



PAŃSTWOWA WYŻSZA  
SZKOŁA ZAWODOWA  
IM. PREZYDENTA  
STANISŁAWA WOJCIECHOWSKIEGO  
W KALISZU



# Alcohol and Heart

*Zbigniew Gaciong*



Katedra i Klinika Chorób Wewnętrznych, Nadciśnienia  
Tętniczego i Angiologii  
Warszawski Uniwersytet Medyczny



Hypertension  
Excellence Center

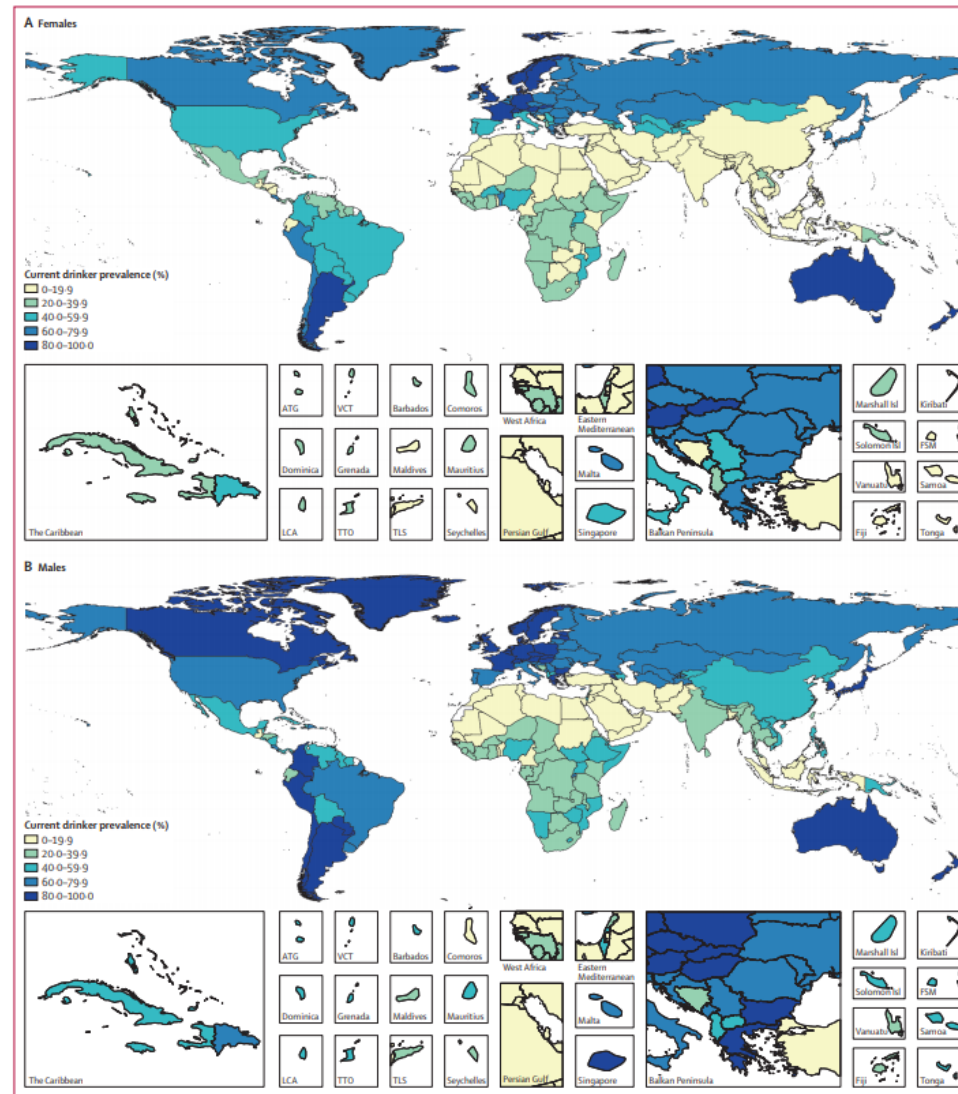
*Zbigniew Gaciong*, Department of Internal Medicine, Hypertension and Vascular Diseases  
Medical University of Warsaw

## **Declaration of interest**



# Prevalence of current drinking in World

*Global Burden of Disease Study 2016*



GBD 2016 Alcohol Collaborators. Alcohol use and burden for 195 countries and territories, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018; 392:1015-1035

DO YOU THINK THAT DRINKING MODERATE  
AMOUNTS OF RED WINE PROLONGS LIFE AND  
PROTECTS YOUR HEART?

# Risk factors for premature death

## *Global Burden of Disease Study*

1990		2010	
Mean rank (95% UI)	Risk factor	Risk factor	Mean rank (95% UI)
1.1 (1-2)	1 Childhood underweight	1 High blood pressure	1.1 (1-2)
2.1 (1-4)	2 Household air pollution	2 Smoking (excluding SHS)	1.9 (1-2)
2.9 (2-4)	3 Smoking (excluding SHS)	3 Alcohol use	3.0 (2-4)
4.0 (3-5)	4 High blood pressure	4 Household air pollution	4.7 (3-7)
5.4 (3-8)	5 Suboptimal breastfeeding	5 Low fruit	5.0 (4-8)
5.6 (5-6)	6 Alcohol use	6 High body-mass index	6.1 (4-8)
7.4 (6-8)	7 Ambient PM pollution	7 High fasting plasma glucose	6.6 (5-8)
7.4 (6-8)	8 Low fruit	8 Childhood underweight	8.5 (6-11)
9.7 (9-12)	9 High fasting plasma glucose	9 Ambient PM pollution	8.9 (7-11)
10.9 (9-14)	10 High body-mass index	10 Physical inactivity	9.9 (8-12)
11.1 (9-15)	11 Iron deficiency	11 High sodium	11.2 (8-15)
12.3 (9-17)	12 High sodium	12 Low nuts and seeds	12.9 (11-17)
13.9 (10-19)	13 Low nuts and seeds	13 Iron deficiency	13.5 (11-17)
14.1 (11-17)	14 High total cholesterol	14 Suboptimal breastfeeding	13.8 (10-18)

*A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012; 380: 2224–60*

# Is drinking good for your heart?

- Epidemiological evidence on cardiovascular effects of drinking
- Mechanism of „protective” effect of alcohol
- Recommendations

## **Standard drink**

United States (US): 14 to 15 g alcohol (0.5 to 0.6 fl oz),

Great Britain: 8 g alcohol

Japan: 19.75 g alcohol

## **Moderate drinking:** low risk for alcohol problems

Women: <2 drinks per day

Men: <3 drinks per day

People age  $\geq 65$ : < 2 drinks per day

## **Heavy drinking:** at risk for alcohol problems

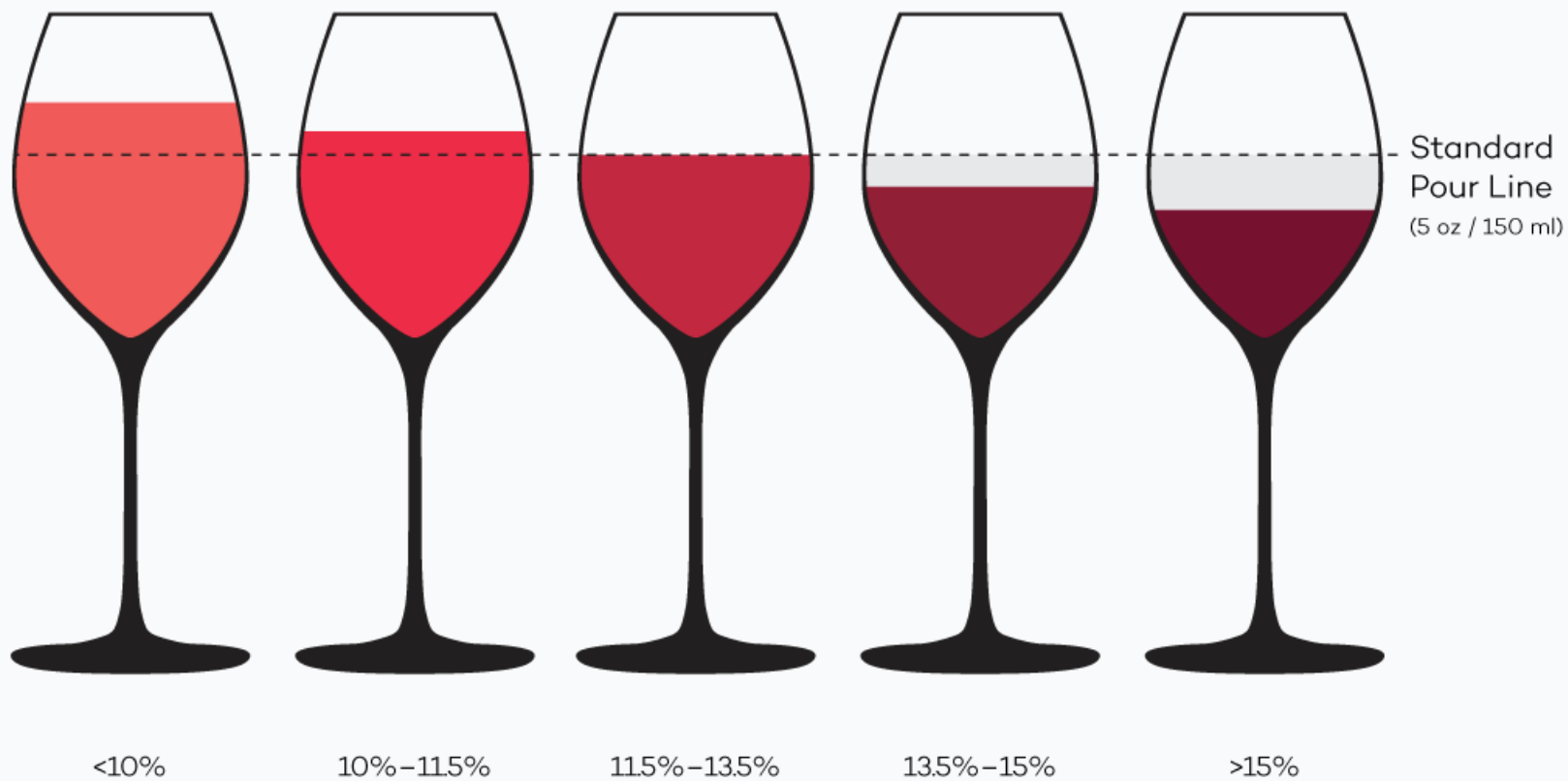
Women: >7 drinks per week or 3 drinks per occasion

Men: >14 drinks per week or 4 drinks per occasion

## **Binge drinking:**

Women: 4 or more drinks in a row

Men: 5 or more drinks in a row



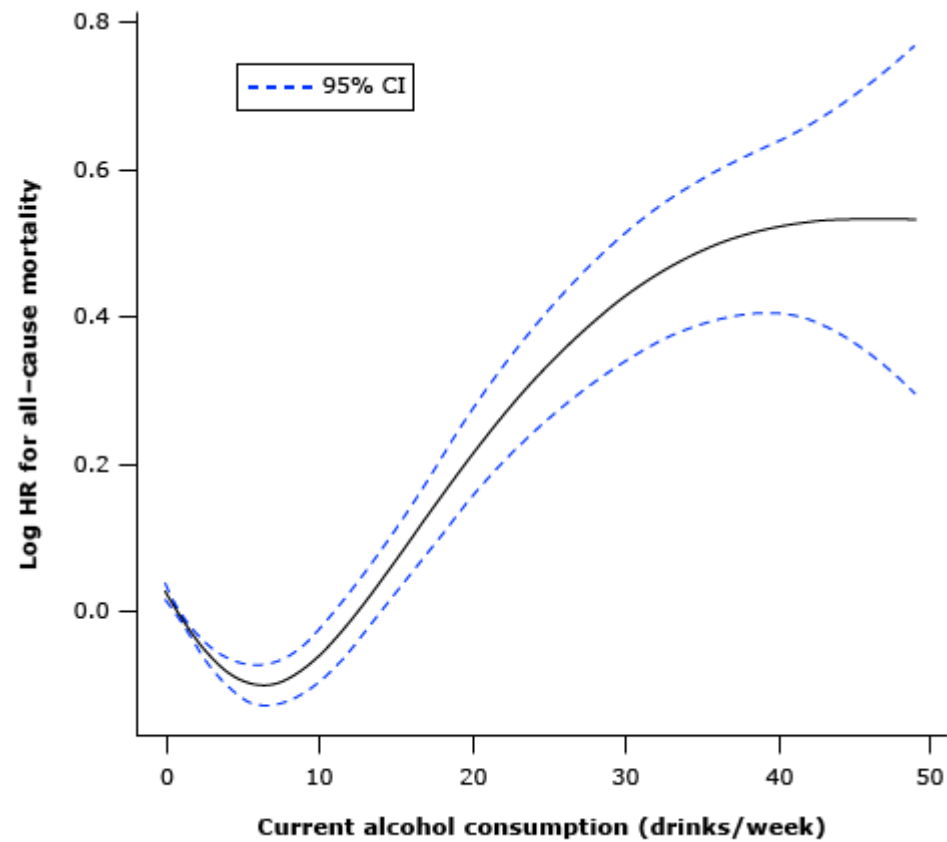
# WINE SERVING SIZE

Based on Alcohol Content



# Alcohol consumption and all-cause mortality

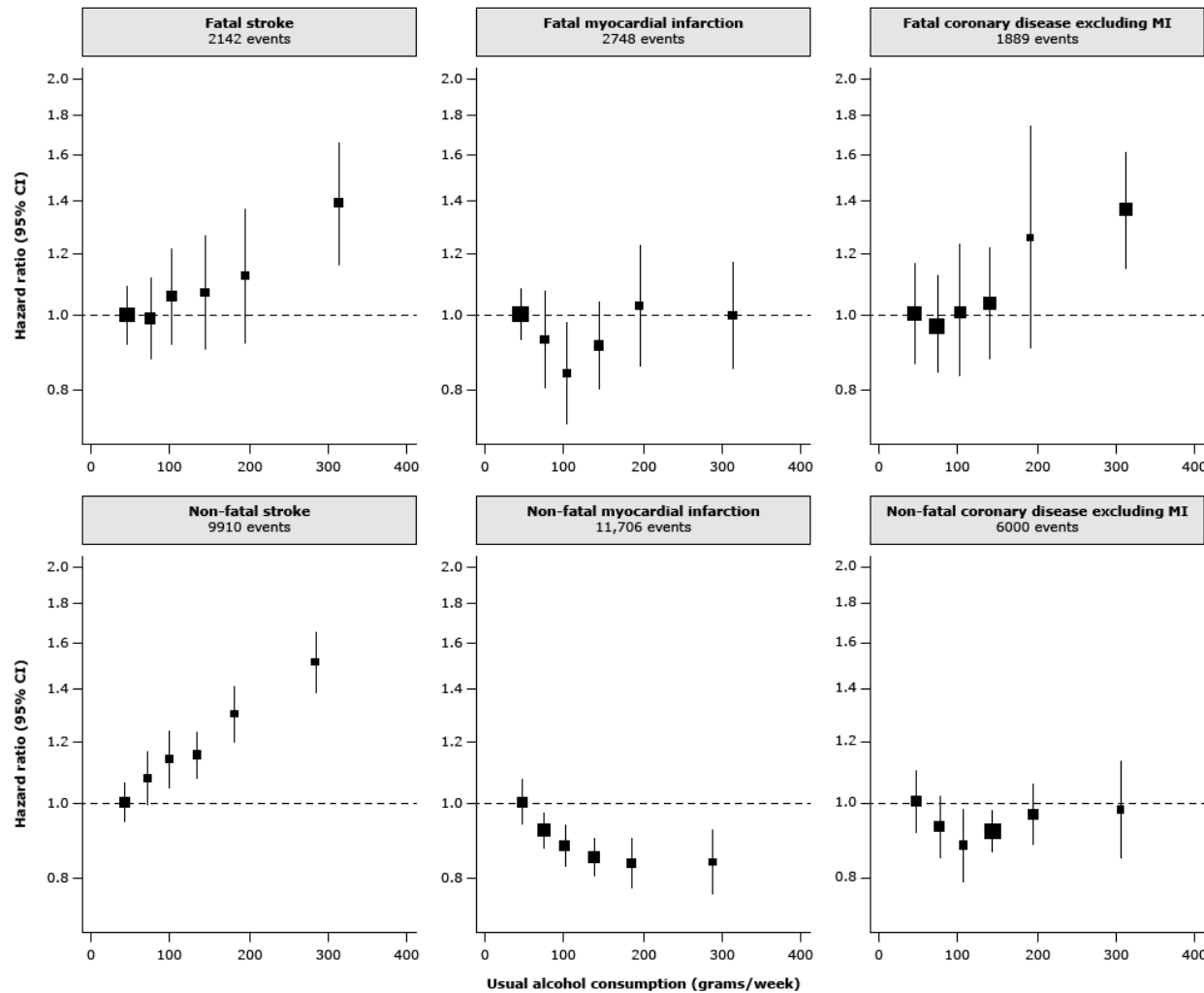
*National Health Interview Surveys (n= 333,247)*



*Xi B, Veeranki SP, Zhao M, et al. Relationship of Alcohol Consumption to All-Cause, Cardiovascular, and Cancer-Related Mortality in U.S. Adults. J Am Coll Cardiol 2017; 70:913*

# Associations of usual alcohol consumption with fatal and non-fatal myocardial infarction and stroke

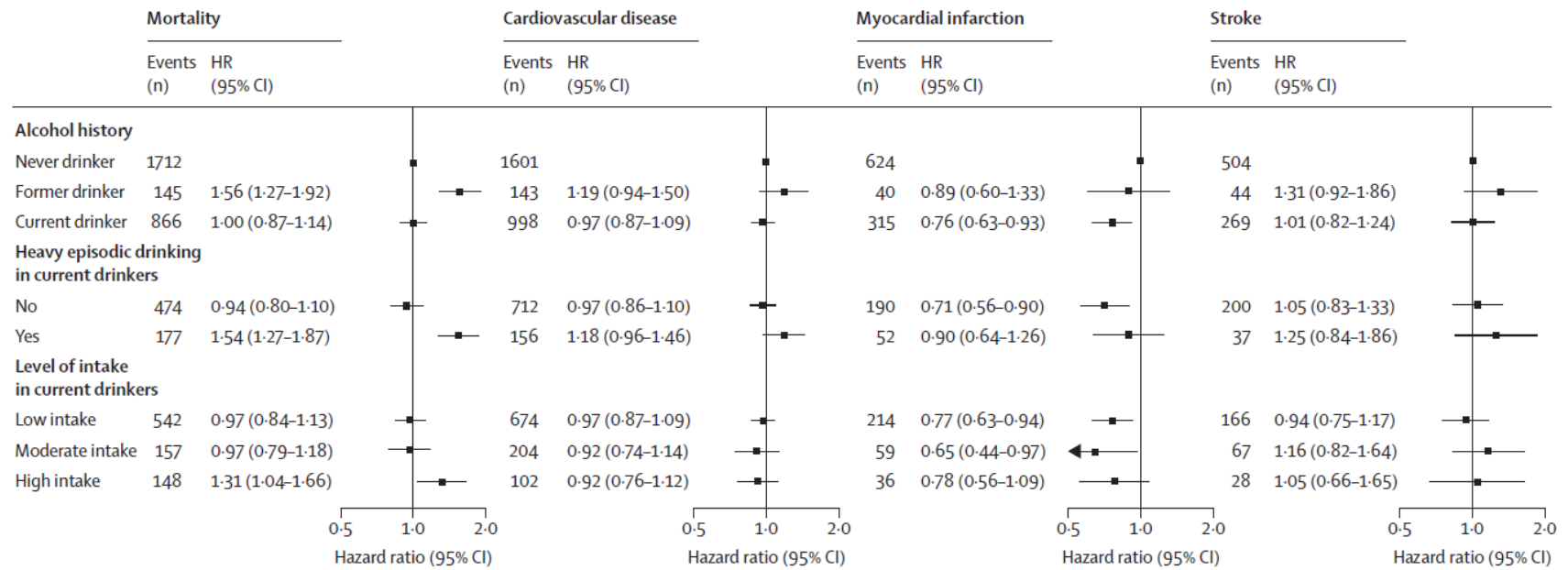
*N= 599,912 drinkers, 83 prospective studies*



Wood AM, Kaptoge S, Butterworth AS, et al. Risk thresholds for alcohol consumption: combined analysis of individual-participant data for 599,912 current drinkers in 83 prospective studies. *Lancet* 2018; 391:1513

# Association between alcohol consumption and cardiovascular disease

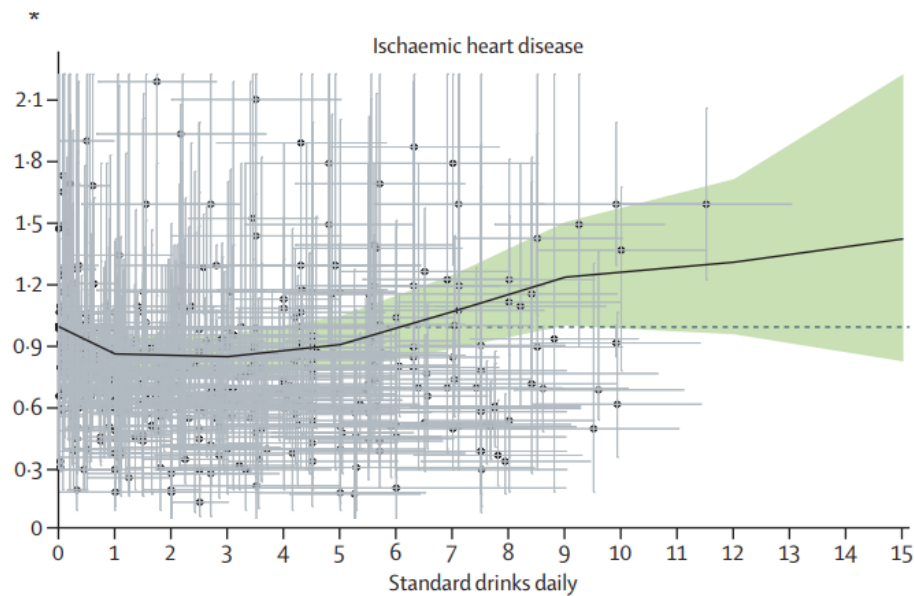
## *Prospective Urban Rural Epidemiological Study (n=114 970)*



A Smyth, et al. Alcohol consumption and cardiovascular disease, cancer, injury, admission to hospital, and mortality: a prospective cohort study. *Lancet* 2015; 386: 1945-54

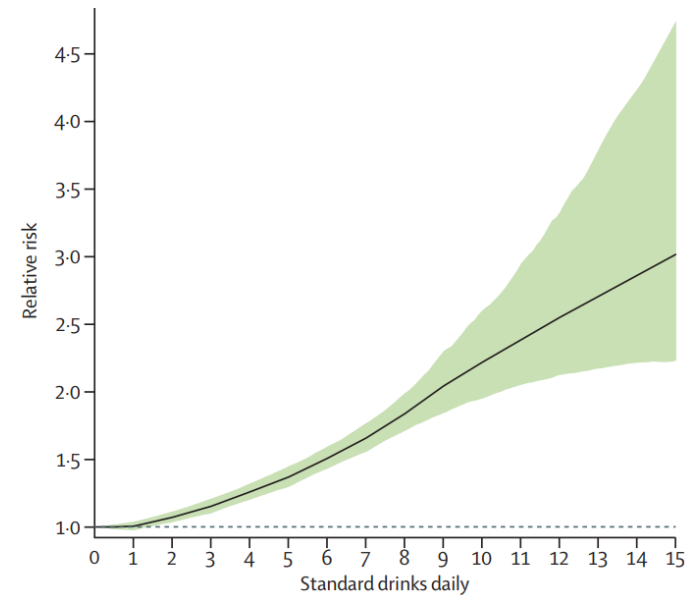
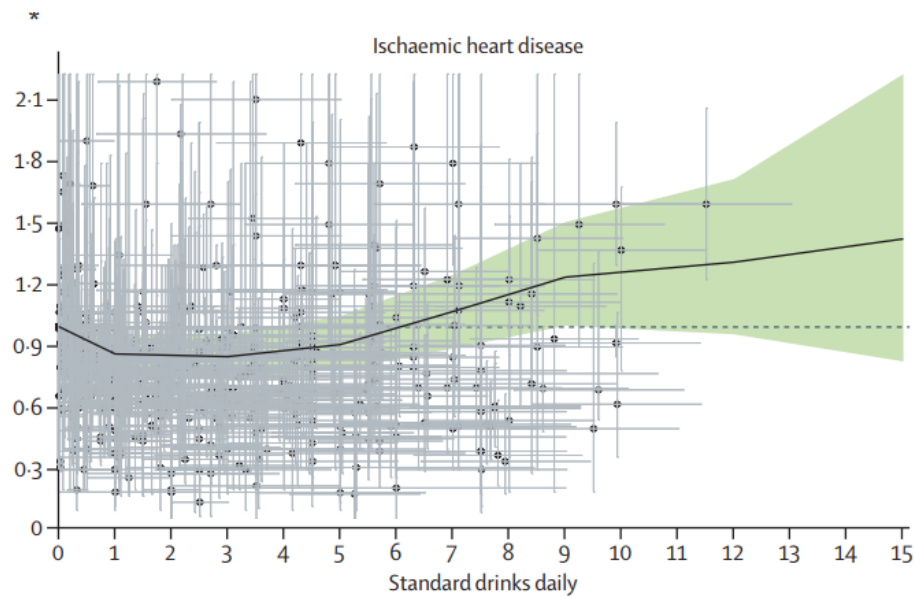
# Moderate drinking is associated with reduced risk of ischemic heart disease ...

*Global Burden of Disease Study 2016*



# Moderate drinking is associated with reduced risk of ischemic heart disease ...but increases the risk of all health outcomes

*Global Burden of Disease Study 2016*



# Alcohol intake and cardiovascular risk - epidemiology

- Reduction of risk as compared to non-drinkers
- Effective in primary and secondary prevention, low and high risk groups
- U-shaped relationship
- Stroke less sensitive to „protective” effect
- No difference between different types of liquor
- „Wide therapeutic window”
- Females respond to lower doses of alcohol
- Type of drinking behaviour affects cardiovascular outcomes
- Possible genetic influence (slow oxidizing allele of alcohol dehydrogenase type 3, *ADH3*)

# Alcohol intake and cardiovascular risk - epidemiology

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- Possible genetic influence (slow oxidizing allele of alcohol dehydrogenase type 3, *ADH3*)
- **No control group and placebo studies**

**To Drink or Not to Drink**

**That is the Question ?**



# Alcohol use is not distributed randomly among individuals

- People who are ill (whether they realize it or not) may stop drinking
- Inclusion of former alcoholics
- Abstention as an indicator of underlying emotional or physical problems
- Moderate alcohol use as a marker of socioeconomic status
- Moderate alcohol use as an indicator of resistance to alcoholism

# Abstinence as an indicator of underlying emotional or physical problems

## At age 33

- 33 percent of lifelong abstainers had poor physical health in childhood compared with 14 percent of moderate drinkers
- In addition, only 16 percent of abstainers came from warm childhood homes versus 35 percent of moderate drinkers.
- Abstainers had double the risk of psychological distress or limiting illness than light or moderate drinkers, regardless of gender

*Vaillant, GE. Natural History of Alcoholism Revisited. Harvard University Press, Cambridge 1995.*

*Power C, Rodgers B, Hope S. U-shaped relation for alcohol consumption and health in early adulthood and implications for mortality. Lancet 1998; 352:877.*

# Cardiovascular risk factors are more prevalent among non-drinkers than moderate drinkers

Risk factor/confounder	Nondrinkers (%, SE) (n = 116,841)	Moderate drinkers (%, SE) (n = 118,889)	Adjusted <sup>a</sup> relative odds (95% CI) of being a nondrinker
<b>HEALTH CONDITIONS</b> ( <i>continued</i> )			
Current asthma	8.7 (0.16)	6.9 (0.14)	1.19 (1.13–1.27)
Any teeth removed (10 states) <sup>b</sup>	54.8 (0.63)	40.7 (0.54)	1.57 (1.46–1.68)
Arthritis	32.3 (0.25)	23.5 (0.22)	1.24 (1.19–1.28)
<b>General health status</b>			
Excellent	17.3 (0.22)	24.7 (0.23)	1.00 (referent)
Very good	28.3 (0.26)	37.4 (0.26)	1.05 (1.01–1.10)
Good	31.2 (0.26)	28.0 (0.25)	1.53 (1.47–1.61)
Fair	15.9 (0.21)	8.0 (0.16)	2.57 (2.42–2.73)
Poor	7.3 (0.14)	2.0 (0.07)	4.58 (4.18–5.02)
≥14 unhealthy physical days	14.1 (0.20)	6.2 (0.13)	2.23 (2.12–2.36)
≥14 unhealthy mental days	10.6 (0.18)	8.0 (0.15)	1.32 (1.25–1.40)
≥14 activity limitation days	16.3 (0.29)	7.5 (0.20)	2.15 (2.00–2.32)
Use medical equipment	9.4 (0.15)	3.9 (0.10)	2.13 (2.00–2.28)
<b>CVD risk score<sup>c</sup></b>			
0	23.5 (0.26)	29.0 (0.25)	1.00 (referent)
1	25.1 (0.25)	31.1 (0.26)	1.00 (0.95–1.05)
2	21.4 (0.23)	21.0 (0.22)	1.24 (1.18–1.31)
3	15.8 (0.19)	12.0 (0.17)	1.58 (1.49–1.67)
4	9.2 (0.15)	5.0 (0.12)	2.12 (1.98–2.28)
≥5	5.0 (0.12)	1.9 (0.07)	3.19 (2.89–3.52)

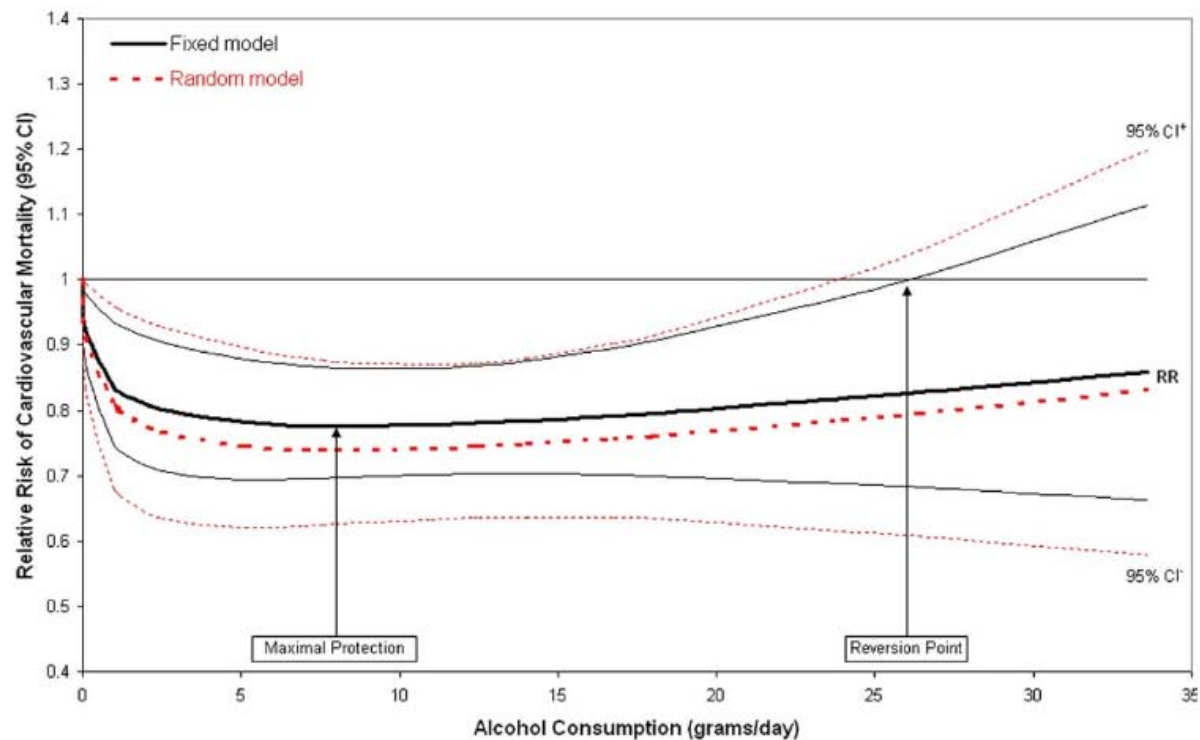
TS Naimi, et al. Cardiovascular Risk Factors and Confounders Among Nondrinking and Moderate-Drinking U.S. Adults. *Am J Prev Med* 2005;28(4):369–373)

Whether wine is  
a nourishment,  
medicine or poison  
is a matter of  
dosage.<sup>1141</sup>

-Paracelsus (1493-1591)



In patients with cardiovascular disease moderate alcohol consumption is associated with lower cardiovascular risk  
*Meta-analysis (n=12 819 pts)*



# Risk of myocardial infarction and level of alcohol intake

## *Health Professionals Follow-up Study*

	0 g/day	0.1–9.9 g/day	10.0–14.9 g/day	15.0–49.9 g/day	≥50.0 g/day	
Liquor						
No. of cases of MI	646	515	156	87	14	
Person-yr	186,506	142,782	41,587	22,390	3706	
Relative risk	1.00	1.02	0.80	0.73	0.67	<0.001
95% CI	—	0.91–1.15	0.67–0.96	0.58–0.92	0.39–1.14	
Multivariate relative risk	1.00	1.03	0.79	0.67	0.54	<0.001
95% CI	—	0.91–1.16	0.66–0.95	0.53–0.84	0.31–0.92	

*KJ Mukamal, et al. Roles of Drinking Pattern and Type of Alcohol Consumed in Coronary Heart Disease in Men. N Eng J Med. 2003; 348: 109-18*

# Women require less alcohol to protect their hearts

## *Nurses' Health Study*

		AVERAGE ALCOHOL INTAKE (g/DAY)					
		0	0.1–1.4	1.5–4.9	5.0–14.9	15.0–29.9	≥30.0
Death from all causes							
No.	837	321	460	509	272	259	
Adjusted RR	1.0	0.86	0.76	0.80	0.81	1.19	
(95% CI)		(0.75–0.98)	(0.68–0.86)	(0.71–0.89)	(0.71–0.93)	(1.03–1.38)	
Multivariate RR	1.0	0.91	0.83	0.88	0.89	1.19	
(95% CI)		(0.80–1.03)	(0.74–0.93)	(0.79–0.99)	(0.77–1.02)	(1.02–1.38)	
Death from cardiovascular disease							
No.	202	64	67	87	44	39	
Multivariate RR	1.0	0.79	0.57	0.73	0.66	0.74	
(95% CI)		(0.59–1.05)	(0.43–0.76)	(0.56–0.95)	(0.47–0.93)	(0.51–1.08)	





# Alcohol impairment charts for men and women

## Approximate blood alcohol percentages

**Body weight (lbs) for men**

		100	120	140	160	180	200	220	240	
Number of drinks	1	.04	.03	.03	.02	.02	.02	.02	.02	Impairment begins
	2	.08	.06	.05	.05	.04	.04	.03	.03	Driving skills significantly affected Possible criminal penalties
	3	.11	.09	.08	.07	.06	.06	.05	.05	
	4	.15	.12	.11	.09	.08	.08	.07	.06	
	5	.19	.16	.13	.12	.11	.09	.09	.08	Legally intoxicated Criminal penalties
	6	.23	.19	.16	.14	.13	.11	.10	.09	
	7	.26	.22	.19	.16	.15	.13	.12	.11	
	8	.30	.25	.21	.19	.17	.15	.14	.13	
	9	.34	.28	.24	.21	.19	.17	.15	.14	
	10	.38	.31	.27	.23	.21	.19	.17	.16	

**Body weight (lbs) for women**

		90	100	120	140	160	180	200	220	240	
Number of drinks	1	.05	.05	.04	.03	.03	.03	.02	.02	.02	Impairment begins
	2	.10	.09	.08	.07	.06	.05	.05	.04	.04	Driving skills significantly affected Possible criminal penalties
	3	.15	.14	.11	.10	.09	.08	.07	.06	.06	
	4	.20	.18	.15	.13	.11	.10	.09	.08	.08	
	5	.25	.23	.19	.16	.14	.13	.11	.10	.09	Legally intoxicated Criminal penalties
	6	.30	.27	.23	.19	.17	.15	.14	.12	.11	
	7	.35	.32	.27	.23	.20	.18	.16	.14	.13	
	8	.40	.36	.30	.26	.23	.20	.18	.17	.15	
	9	.45	.41	.34	.29	.26	.23	.20	.19	.17	
	10	.51	.45	.38	.32	.28	.25	.23	.21	.19	

# ALCOHOL AS A DRUG – A MECHANISM OF ACTION

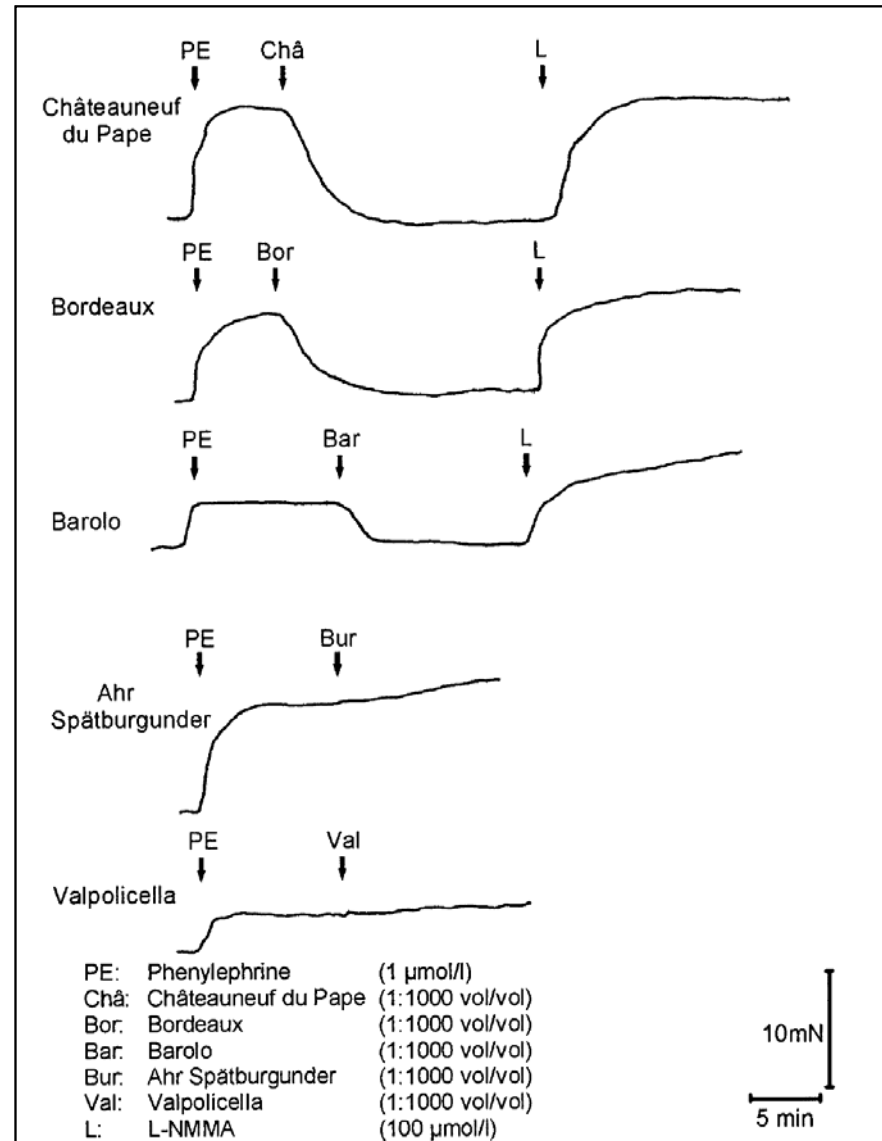
# Effect of alcohol consumption on blood chemistry

- Serum HDL-cholesterol increased by 4.0 mg/dL (0.1 mmol/L)
- Serum apolipoprotein A-I increased by 8.8 mg/dL
- Serum triglycerides increased by 5.7 mg/dL
- Plasma fibrinogen concentration decreased by 7.5 mg/dL
- Tissue-type plasminogen activator concentration increased by 1.25 ng/mL
- Plasminogen concentration increased by 1.5 percent
- Adiponectin levels were significantly increased
- Blood viscosity was reduced by 10%

# Mechanisms of cardiovascular effect of alcohol

- Change in lipid profile
- Profibrinolytic
- Vasodilatory
- Anti-oxidant properties
- Anti-inflammatory
- Anti-platelet
- Increased insulin sensitivity

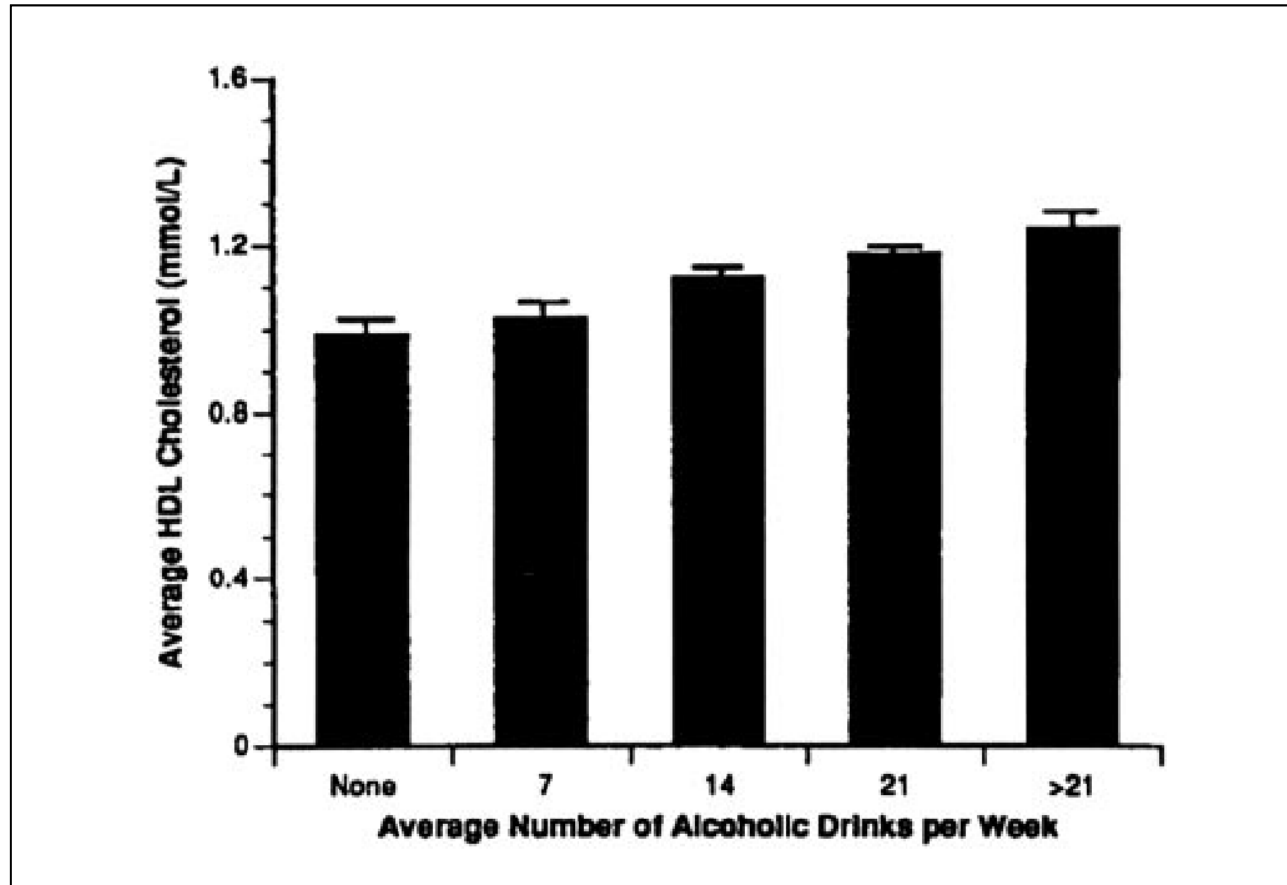
# Endothelium-dependent vasodilatatory effect is specific for type of wine



# Mechanisms of cardiovascular effect of alcohol

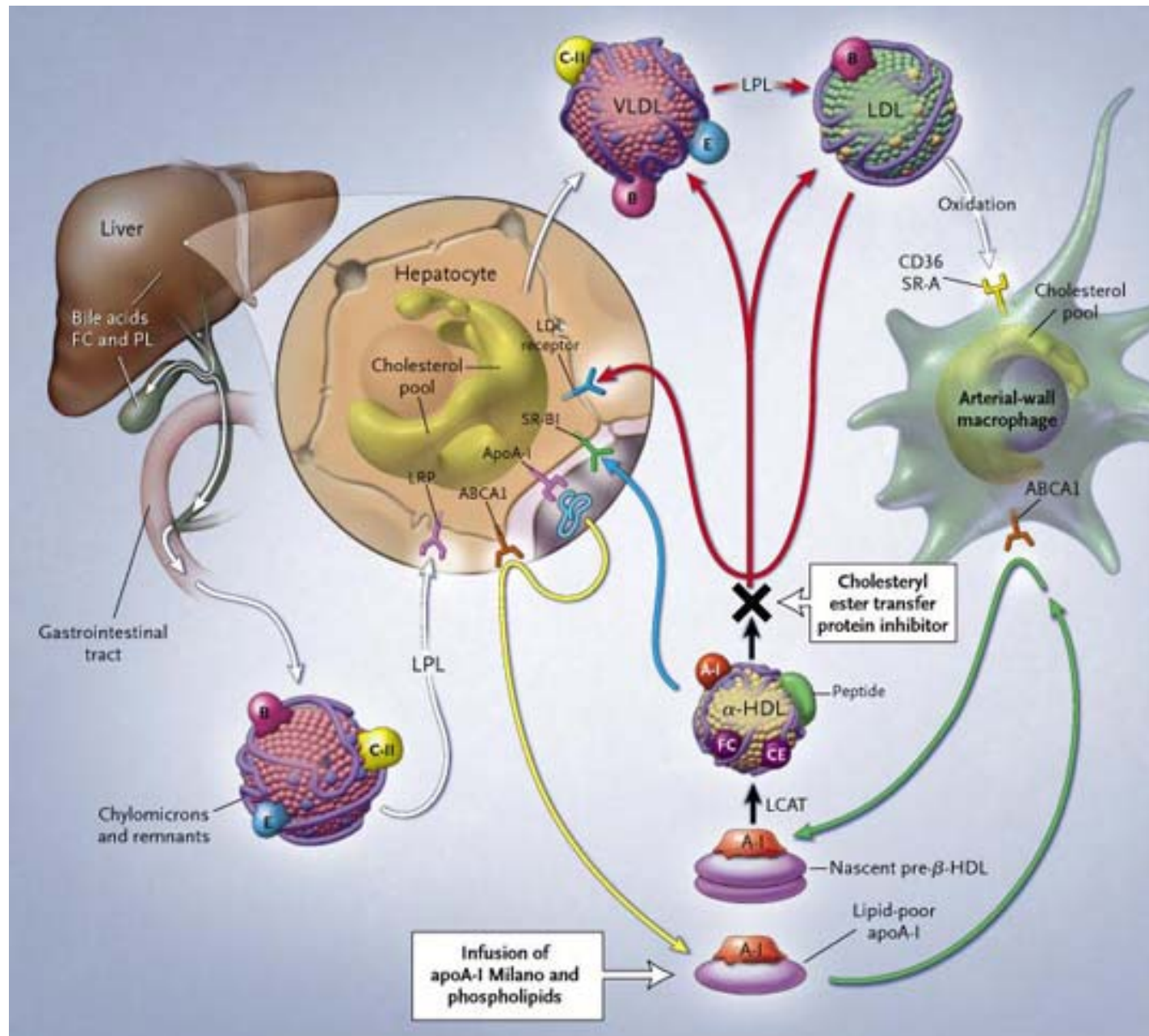
- Change in lipid profile
- Profibrinolytic
- Vasodilatory
- Anti-oxidant properties
- Anti-inflammatory
- Anti-platelet
- Increased insulin sensitivity
  
- **Dose-dependent raise in blood pressure**

# Effect of alcohol consumption on HDL cholesterol level



*I Suh et al. Alcohol use and mortality from coronary heart disease: the role of high-density lipoprotein cholesterol. Ann Intern Med. 1992; 116: 881-7*

# Alcohol effect on HDL is related to inhibition of CETP





# *The* NEW ENGLAND JOURNAL *of* MEDICINE

ESTABLISHED IN 1812

NOVEMBER 22, 2007

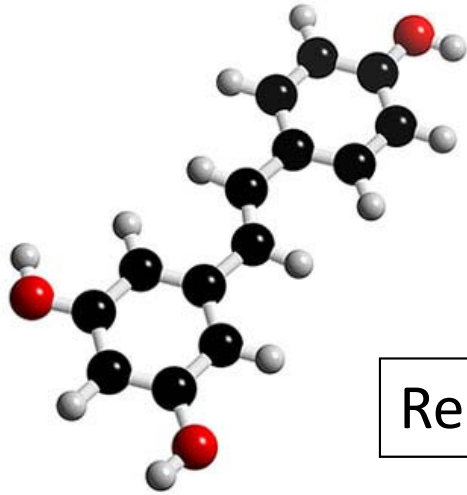
VOL. 357 NO. 21

## Effects of Torcetrapib in Patients at High Risk for Coronary Events

Philip J. Barter, M.D., Ph.D., Mark Caulfield, M.D., M.B., B.S., Mats Eriksson, M.D., Ph.D.,  
Scott M. Grundy, M.D., Ph.D., John J.P. Kastelein, M.D., Ph.D., Michel Komajda, M.D., Jose Lopez-Sendon, M.D., Ph.D.,  
Lori Mosca, M.D., M.P.H., Ph.D., Jean-Claude Tardif, M.D., David D. Waters, M.D., Charles L. Shear, Dr.P.H.,  
James H. Revkin, M.D., Kevin A. Buhr, Ph.D., Marian R. Fisher, Ph.D., Alan R. Tall, M.B., B.S.,  
and Bryan Brewer, M.D., Ph.D., for the ILLUMINATE Investigators\*

### **CONCLUSIONS**

Torcetrapib therapy resulted in an increased risk of mortality and morbidity of unknown mechanism. Although there was evidence of an off-target effect of torcetrapib, we cannot rule out adverse effects related to CETP inhibition. (ClinicalTrials.gov number, NCT00134264.)



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# Administration of resveratrol to mice fed high fat diets

*(Baur JA, Pearson KJ, Price NL, et al. Resveratrol improves health and survival of mice on a high-calorie diet. Nature 2006; 444:337)*

- Improves the metabolic profile
- Prolong the lifespan of mice
- Enhances performance of mice on motor skills testing

# Administration of resveratrol to mice fed high fat diets

*(Baur JA, Pearson KJ, Price NL, et al. Resveratrol improves health and survival of mice on a high-calorie diet. Nature 2006; 444:337)*

- Improves the metabolic profile
  - Prolong the lifespan of mice
  - Enhances performance of mice on motor skills testing
- 
- Mice received 22.4 mg of resveratrol per kg daily
  - Resveratrol concentration of red wine is 1.5 to 3 mg per liter
  - An average person would need to consume over 1000 liters of red wine daily to achieve similar resveratrol concentrations

# 7 years. 26 journal articles. 145 fraud instances. The heart of a resveratrol research scandal

By Shane Starling

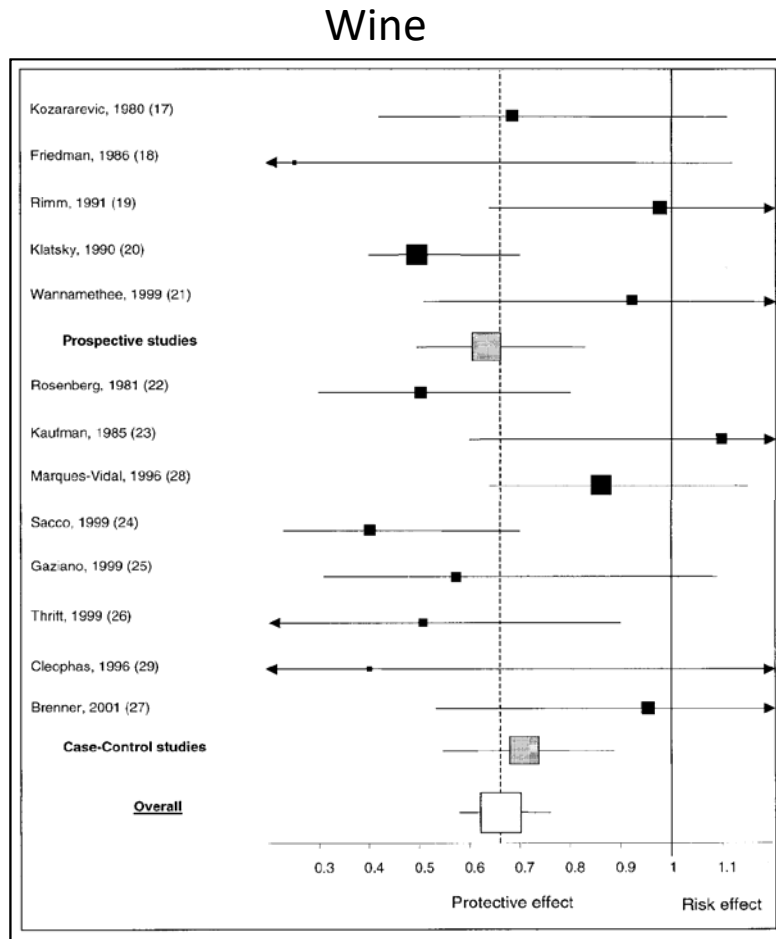
13-Jan-2012 - Last updated on 13-Jan-2012 at 16:41 GMT

The resveratrol research community won't be badly damaged by a University of Connecticut researcher accused of publishing falsified data on the red wine antioxidant over seven years in 26 journal articles, say industry observers and the man at the middle of the furore.



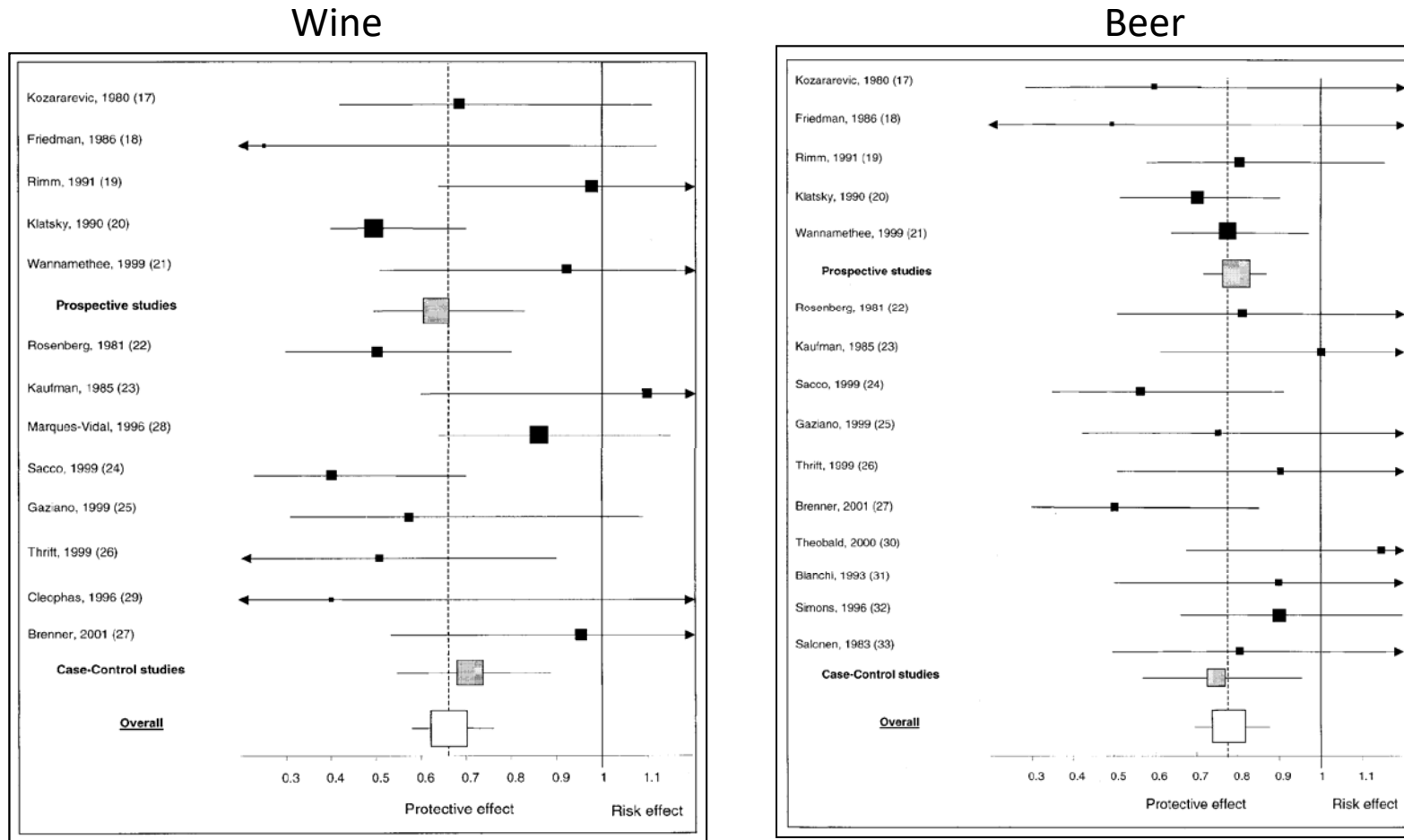
Dr Das

# Wine and beer consumption in relation to cardiovascular risk (meta-analysis)



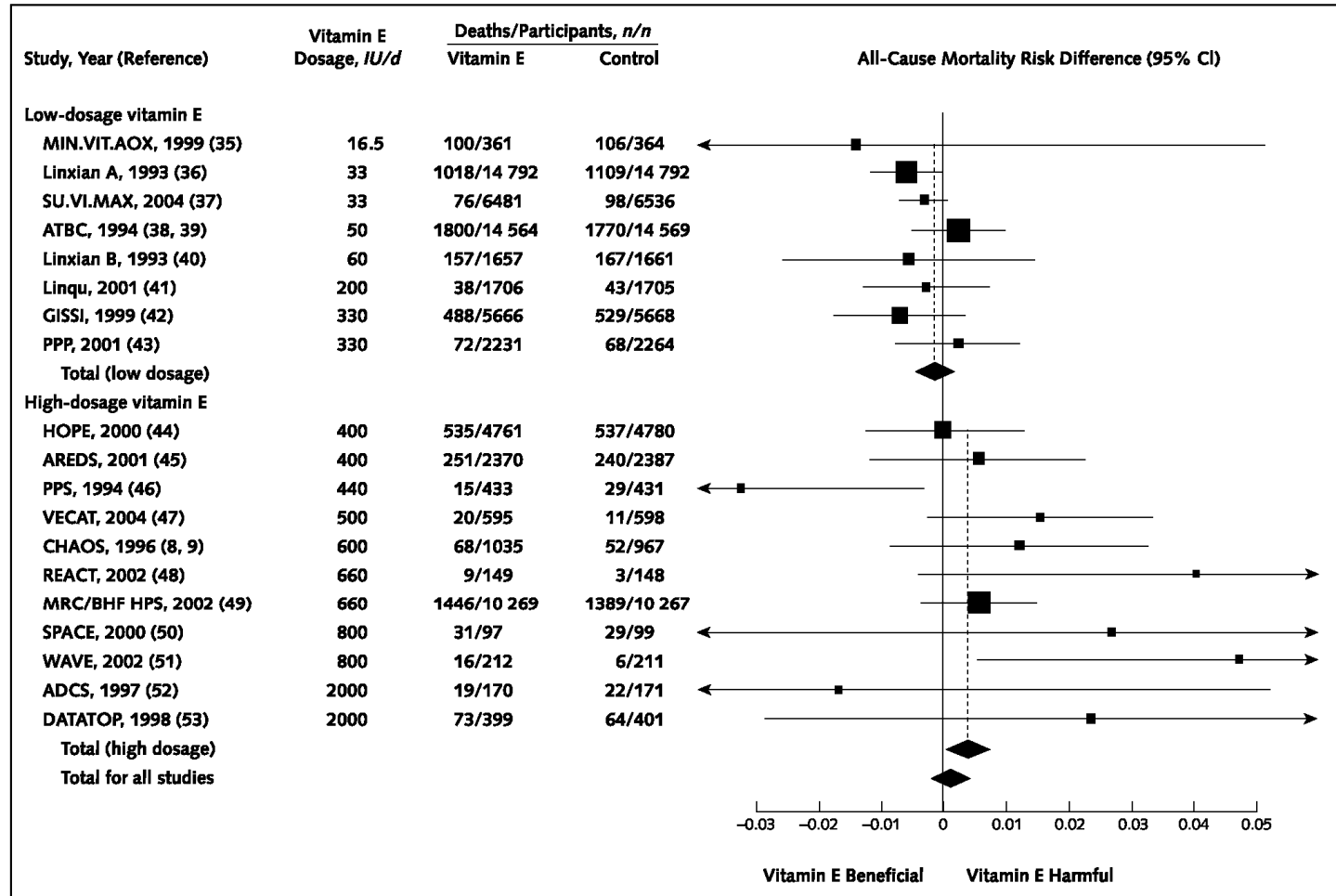


# Wine and beer consumption in relation to cardiovascular risk (meta-analysis)





# Anti-oxidant vitamins may increase the risk of death?



## **AHA Science Advisory**

### **Antioxidant Vitamin Supplements and Cardiovascular Disease**

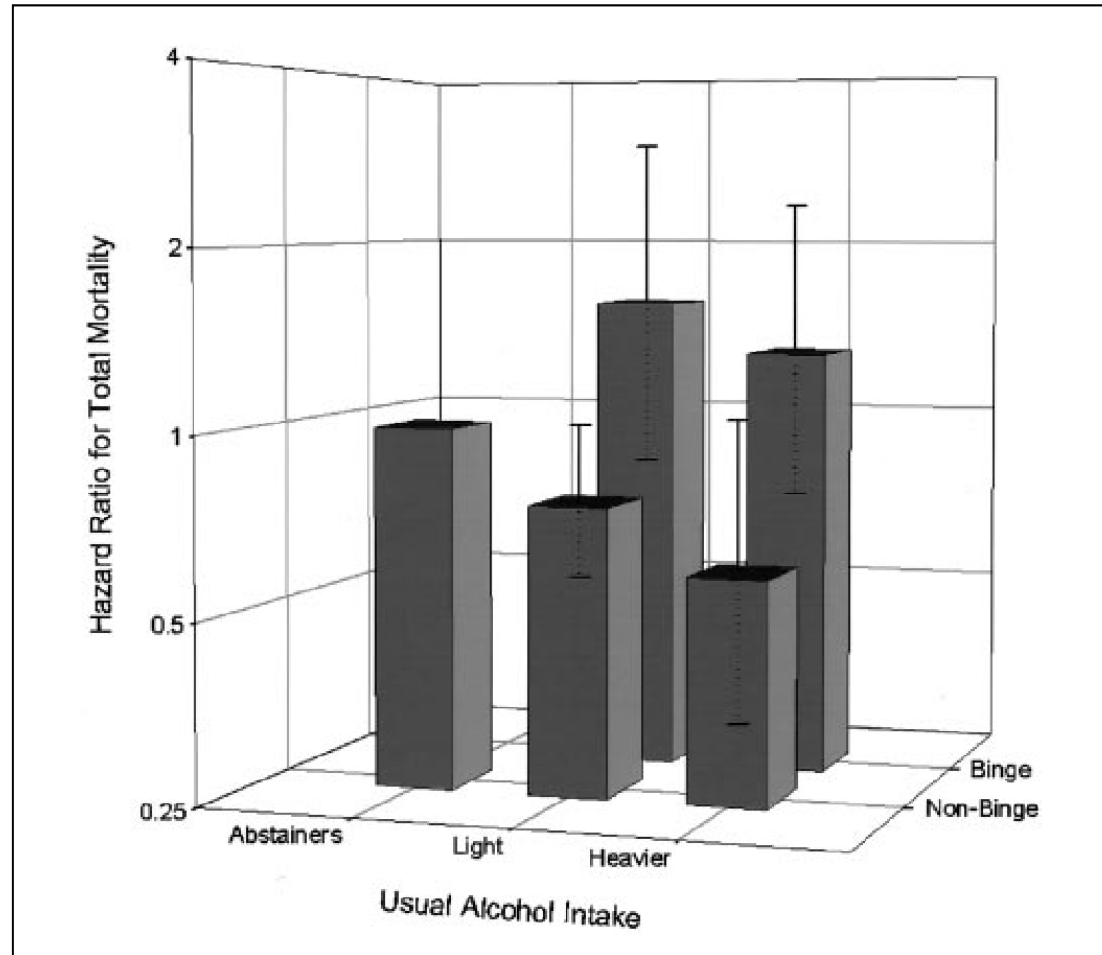
Penny M. Kris-Etherton, PhD, RD; Alice H. Lichtenstein, DSc; Barbara V. Howard, PhD;  
Daniel Steinberg, MD, PhD; Joseph L. Witztum, MD; for the Nutrition Committee of the American  
Heart Association Council on Nutrition, Physical Activity, and Metabolism

#### **Summary**

At this time, the scientific data do not justify the use of antioxidant vitamin supplements for CVD risk reduction.

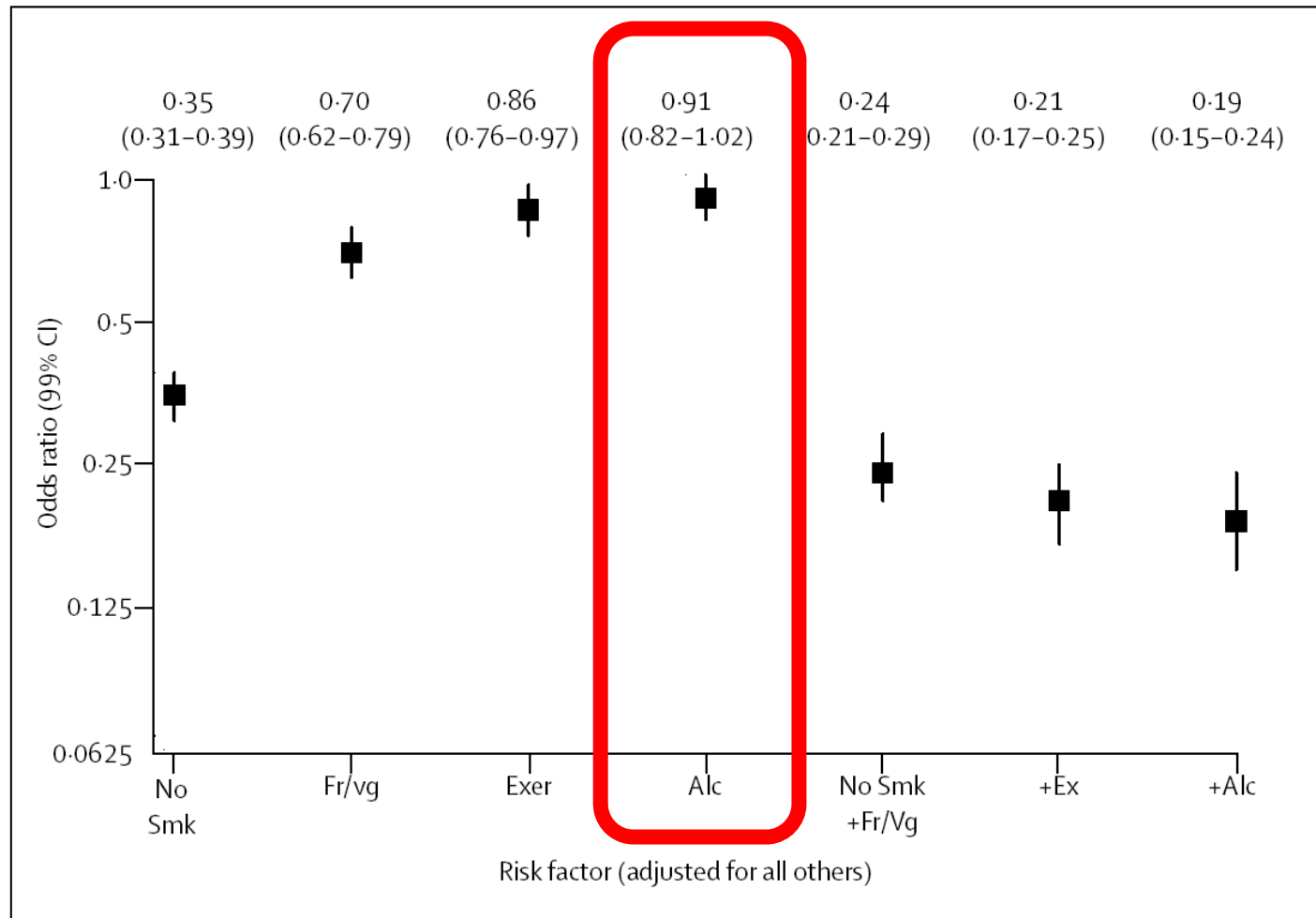
IT IS IMPORTANT HOW YOU DRINK NOT WHAT YOU DRINK.

# Binge drinking increases cardiovascular mortality regardless of amount of alcohol consumed



WHEN YOU CAN MANAGE ALCOHOL INTAKE YOU ALSO  
CONTROL OTHER CARDIOVASCULAR RISK FACTORS

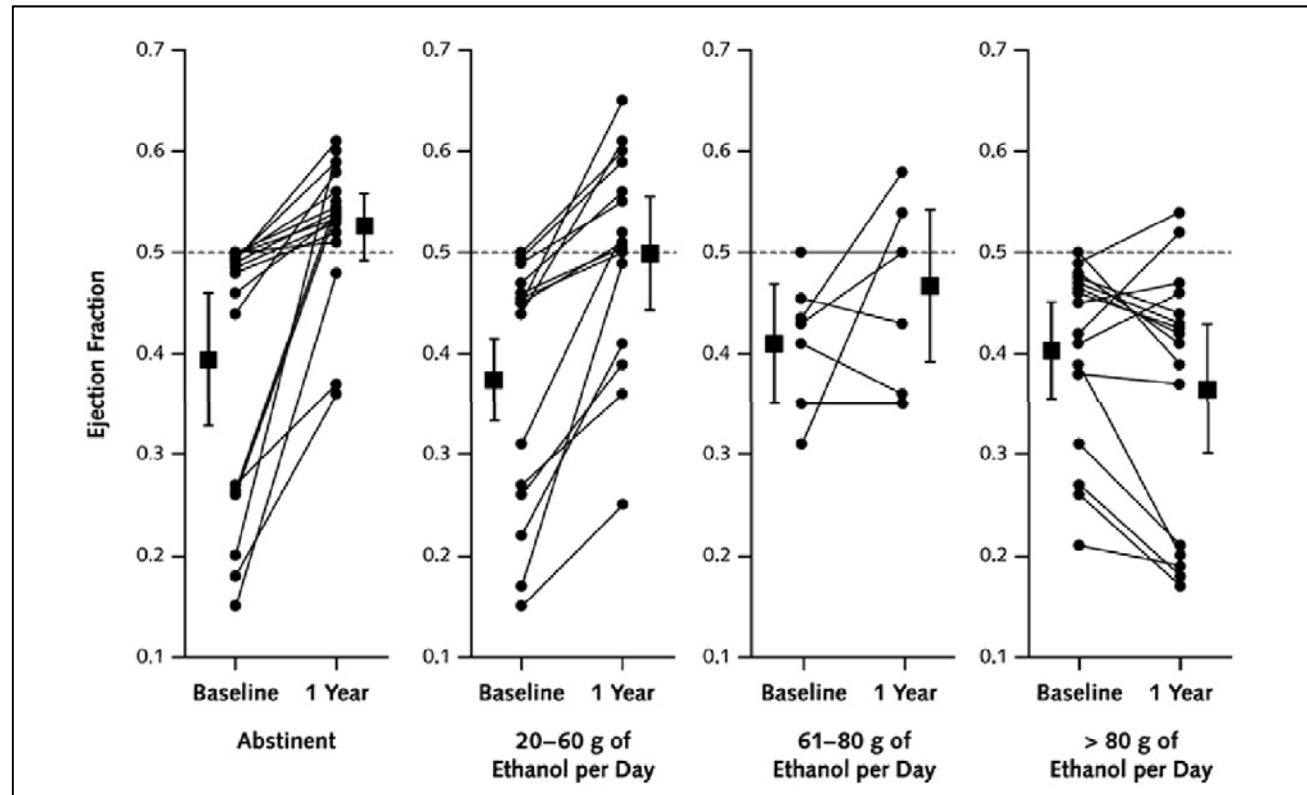
# Risk of myocardial infarction after exposure to different risk factors – small added effect of regular alcohol use INTERHEART Study



S Yusuf et al. Effect of potentially modi.able risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet 2004; 364: 937-52

ALCOHOL CAN BE DANGEROUS FOR YOUR HEART

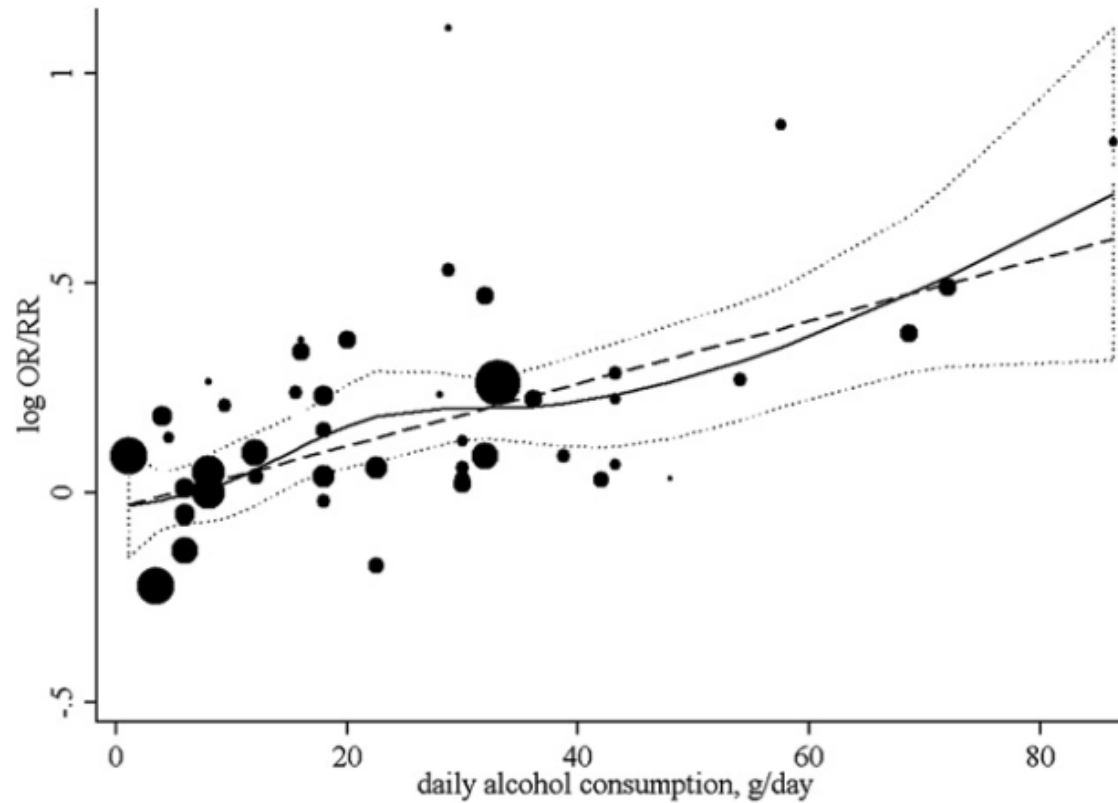
# Abstinency normalizes left ventricular function in subjects with heart failure





# Even moderate drinking increases risk of atrial fibrillation

*Meta-analysis (14 studies, 130 820 pts)*



IS DRINKING GOOD FOR YOUR HEART?  
RECOMMENDATIONS OF EXPERTS

## **AHA Science Advisory**

### **Wine and Your Heart**

**A Science Advisory for Healthcare Professionals From the Nutrition Committee, Council on Epidemiology and Prevention, and Council on Cardiovascular Nursing of the American Heart Association**

Ira J. Goldberg, MD; Lori Mosca, MD, PhD, MPH;  
Mariann R. Piano, RN, PhD; Edward A. Fisher, MD, PhD

alcohol ingestion, unlike other dietary modifications, poses a number of health hazards. Without a large-scale, randomized, clinical end-point trial of wine intake, there is little current justification to recommend alcohol (or wine specifically) as a cardioprotective strategy.



Department  
of Health

## Alcohol Guidelines Review – Report from the Guidelines development group to the UK Chief Medical Officers

(published January 2016 with the  
consultation on the language and  
understanding of the UK Chief Medical  
Officers low-risk alcohol guidelines)

People who do not drink any  
alcohol at all should not be  
recommended to start drinking in  
the interests of their health.

January 2016

# Is drinking good for your heart?

## Summary

- Epidemiological evidence does not support causal relationship
- Mechanism of „protective” effect of alcohol has not been identified
- Moderate drinking is a marker of healthier life style
- Drinking cannot be recommended as a measure to reduce cardiovascular risk
- Abstinence may improve prognosis in certain diseases

DESPITE **EPIDEMIOLOGICAL FINDINGS**, THERE IS **NO** EVIDENCE ON **CAUSAL RELATIONSHIP** BETWEEN DRINKING AND CARDIOVASCULAR DISEASES. THEREFORE, ALCOHOL BEVERAGES **SHOULD NOT BE RECOMMENDED** AS A SUBSTITUTE FOR THE WELL-PROVEN, CARDIOVASCULAR RISK REDUCING ALTERNATIVES SUCH AS LOW FAT DIET, EXERCISE AND PHARMACOTHERAPY.

