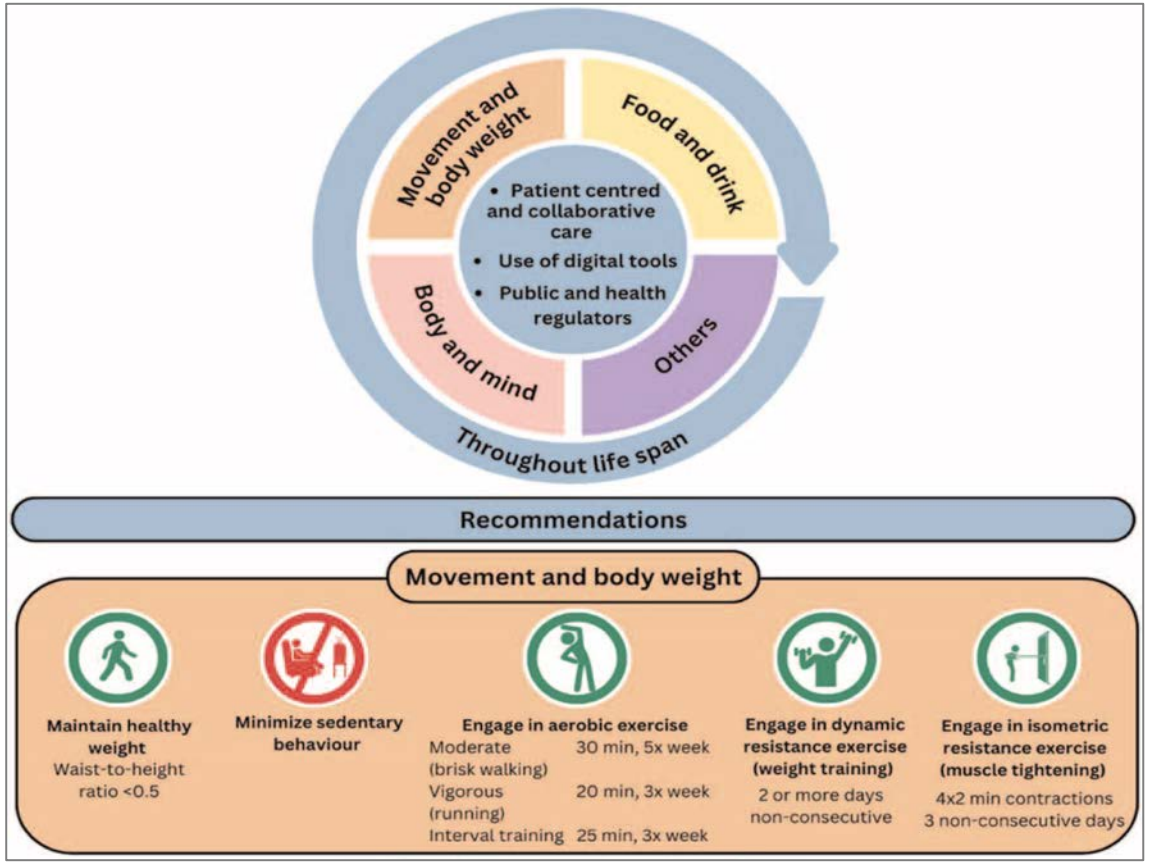
4. Magnésium

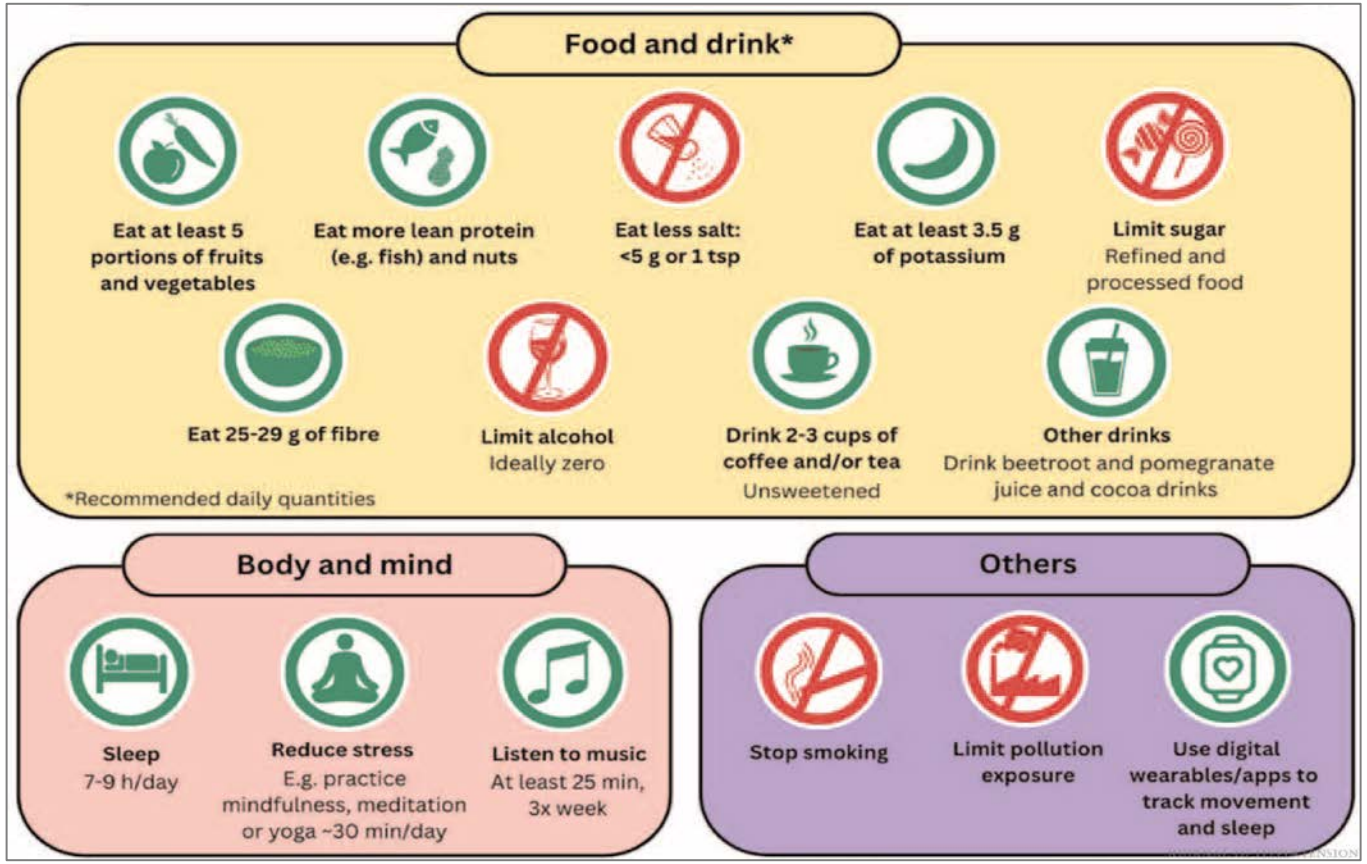
5. Vitamines

Régime méditerranéen

Lifestyle management of hypertension: International Society of Hypertension position

Endorsed by: World Hypertension League and European Society of Hypertension





Charchar, Fadi J et al. Journal of Hypertension, September 13, 2023