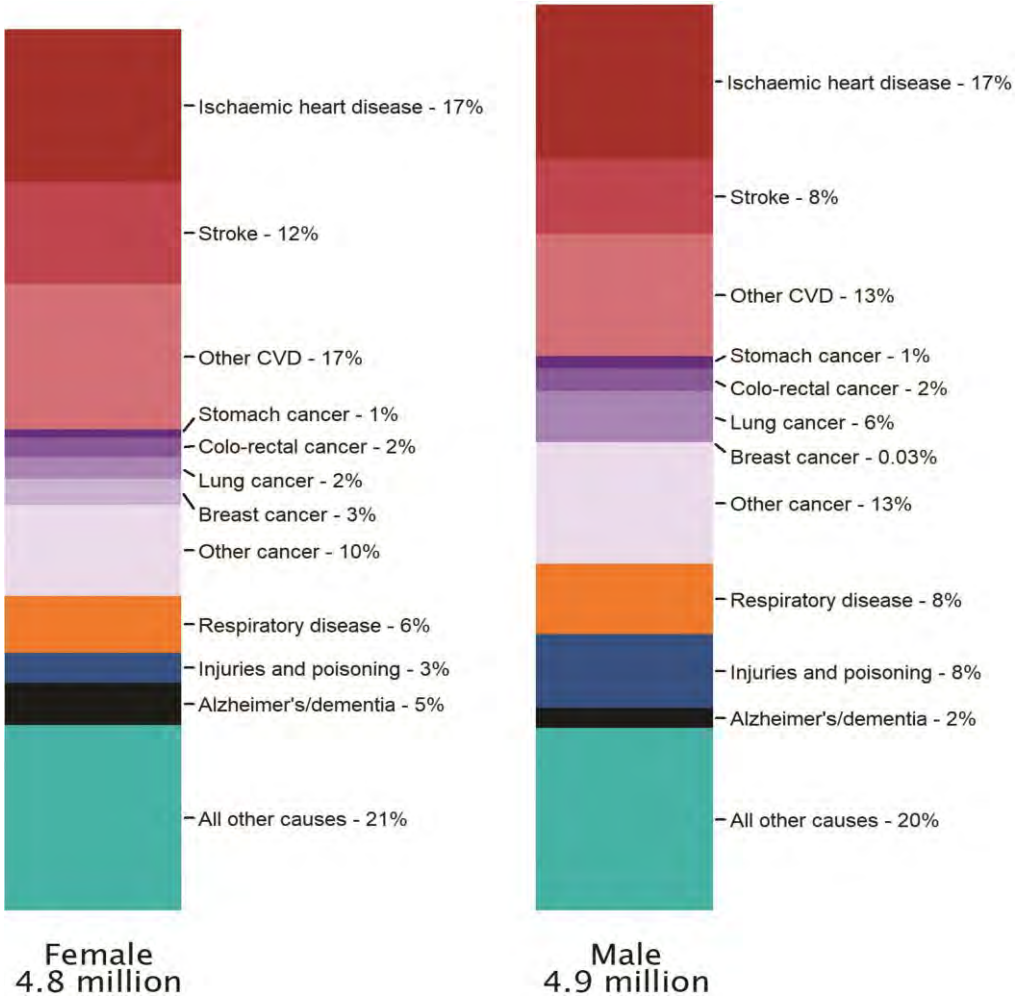
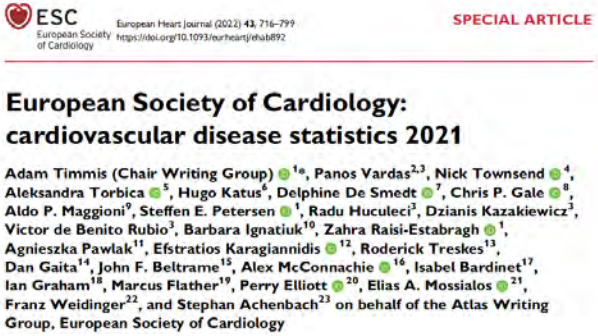
Malattie cardiometaboliche e loro interazioni con fattori di rischio ambientale e lifestyle delle città

Claudio Borghi

Department of Medical and Surgical Sciences
University of Bologna
Bologna, Italy



National causes of death in females and males in European Society of Cardiology member countries.



ESC European Society of Cardiology

European Heart Journal (2022) 43, 716–799
https://doi.org/10.1093/eurheartj/ehab892

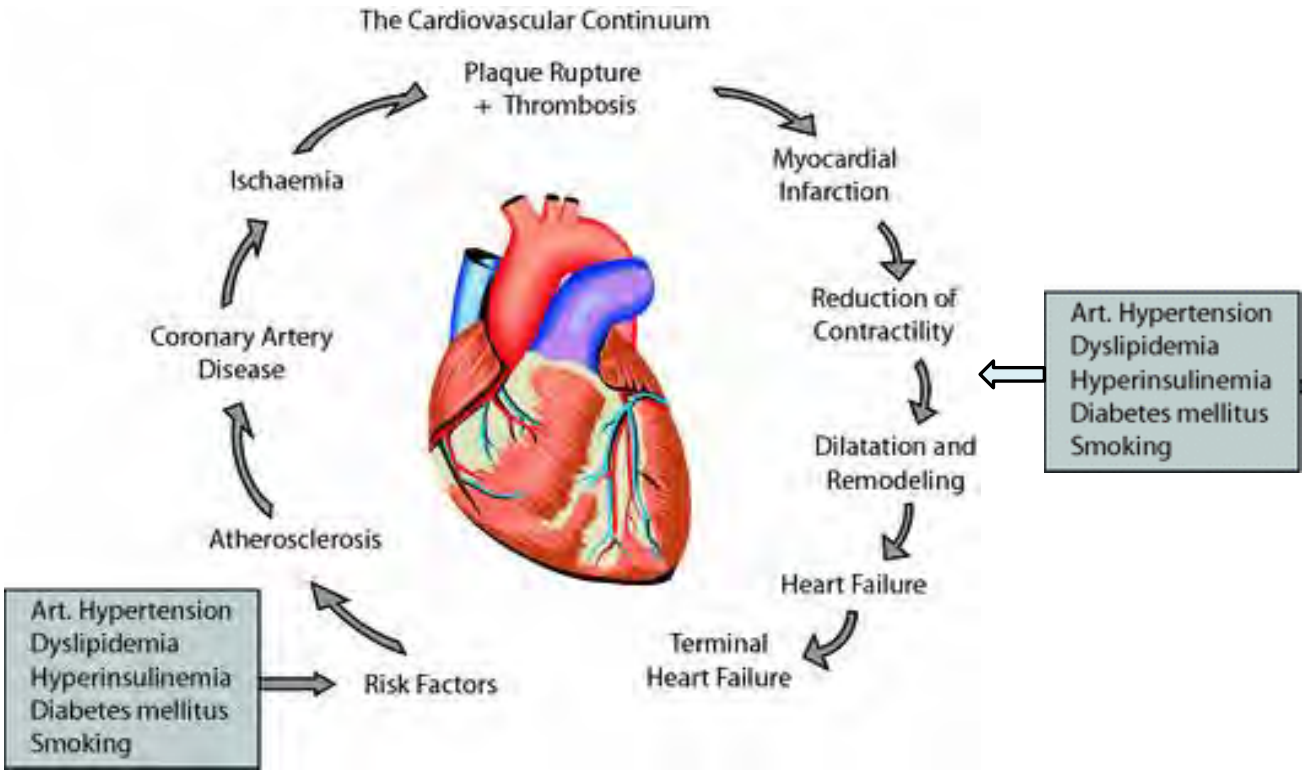
SPECIAL ARTICLE

European Society of Cardiology: cardiovascular disease statistics 2021

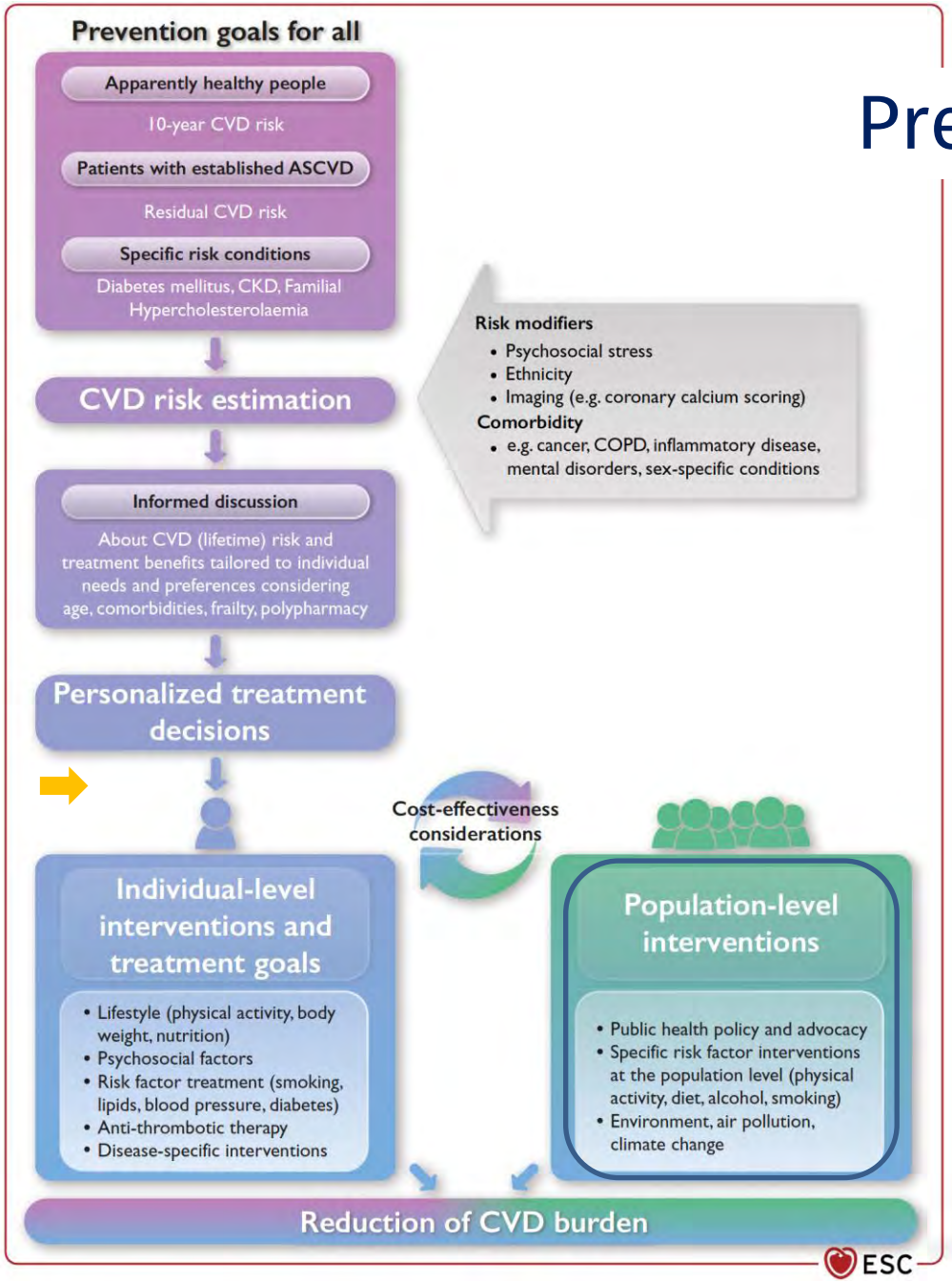
Adam Timmis (Chair Writing Group)[1*], Panos Vardas[2,3], Nick Townsend[4], Aleksandra Torbica[5], Hugo Katus[6], Delphine De Smedt[7], Chris P. Gale[8], Aldo P. Maggioni[9], Steffen E. Petersen[1], Radu Huculeci[3], Dzianis Kazakiewicz[3], Victor de Benito Rubio[3], Barbara Ignatiuk[10], Zahra Raisi-Estabragh[1], Agnieszka Pawlak[11], Efstratios Karagiannidis[12], Roderick Treskes[13], Dan Gaita[14], John F. Beltrame[15], Alex McConnachie[16], Isabel Bardinet[17], Ian Graham[18], Marcus Flather[19], Perry Elliott[20], Elias A. Mossialos[21], Franz Weidinger[22], and Stephan Achenbach[23] on behalf of the Atlas Writing Group, European Society of Cardiology

Timmis a et Eur Heart J, February 2022

Chain of events leading to CV disease



Prevention of CV disease



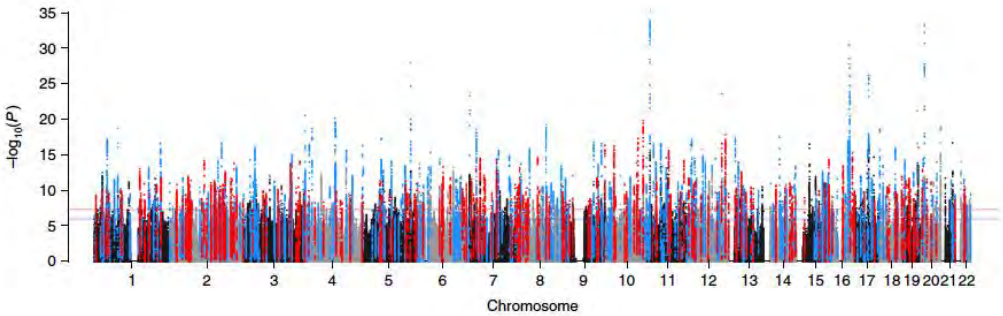
2021 ESC Guidelines on CV disease prevention in clinical practice, Eur Heart J 2021

JANUARY 18, 2010
Joe Klein: The CIA's Afghan Disaster
Yemen: The New Center Of Terror
Why the Recession Hasn't Been Cool To Teens
TIME
WHY YOUR DNA ISN'T YOUR DESTINY
The new science of epigenetics reveals how the choices you make can change your genes —and those of your kids
BY JOHN CLOUD

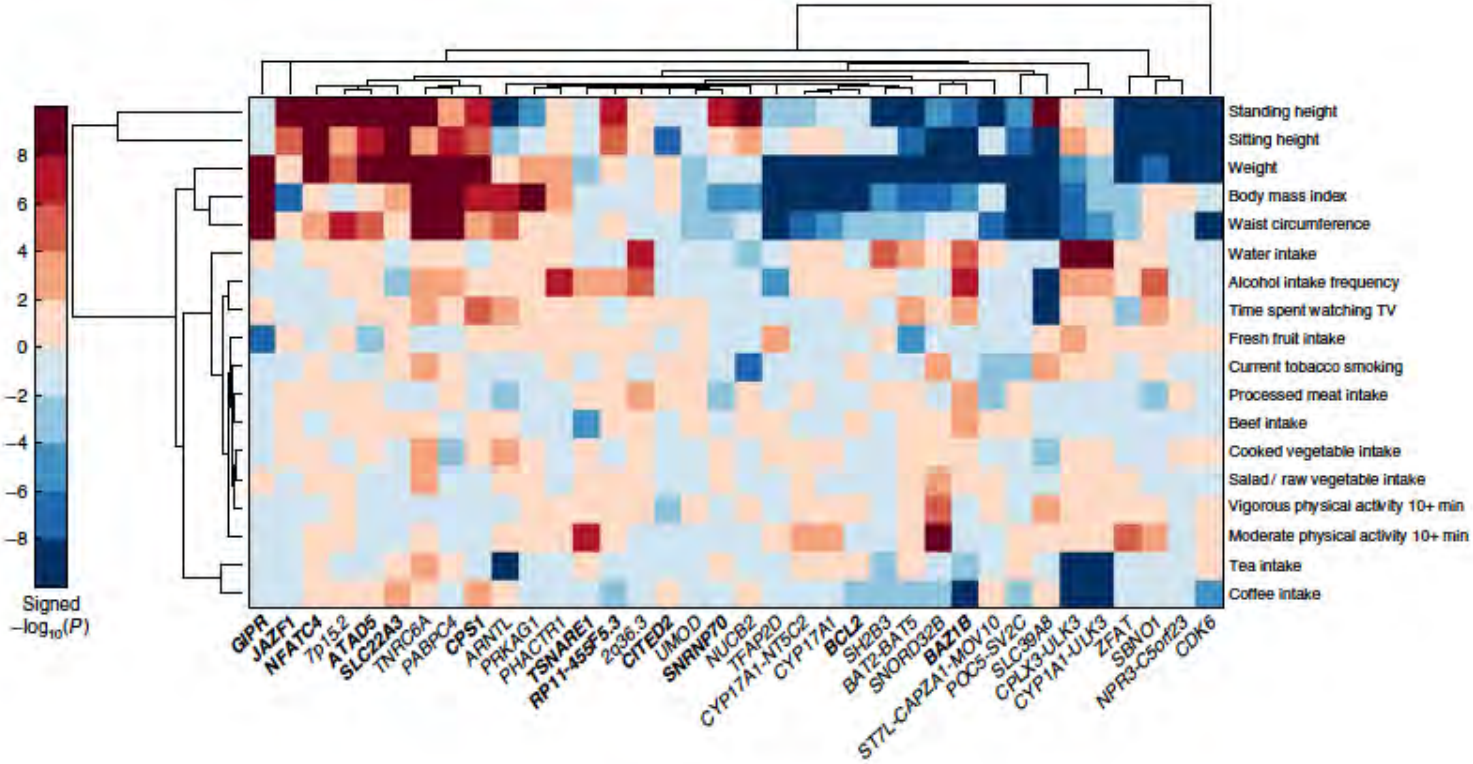
nature genetics
ARTICLES
https://doi.org/10.1038/s41588-018-0205-x

Genetic analysis of over 1 million people identifies 535 new loci associated with blood pressure traits

High blood pressure is a highly heritable and modifiable risk factor for cardiovascular disease. We report the largest genetic association study of blood pressure traits (systolic, diastolic and pulse pressure) to date in over 1 million people of European ancestry. We identify 535 novel blood pressure loci that not only offer new biological insights into blood pressure regulation but also highlight shared genetic architecture between blood pressure and lifestyle exposures. Our findings identify new biological pathways for blood pressure regulation with potential for improved cardiovascular disease prevention in the future.



Blue= downreg
Red= upreg



Nature Genetics, 2018

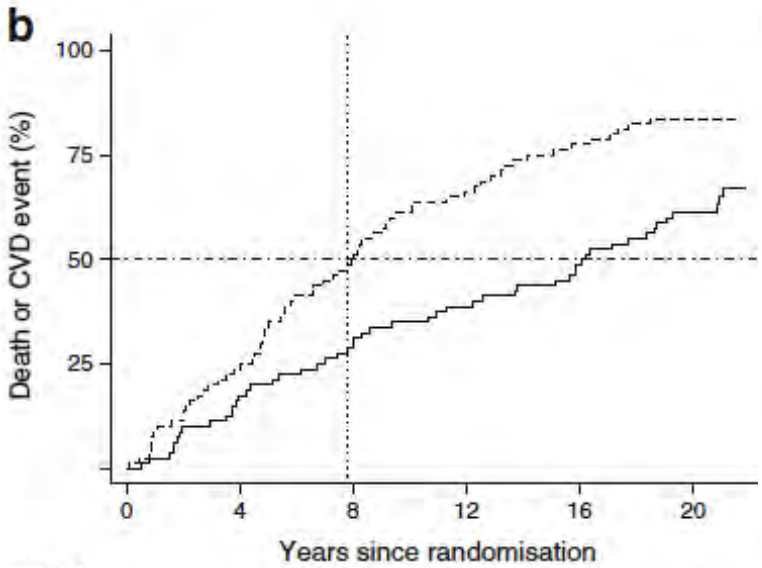
DECEMBER 13, 2004
THE YEAR IN MEDICIN
TIME
THE STEALTH KILLER
Europe's HIGH BLOOD PRESSURE crisis is spinning out of control. Learn about it, treat it—and maybe save your life
DECEMBER 3, 2001
TIME
JACK ACTS HIS AGE!
Hilary Carroll, 11, has "adult-onset" diabetes
DIABETE
ARE YOU AT RISK?
TIME
CHOLESTERO
And Now the Bad News...
SPECIAL ISSUE
TIME
OVERCOMING
OBESITY
IN AMERICA
WHY WE EAT SO MUCH
THE ANTI-FAT CRUSADERS
WEIGHT-LOSS HEROES
WHAT TO TELL YOUR KIDS
A GUIDE TO DIET BOOKS

Diabetologia (2016) 59:2298–2307
DOI 10.1007/s00125-016-4065-6

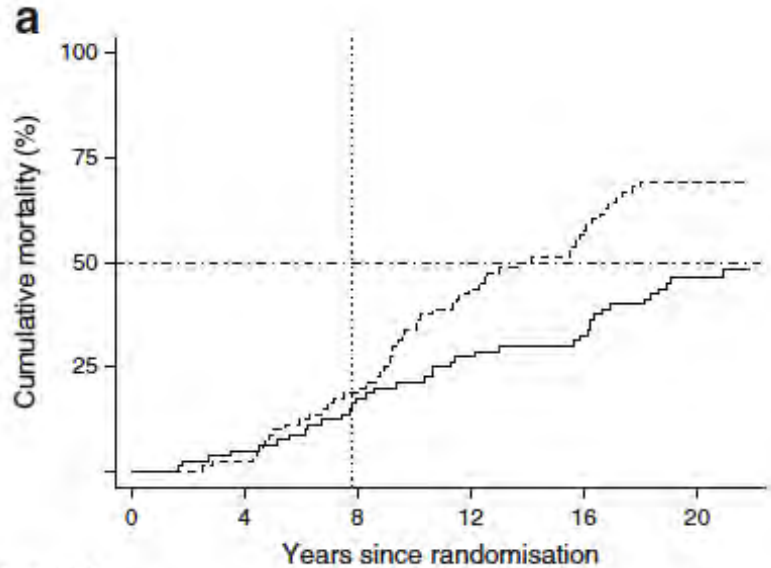
ARTICLE

Years of life gained by multifactorial intervention in patients with type 2 diabetes mellitus and microalbuminuria: 21 years follow-up on the Steno-2 randomised trial

Peter Gæde[1,2] · Jens Oellgaard[1,2,3] · Bendix Carstensen[3] · Peter Rossing[3,4,5] · Henrik Lund-Andersen[3,5,6] · Hans-Henrik Parving[5,7] · Oluf Pedersen[8]



Number at risk						
Intensive	80	66	56	49	41	31
Conventional	80	61	40	27	18	13



Number at risk						
Intensive	80	76	66	58	54	43
Conventional	80	78	65	45	34	24

To look around

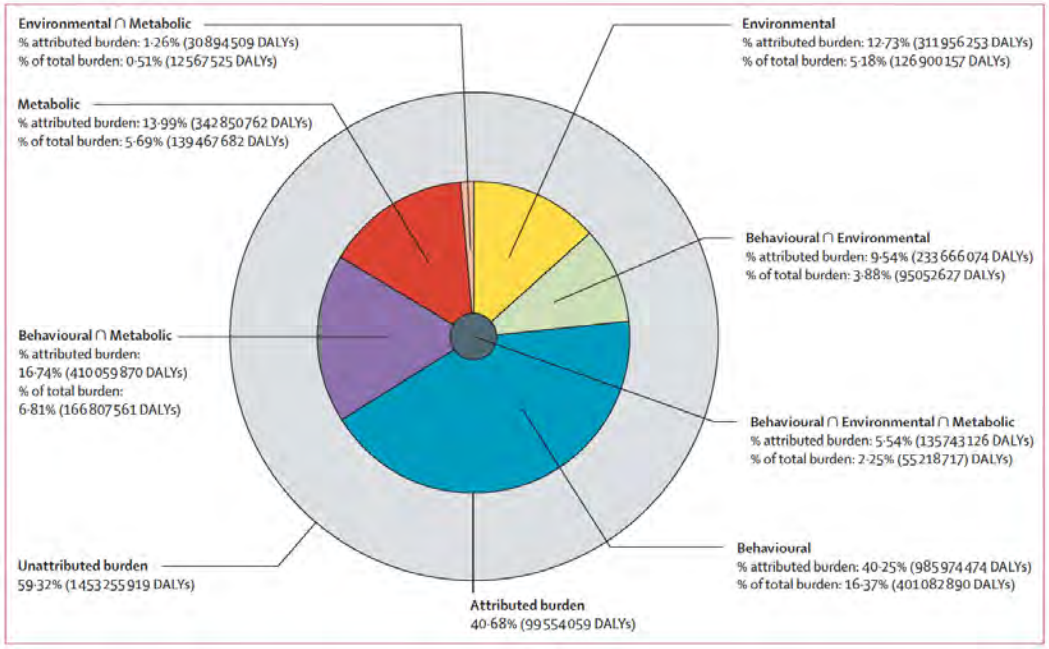


Figure 3: Proportion of all-cause DALYs attributable to behavioural, environmental and occupational, and metabolic risk factors and their overlaps for all ages in 2013
DALYs=disability-adjusted life-years. ∩=interaction.

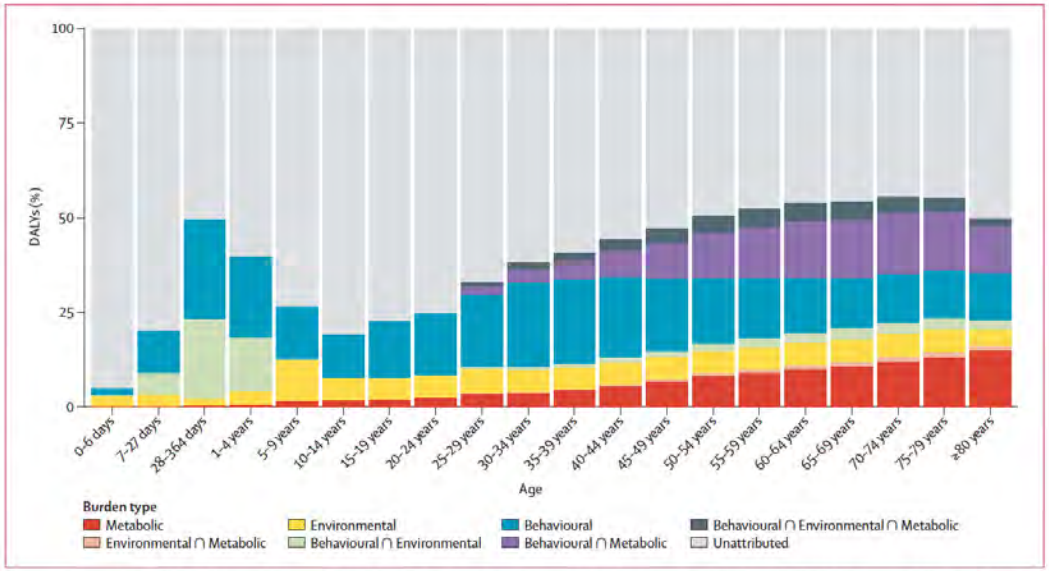


Figure 4: Proportion of global all-cause DALYs attributable to behavioural, environmental and occupational, and metabolic risk factors and their overlaps, by age for both sexes combined in 2013
DALYs=disability-adjusted life-years. ∩=interaction.

Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

GBD 2013 Risk Factors Collaborators*

Lancet 2015; 386: 2287–323

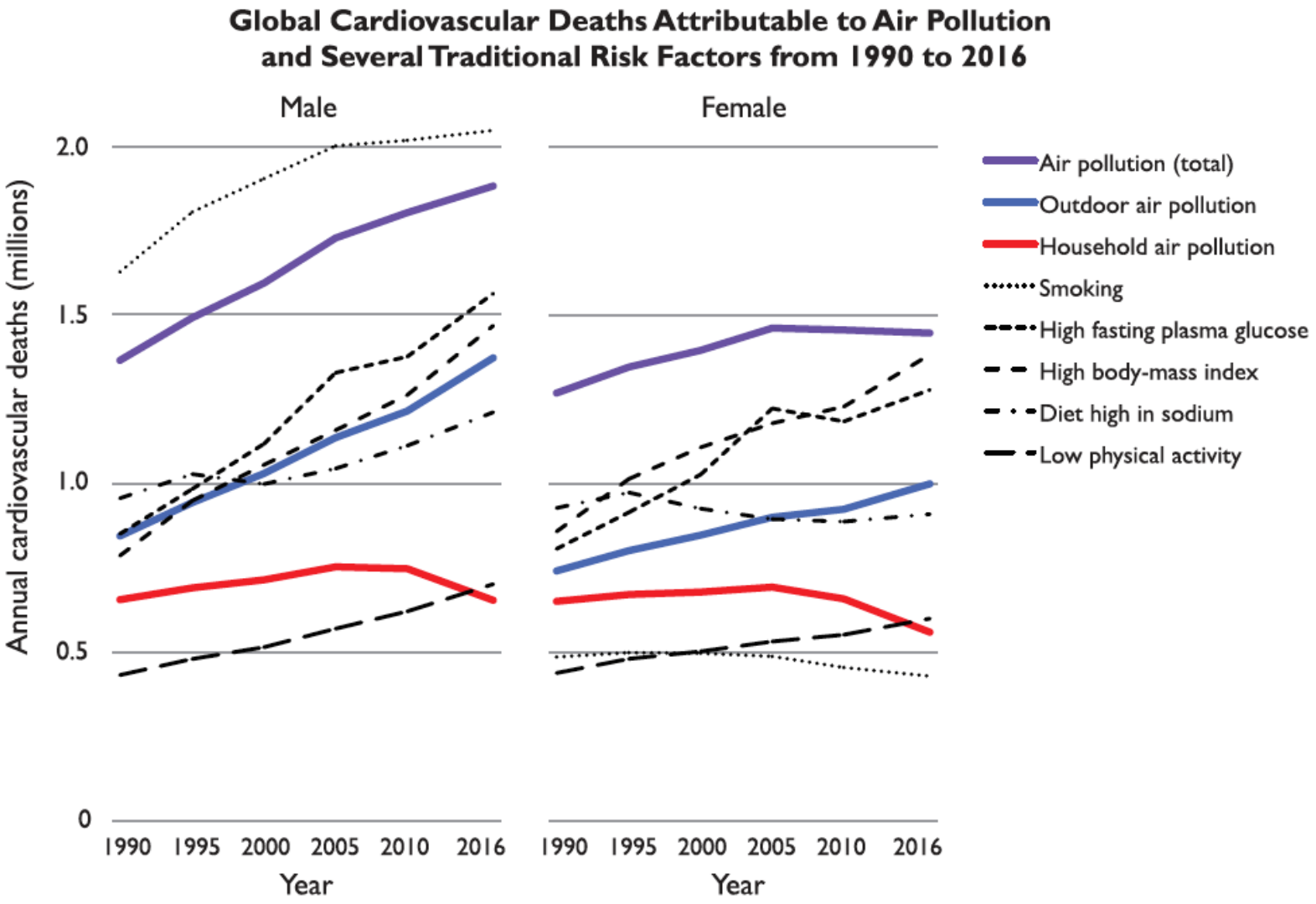
Published Online
September 11, 2015
http://dx.doi.org/10.1016/S0140-6736(15)00128-2

See Comment page 2235

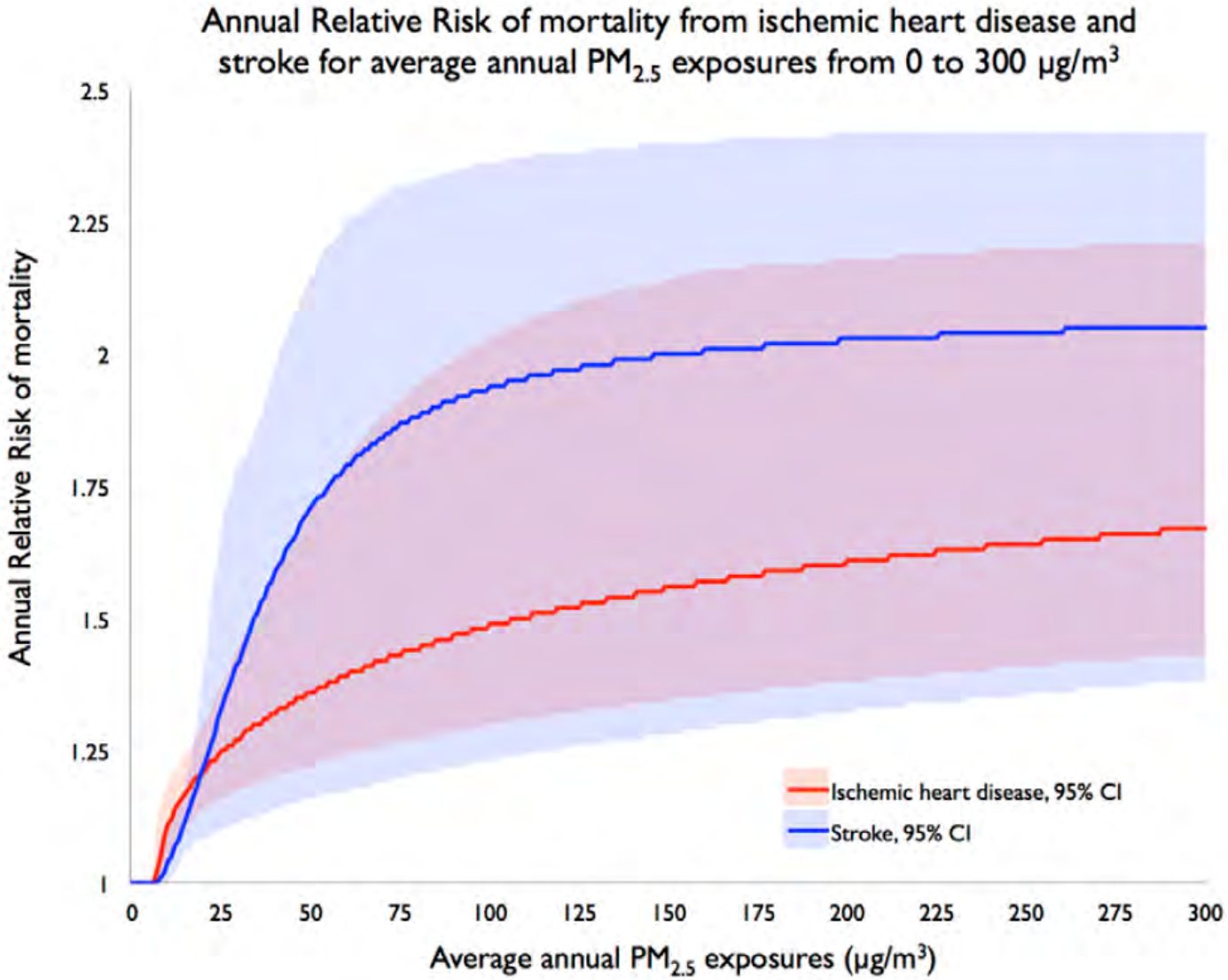
*Collaborators listed at the end of the Article

Correspondence to:
Prof Christopher J L Murray, Institute for Health Metrics and Evaluation, 2301 5th Avenue, Suite 600, Seattle, WA 98121, USA
cjlm@uw.edu

Figure 1 The Great London Smog, 1952.



Global Burden of Diseases, Injuries, and Risk Factors Study, Lancet 2017



Global Burden of Diseases, Injuries, and Risk Factors Study, Lancet 2017

Review

Air pollution and cardiovascular disease: the Paul Wood Lecture, British Cardiovascular Society 2021

Shruti S Joshi , Mark R Miller, David E Newby

Several potential mechanisms have been proposed that link particle inhalation to CV disease including :

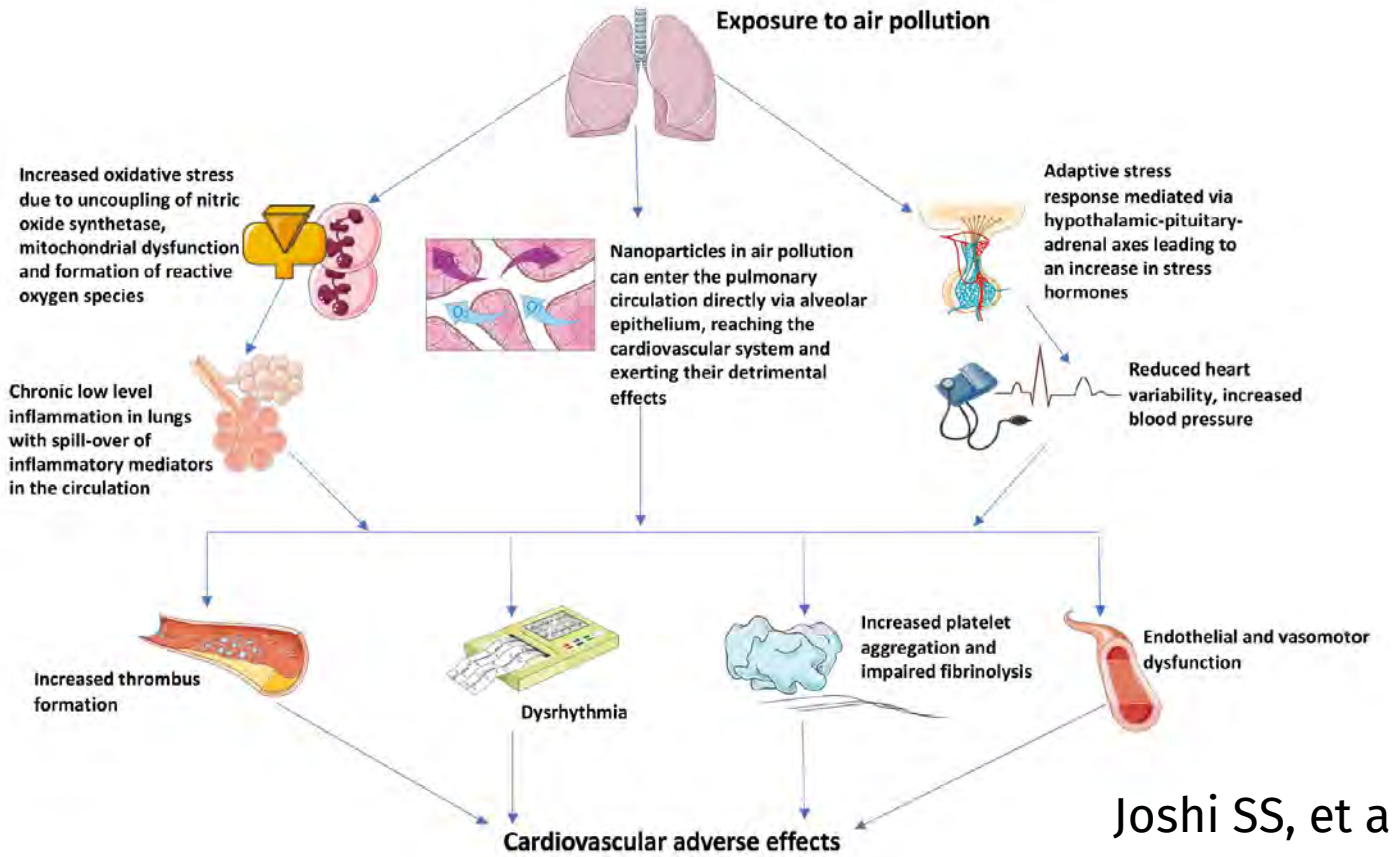
- oxidative stress and inflammation,
- changes in autonomic balance
- changes in neuroendocrine regulation
- particle translocation into the circulation itself.
- endothelial, vasomotor and fibrinolytic dysfunction
- increased thrombogenicity and blood pressure

Review

Air pollution and cardiovascular disease: the Paul Wood Lecture, British Cardiovascular Society 2021

Shruti S Joshi , Mark R Miller, David E Newby

Mechanisms underlying cardiovascular adverse effects due to air pollution.

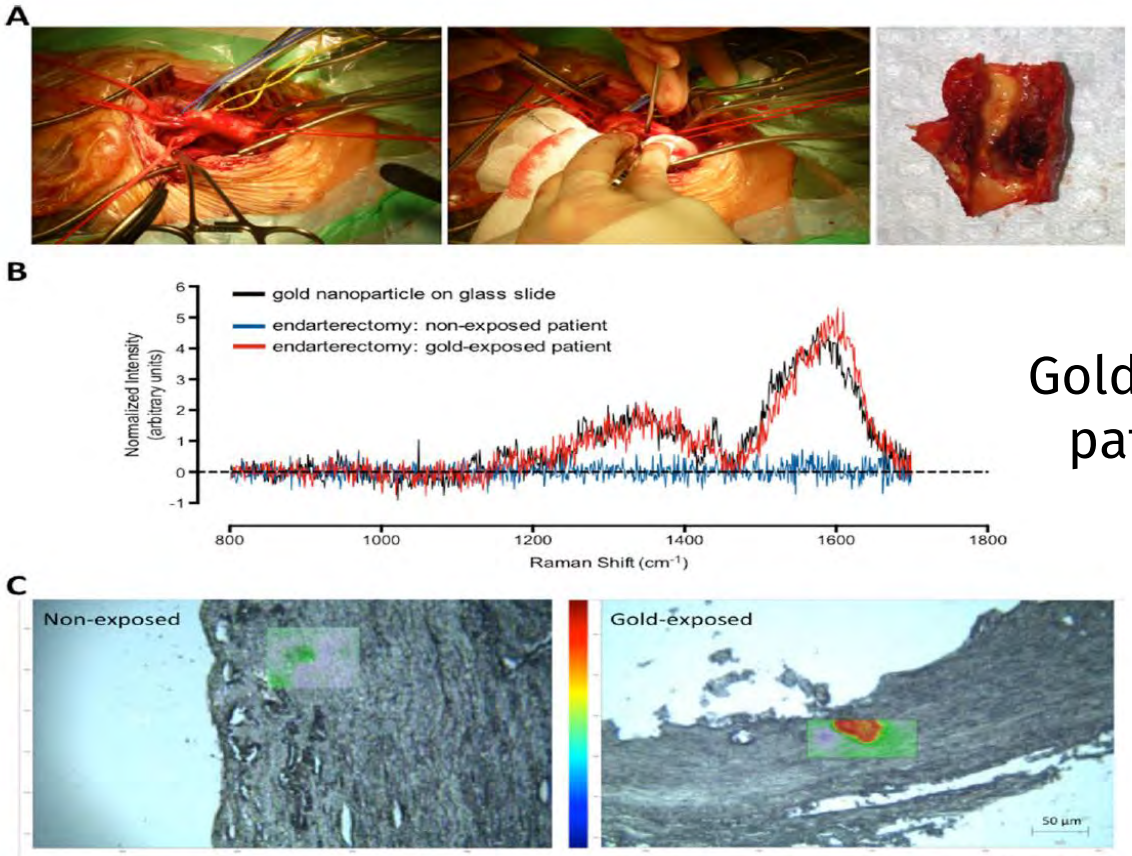


Joshi SS, et al. Heart 2022;108:1267–1273.

Review

Air pollution and cardiovascular disease: the Paul Wood Lecture, British Cardiovascular Society 2021

Shruti S Joshi , Mark R Miller, David E Newby



Gold nanoparticles exposure in patients undergoing carotid endarterectomy.

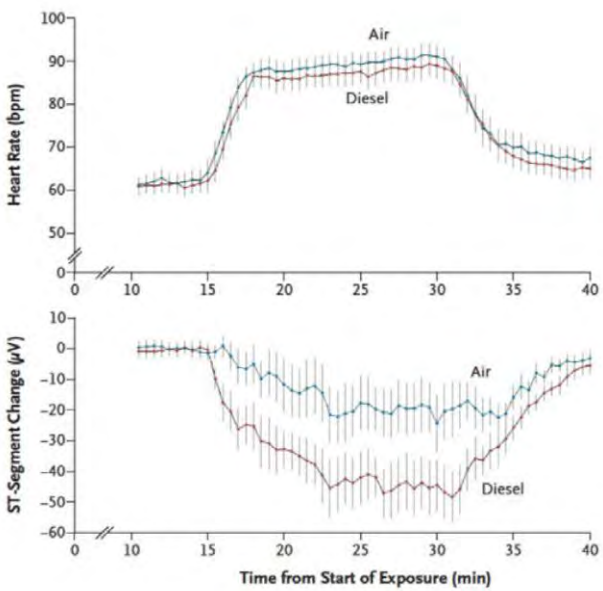
Joshi SS, et al. Heart 2022;108:1267–1273

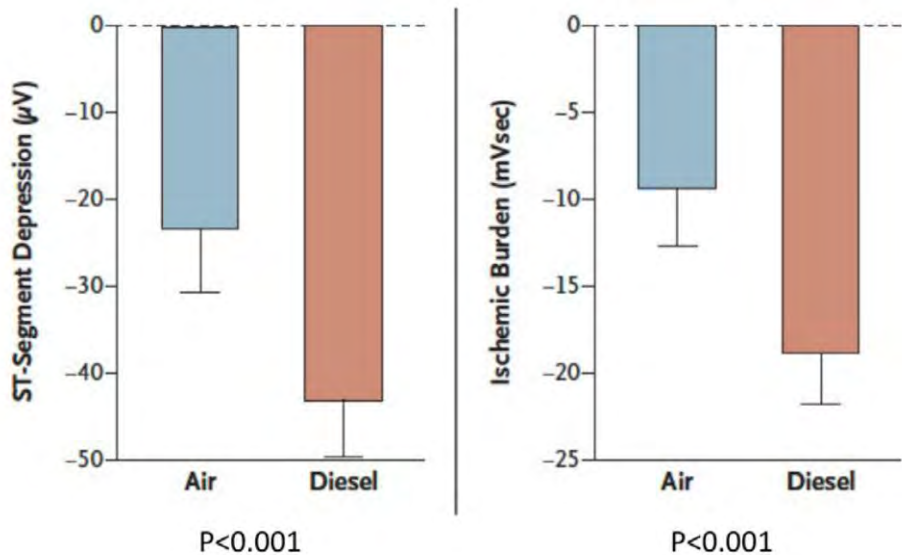
Review

Air pollution and cardiovascular disease: the Paul Wood Lecture, British Cardiovascular Society 2021

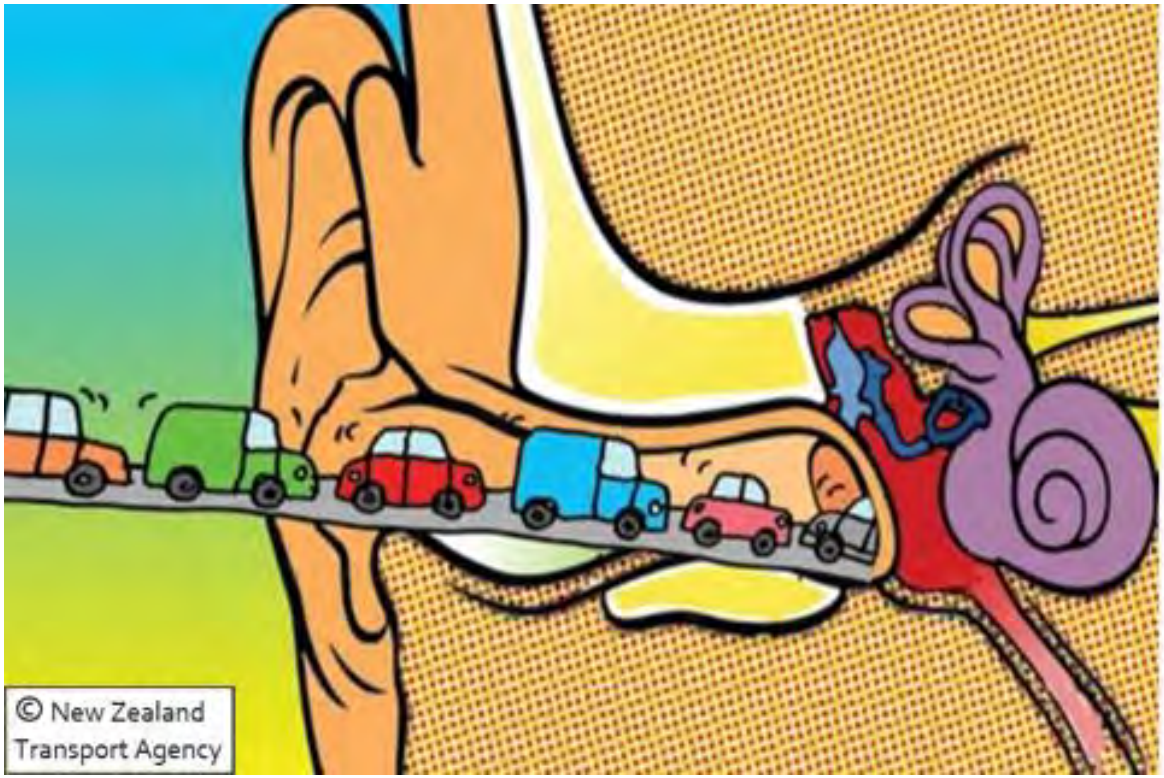
Shruti S Joshi , Mark R Miller, David E Newby

Myocardial ischemia during 15 min intervals of exercise-induced stress and exposure to diesel exhaust or filtered air in the 20 subjects.





Joshi SS, et al. Heart 2022;108:1267–1273



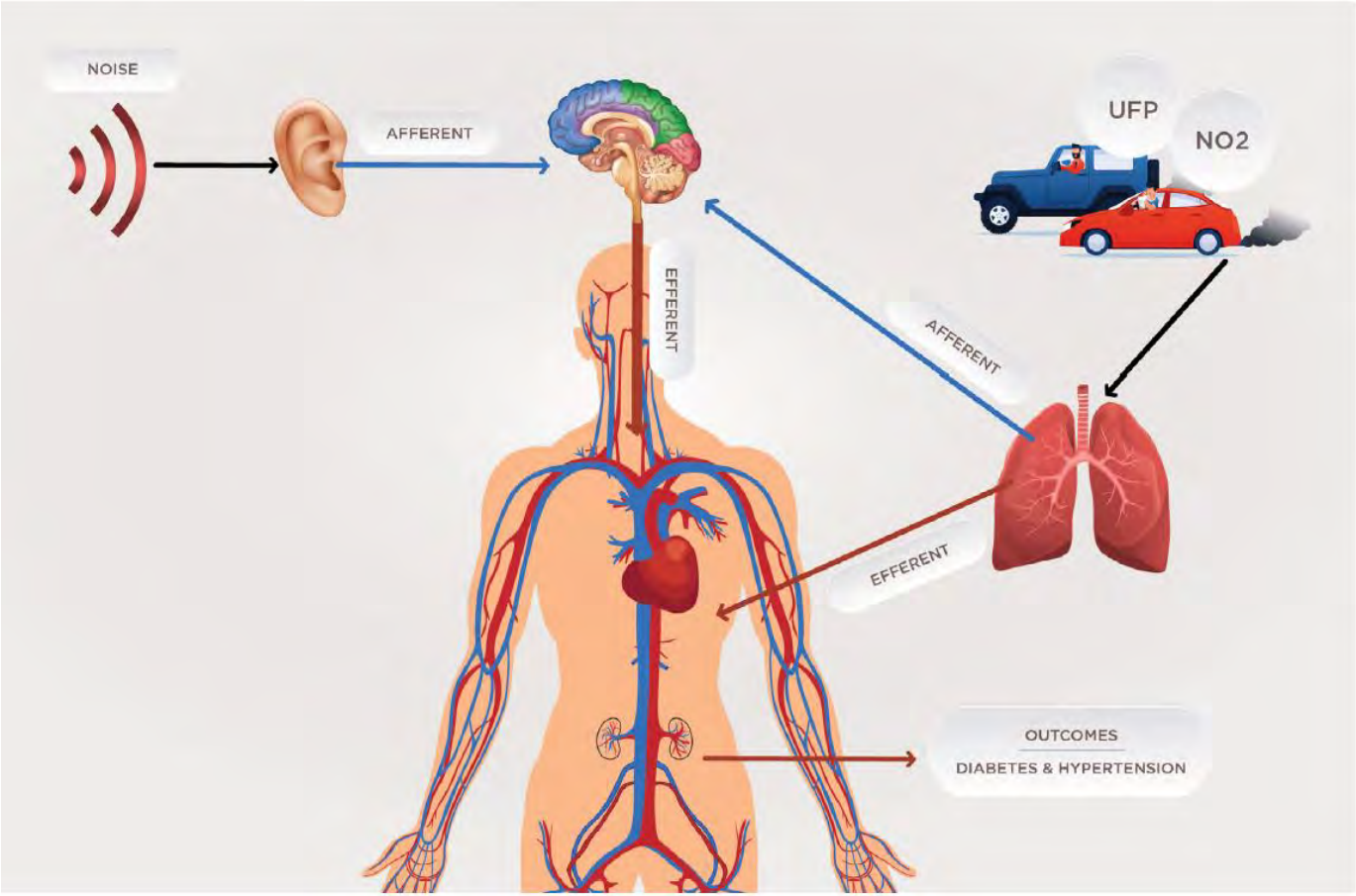
Let's act on road traffic noise

EDITORIAL

American Heart Association.

Environmental Determinants of Hypertension and Diabetes Mellitus: Sounding Off About the Effects of Noise

Mathias Basner, MD, PhD;* Daniel W. Riggs, MS;* Daniel J. Conklin, PhD



J Am Heart Assoc. 2020;9:e016048.

European Heart Journal (2011) 32, 737–744
doi:10.1093/eurheartj/ehq466

CLINICAL RESEARCH
Prevention and epidemiology

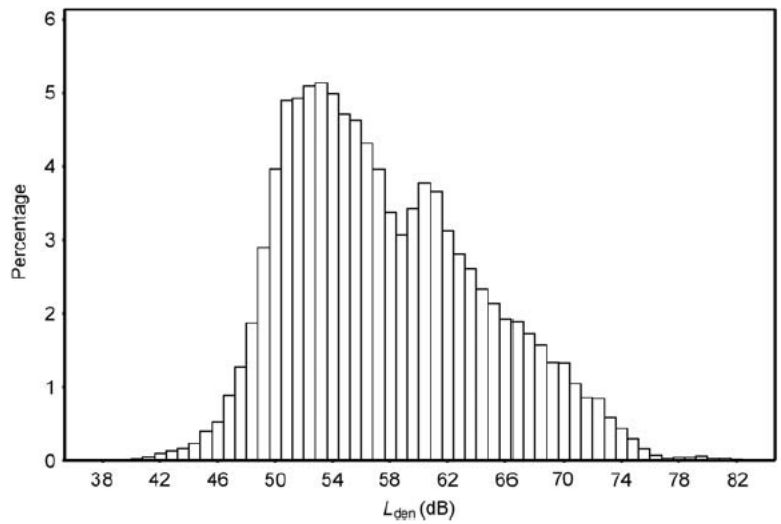
Road traffic noise and stroke: a prospective cohort study

Mette Sørensen[1*], Martin Hvidberg[2], Zorana J. Andersen[1], Rikke B. Nordsborg[1], Kenneth G. Lillelund[3], Jørgen Jakobsen[4], Anne Tjønneland[1], Kim Overvad[5,6†], and Ole Raaschou-Nielsen[1†]

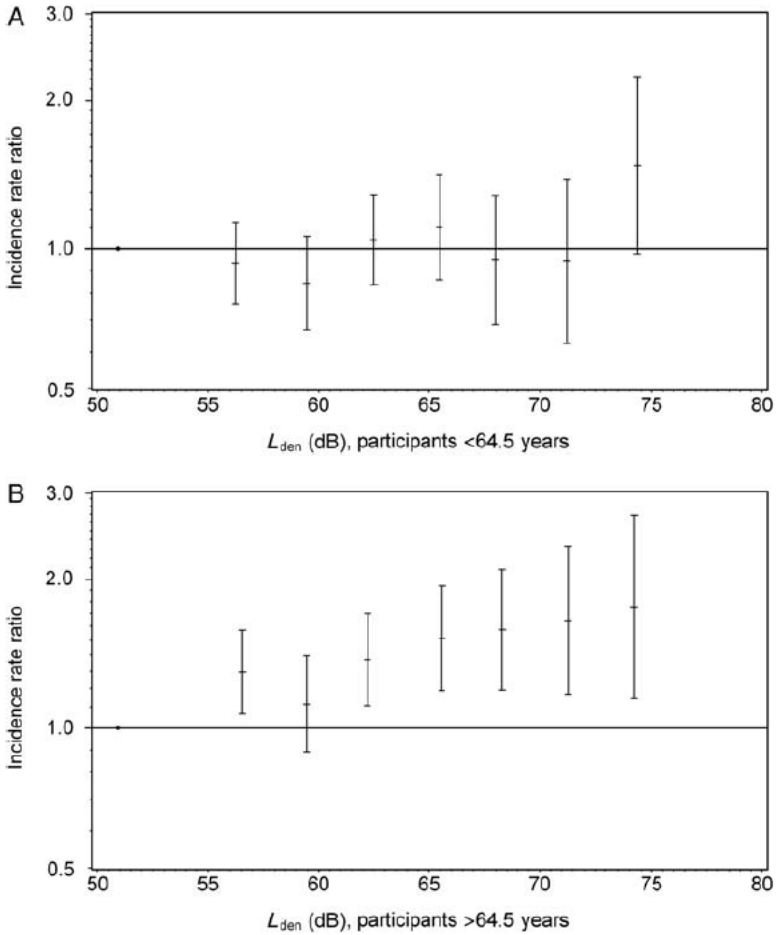
[1]Institute of Cancer Epidemiology, Danish Cancer Society, Strandboulevarden 49, 2100 Copenhagen Ø, Denmark; [2]National Environmental Research Institute, Aarhus University, Roskilde, Denmark; [3]Rambøll Danmark A/S, Aarhus, Denmark; [4]Danish Environmental Protection Agency, Copenhagen, Denmark; [5]Department of Epidemiology, School of Public Health, Aarhus University, Aarhus, Denmark; and [6]Department of Cardiology, Centre for Cardiovascular Research, Aalborg Hospital, Aarhus University Hospital, Aalborg, Denmark

Received 15 April 2010; revised 14 October 2010; accepted 5 November 2010; online publish-ahead-of-print 25 January 2011

Distribution of residential exposure to road traffic noise (L_{den}) at the time of enrolment into the cohort.



Dose-response relationship between exposure to road traffi noise (Lden) and incidence rate ratio for stroke



ORIGINAL RESEARCH

American Heart Association.

Association Between Road Traffic Noise and Incidence of Diabetes Mellitus and Hypertension in Toronto, Canada: A Population-Based Cohort Study

Saeha Shin, MPH;* Li Bai, PhD;* Tor H. Oiamo, PhD; Richard T. Burnett, PhD; Scott Weichenthal, PhD; Michael Jerrett, PhD; Jeffrey C. Kwong, MD, MSc; Mark S. Goldberg, PhD; Ray Copes, MD, MSc; Alexander Kopp, MSc; Hong Chen, PhD

HRs and 95% CIs for the Associations of Incident Hypertension and Diabetes Mellitus With Long-Term Exposure to Road Traffic Noise Using Exposure Categories

Exposure	Model*	HR (95% CI)	
		Diabetes Mellitus	Hypertension
$L_{Aeq,24\ h}$, dBA	≤55 (Reference)	1.00	1.00
	55–60	1.08 (1.06–1.09)	1.04 (1.03–1.06)
	60–65	1.07 (1.01–1.13)	1.03 (1.02–1.04)
	>65	1.12 (1.10–1.13)	1.02 (1.01–1.03)
$L_{Aeq,night}$, dBA	≤45 (Reference)	1.00	1.00
	45–50	1.06 (1.04–1.07)	1.05 (1.04–1.06)
	50–55	1.12 (1.10–1.14)	1.08 (1.06–1.09)
	>55	1.15 (1.14–1.17)	1.05 (1.03–1.06)

J Am Heart Assoc. 2020;9:e013021.

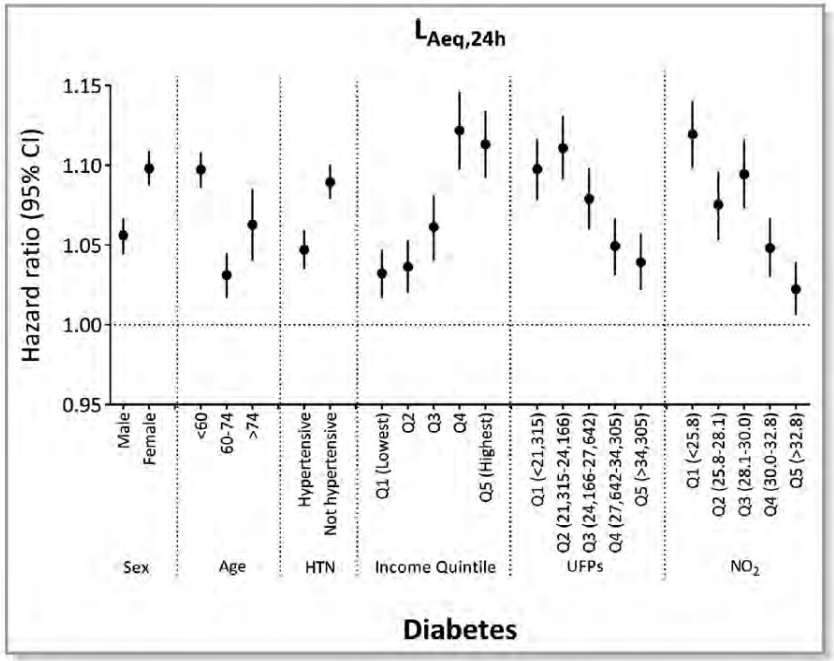
ORIGINAL RESEARCH

American Heart Association.

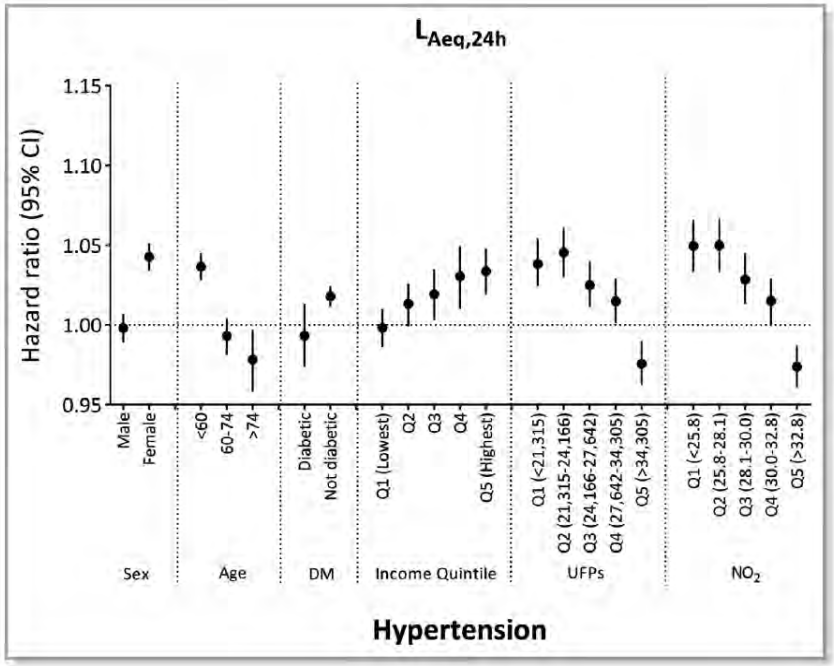
Association Between Road Traffic Noise and Incidence of Diabetes Mellitus and Hypertension in Toronto, Canada: A Population-Based Cohort Study

Saeha Shin, MPH;* Li Bai, PhD;* Tor H. Oiamo, PhD; Richard T. Burnett, PhD; Scott Weichenthal, PhD; Michael Jerrett, PhD; Jeffrey C. Kwong, MD, MSc; Mark S. Goldberg, PhD; Ray Copes, MD, MSc; Alexander Kopp, MSc; Hong Chen, PhD

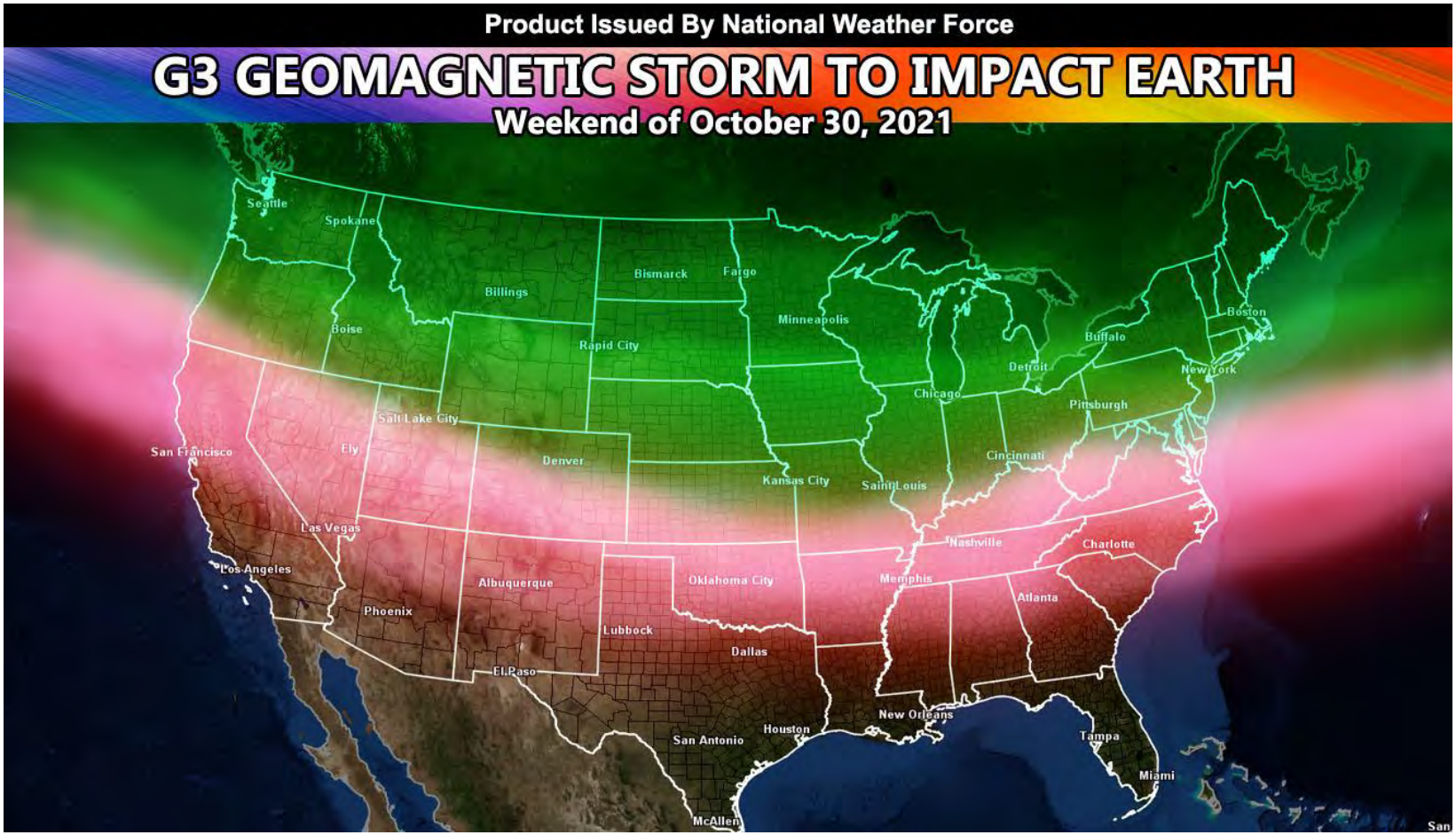
Subgroup analysis for **incident diabetes mellitus** with long-term exposure to road traffic noise by selected individual- and area-level characteristics



Subgroup analysis for **incident hypertension** with long-term exposure to road traffic noise stratified by selected individual- and area-level characteristics and levels of ultrafine particles



J Am Heart Assoc. 2020;9:e013021.


Product Issued By National Weather Force
G3 GEOMAGNETIC STORM TO IMPACT EARTH
Weekend of October 30, 2021
Seattle
Spokane
Billings
Bismarck
Fargo
Minneapolis
Boise
Rapid City
Boston
Buffalo
Detroit
New York
Chicago
Pittsburgh
Salt Lake City
San Francisco
Ely
Denver
Cincinnati
Kansas City
Saint Louis
Las Vegas
Nashville
Charlotte
Los Angeles
Albuquerque
Oklahoma City
Memphis
Atlanta
Phoenix
Lubbock
Dallas
El Paso
New Orleans
Houston
San Antonio
Tampa
Miami
McAllen

Geomagnetic Storms Can Trigger Stroke

Evidence From 6 Large Population-Based Studies in Europe and Australasia

Valery L. Feigin, MD, MSc, PhD; Priya G. Parmar, MSc; Suzanne Barker-Collo, PhD; Derrick A. Bennett, PhD; Craig S. Anderson, MD, PhD; Amanda G. Thrift, BSci (Hons), PhD; Birgitta Stegmayr, PhD; Peter M. Rothwell, MD, PhD; Maurice Giroud, MD, PhD; Yannick Bejot, MD; Phillip Carvil, MSc; Rita Krishnamurthi, PhD; Nikola Kasabov, PhD; for the International Stroke Incidence Studies Data Pooling Project Collaborators

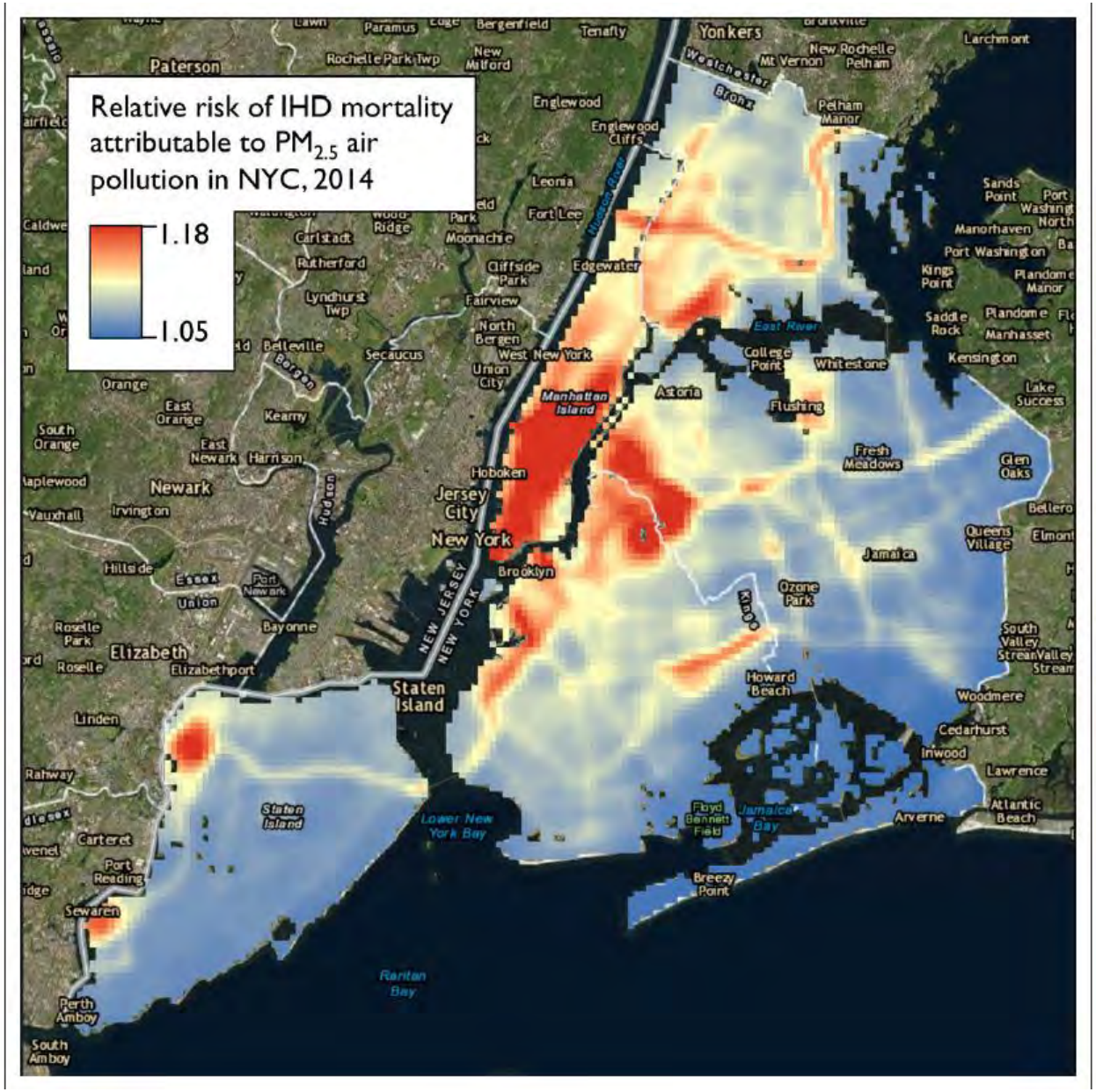
Background and Purpose—Although the research linking cardiovascular disorders to geomagnetic activity is accumulating, robust evidence for the impact of geomagnetic activity on stroke occurrence is limited and controversial.

Methods—We used a time-stratified case-crossover study design to analyze individual participant and daily geomagnetic activity (as measured by Ap Index) data from several large population-based stroke incidence studies (with information on 11 453 patients with stroke collected during 16 031 764 person-years of observation) in New Zealand, Australia, United Kingdom, France, and Sweden conducted between 1981 and 2004. Hazard ratios and corresponding 95% confidence intervals (CIs) were calculated.

Results—Overall, geomagnetic storms (Ap Index 60+) were associated with 19% increase in the risk of stroke occurrence (95% CI, 11%–27%). The triggering effect of geomagnetic storms was most evident across the combined group of all strokes in those aged <65 years, increasing stroke risk by >50%: moderate geomagnetic storms (60–99 Ap Index) were associated with a 27% (95% CI, 8%–48%) increased risk of stroke occurrence, strong geomagnetic storms (100–149 Ap Index) with a 52% (95% CI, 19%–92%) increased risk, and severe/extreme geomagnetic storms (Ap Index 150+) with a 52% (95% CI, 19%–94%) increased risk (test for trend, $P<2\times10^{-16}$).

Conclusions—Geomagnetic storms are associated with increased risk of stroke and should be considered along with other established risk factors. Our findings provide a framework to advance stroke prevention through future investigation of the contribution of geomagnetic factors to the risk of stroke occurrence and pathogenesis. (***Stroke*. 2014;45:1639-1645.**)

Key Words: environment ■ stroke

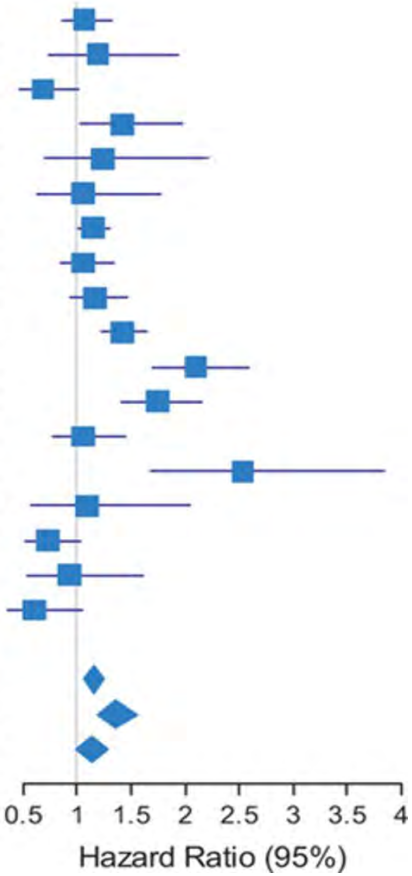


Risk mask prototype showing estimate relative risk of IHD attributable to fine particulates matter air polllution by location in NYC 2014

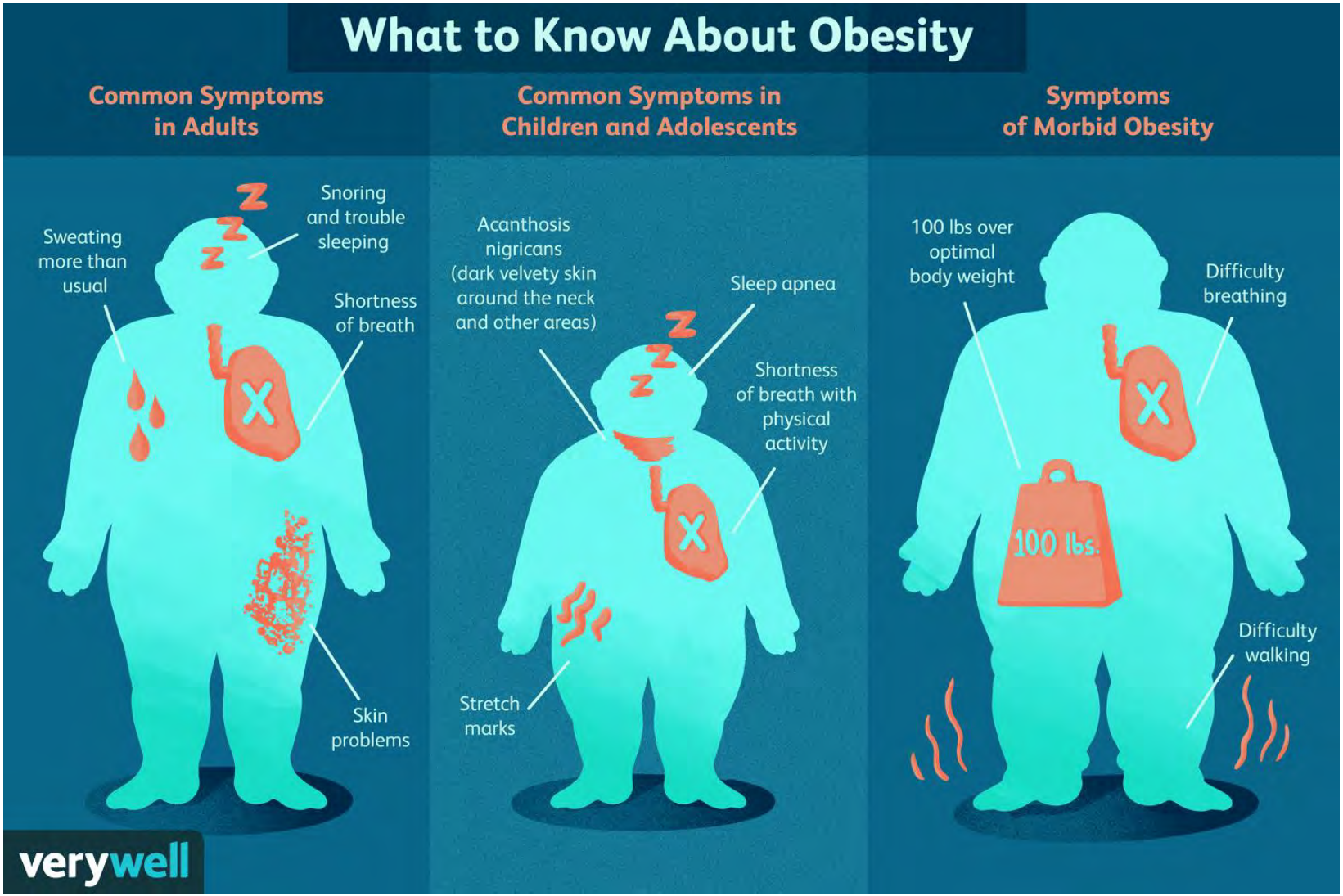
Hadley MH et al, Circulation 2018

Forest plots of stroke occurrence by geomagnetic storm severity by study center.

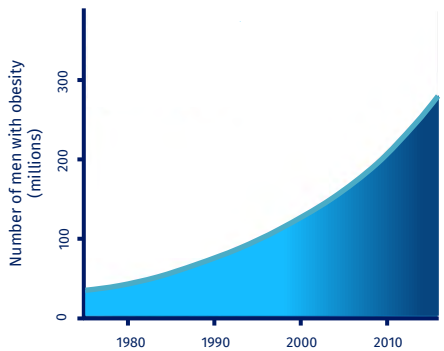
Study City	Geomagnetic Storm Severity	Hazard Ratio	(95% CI)
Dijon	Moderate	1.07	(0.86, 1.32)
	Strong	1.20	(0.74, 1.93)
	Severe/Extreme	0.69	(0.47, 1.00)
Oxfordshire	Moderate	1.42	(1.03, 1.97)
	Strong	1.24	(0.70, 2.21)
	Severe/Extreme	1.06	(0.63, 1.78)
Sweden	Moderate	1.14	(1.01, 1.30)
	Strong	1.06	(0.85, 1.33)
	Severe/Extreme	1.17	(0.94, 1.46)
Auckland	Moderate	1.43	(1.23, 1.65)
	Strong	2.10	(1.70, 2.60)
	Severe/Extreme	1.75	(1.42, 2.16)
Perth	Moderate	1.06	(0.77, 1.46)
	Strong	2.53	(1.68, 3.83)
	Severe/Extreme	1.10	(0.58, 2.05)
Melbourne	Moderate	0.73	(0.52, 1.03)
	Strong	0.94	(0.54, 1.62)
	Severe/Extreme	0.61	(0.35, 1.05)
All cities	**Moderate**	**1.15**	**(1.06, 1.25)**
	Strong	**1.36**	**(1.19, 1.56)**
	Severe/Extreme	**1.13**	**(0.99, 1.29)**

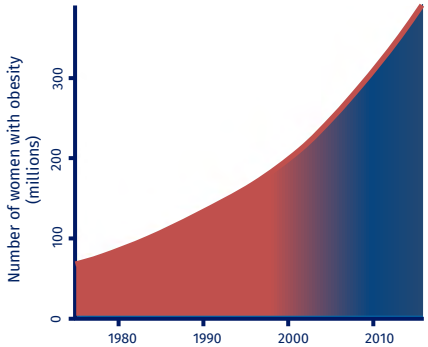


Feigin V L et al. Stroke. 2014;45:1639-1645

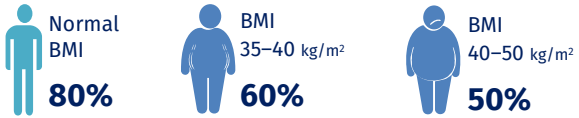

What to Know About Obesity
Common Symptoms in Adults
Sweating more than usual
Snoring and trouble sleeping
Shortness of breath
Skin problems
Common Symptoms in Children and Adolescents
Acanthosis nigricans (dark velvety skin around the neck and other areas)
Sleep apnea
Shortness of breath with physical activity
Stretch marks
Symptoms of Morbid Obesity
100 lbs over optimal body weight
Difficulty breathing
100 lbs.
Difficulty walking
verywell

Obesity is a serious chronic disease

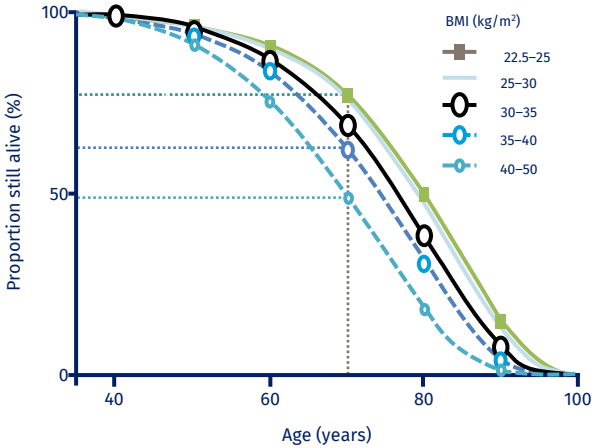




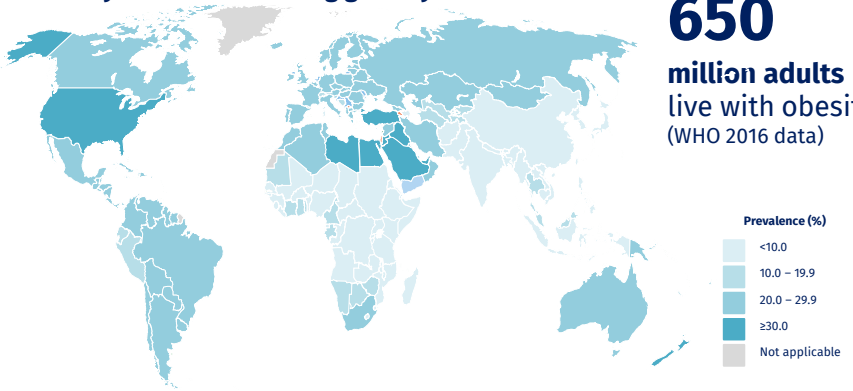
Life expectancy decreases as BMI increases



chance of reaching age 70



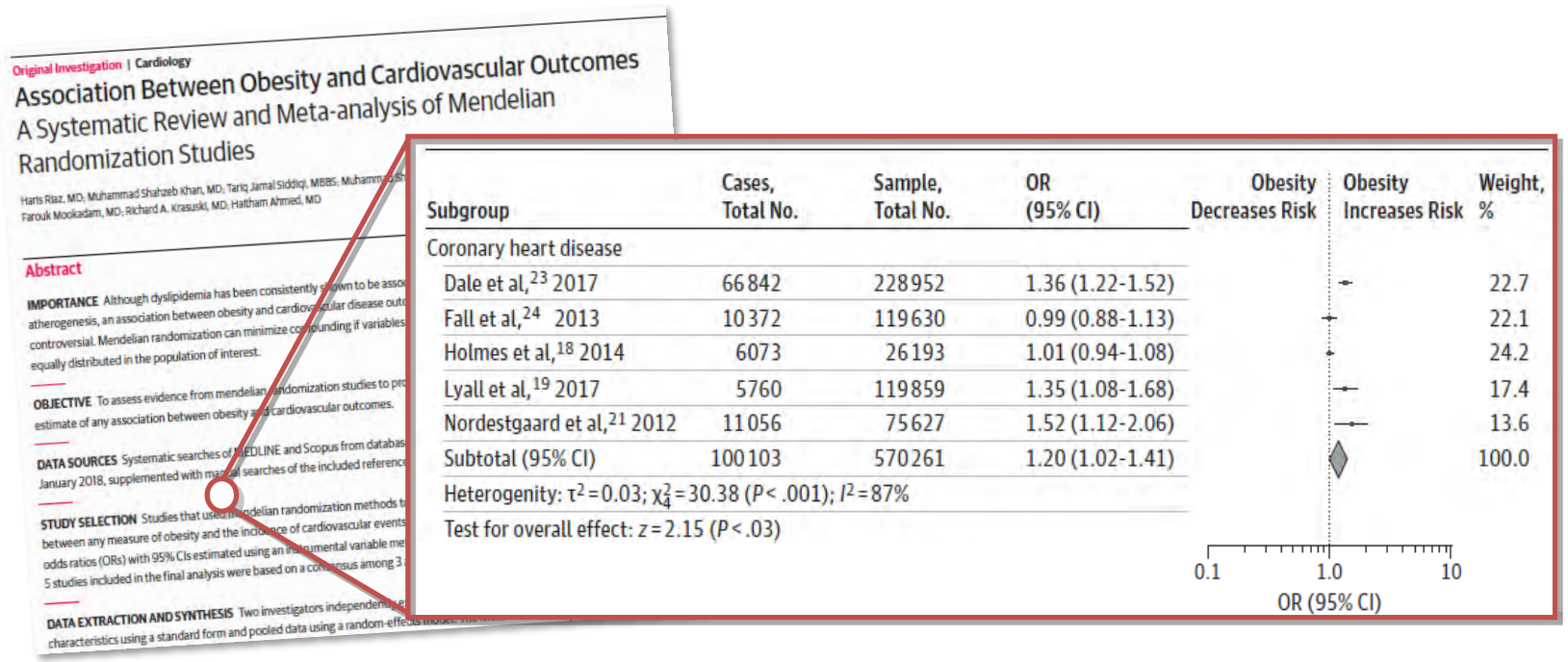
Obesity rates are increasing globally



650
million adults
live with obesity
(WHO 2016 data)

Adapted from NCD Risk Factor Collaboration (NCD-RisC). Lancet 2017:390(Supplement);2627–42; WHO. Global Health Observatory (GHO) data; WHO, Obesity & Overweight; Prospective Studies Collaboration. Lancet 2009;373:1083–96.

Obesity is a risk factor for CVD



Original Investigation | Cardiology

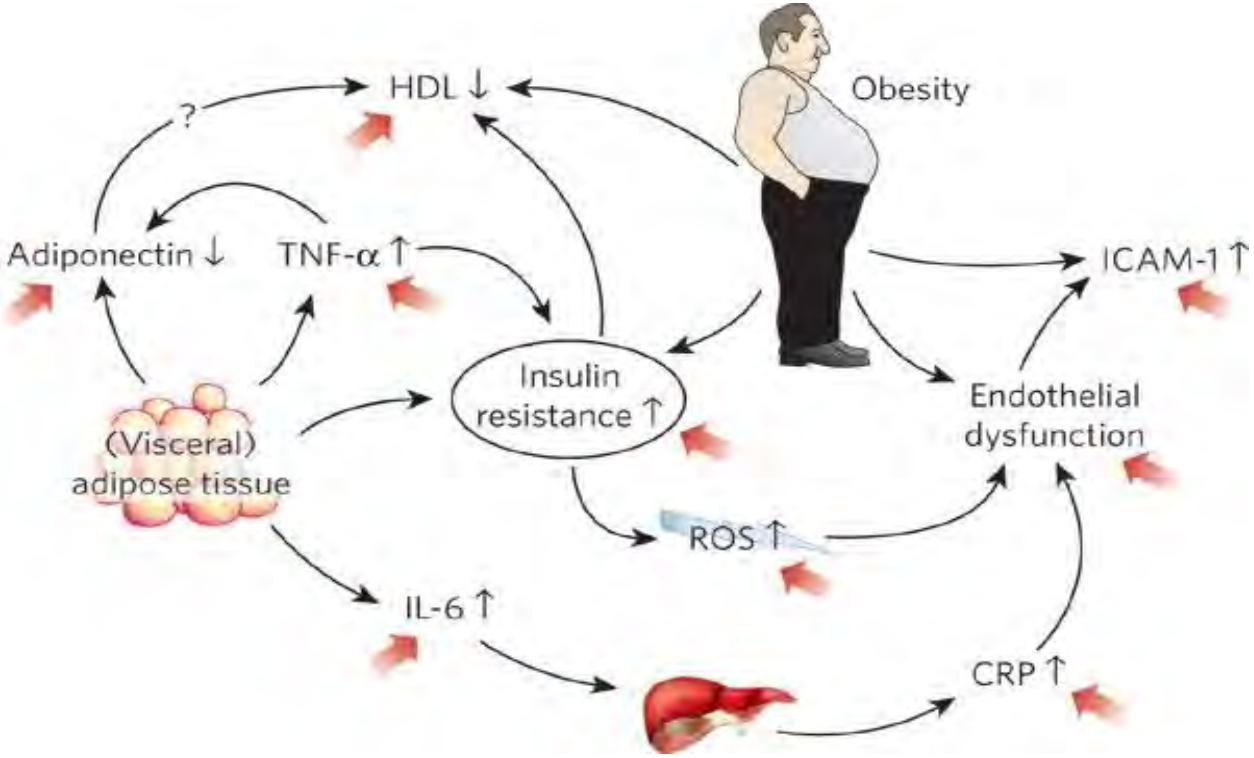
Association Between Obesity and Cardiovascular Outcomes
A Systematic Review and Meta-analysis of Mendelian Randomization Studies

Abstract

Subgroup	Cases, Total No.	Sample, Total No.	OR (95% CI)	Weight, %
Coronary heart disease				
Dale et al,[23] 2017	66 842	228 952	1.36 (1.22-1.52)	22.7
Fall et al,[24] 2013	10 372	119 630	0.99 (0.88-1.13)	22.1
Holmes et al,[18] 2014	6073	26 193	1.01 (0.94-1.08)	24.2
Lyall et al,[19] 2017	5760	119 859	1.35 (1.08-1.68)	17.4
Nordestgaard et al,[21] 2012	11 056	75 627	1.52 (1.12-2.06)	13.6
Subtotal (95% CI)	100 103	570 261	1.20 (1.02-1.41)	100.0
Heterogenity: $\tau^2 = 0.03$; $\chi^2_4 = 30.38$ ($P < .001$); $I^2 = 87\%$				
Test for overall effect: $z = 2.15$ ($P < .03$)				

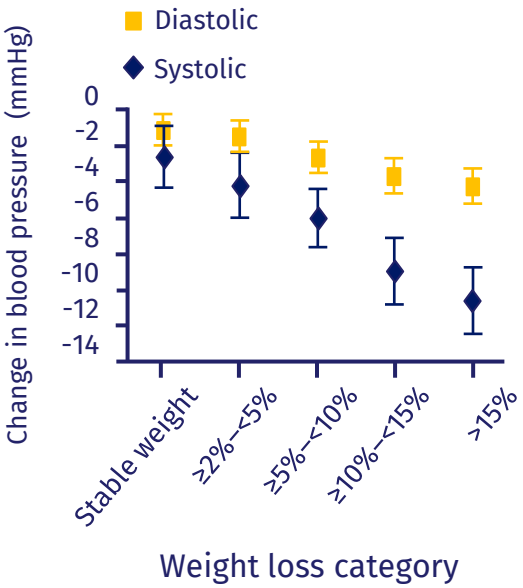
Riaz H et al. *JAMA Netw Open* 2018;1:e183788. doi:10.1001/jamanetworkopen.2018.3788.

CV risk factors associated with abdominal obesity

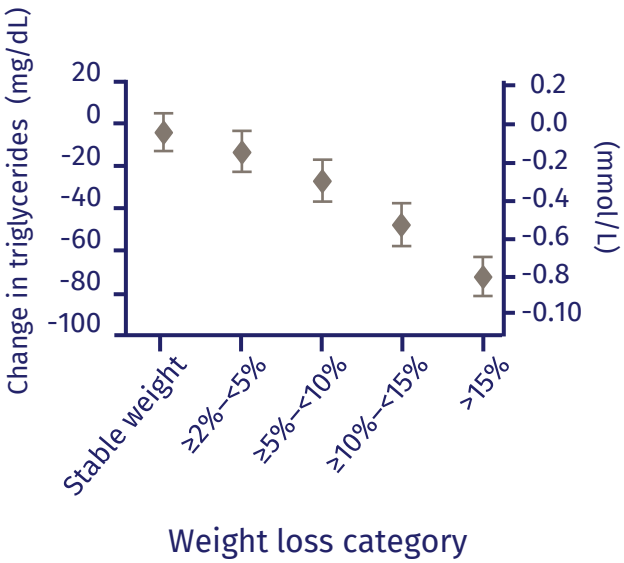


Weight loss leads to improved CV risk markers

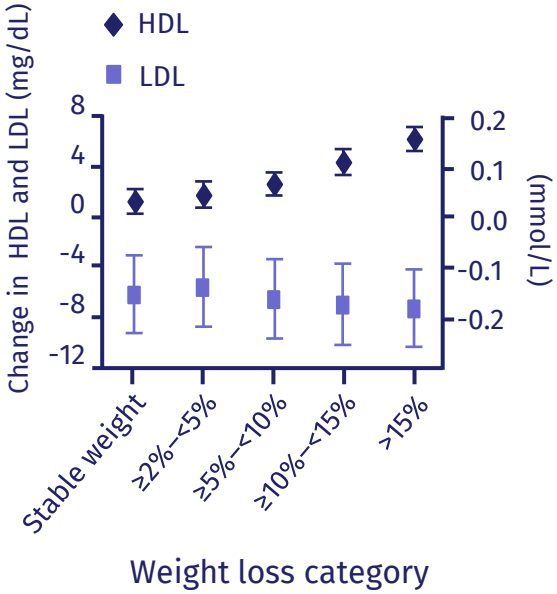
Blood pressure



Triglycerides



HDL and LDL



Data are adjusted least square means and 95% CIs after 1 year. Stable weight = ±2% of baseline weight. p<0.0001 vs. baseline for all categories, except LDL p=0.3614. CI, confidence interval; CVD, cardiovascular disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein.

Wing RR et al. *Diabetes Care* 2011;34:1481–6.

Weight-loss responders have improved CV outcomes

A post-hoc analysis of the Look AHEAD randomised clinical trial

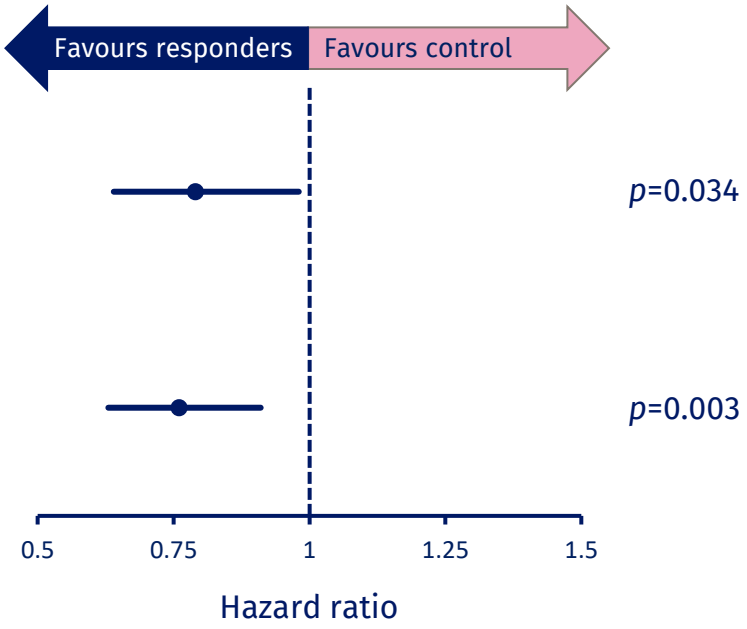
Responder: lost at least 10% of their body weight in the first year of the study

Primary outcome – 21% lower

CV death, non-fatal acute MI, non-fatal stroke, or admission to hospital for angina

Secondary outcome – 24% lower

As above plus CABG, carotid endarterectomy, PCI, hospitalisation for CHF, peripheral vascular disease, or total mortality



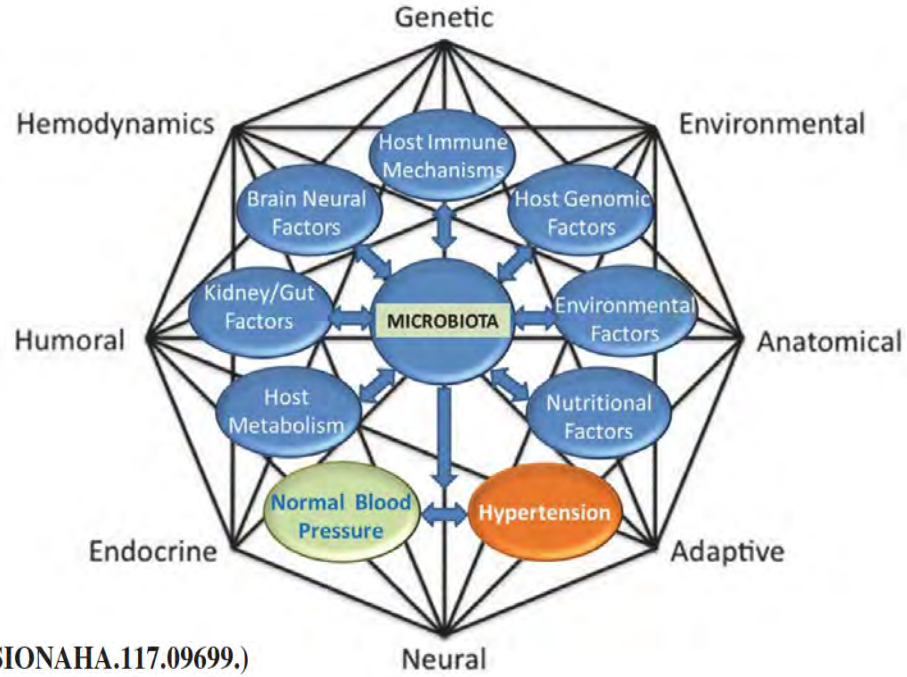
n=4406 participants with T2D to an intensive lifestyle intervention or diabetes support and education. CABG, coronary artery bypass grafting; CHF, congestive heart failure; CV, cardiovascular; MI, myocardial infarction; PCI, percutaneous coronary intervention; T2D, type 2 diabetes.
Look AHEAD Research Group. *Lancet Diabetes Endocrinol* 2016;4:913–921.

Brief Review

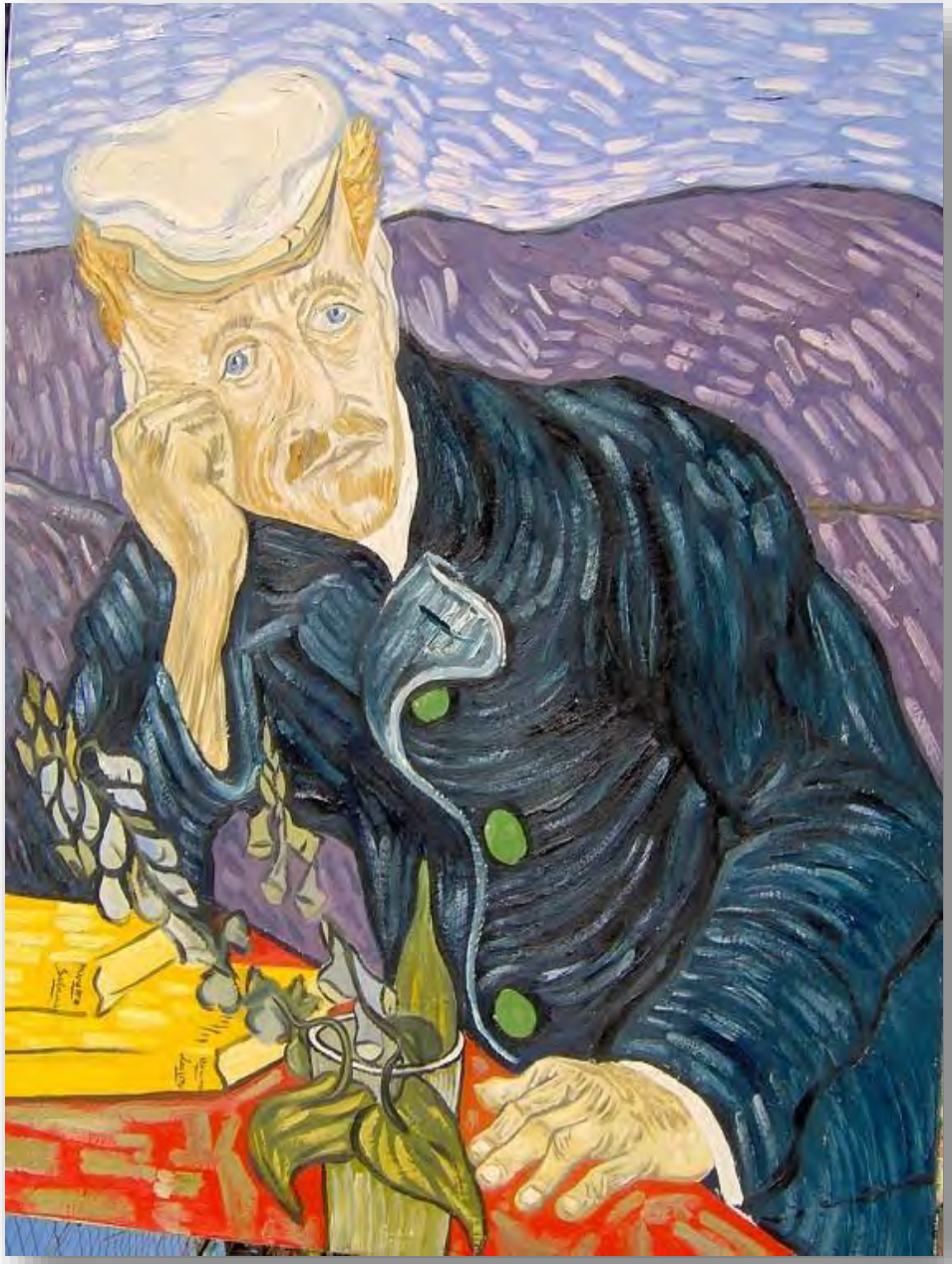
Report of the National Heart, Lung, and Blood Institute Working Group on the Role of Microbiota in Blood Pressure Regulation

Current Status and Future Directions

Mohan K. Raizada, Bina Joe, Nathan S. Bryan, Eugene B. Chang, Floyd E. Dewhirst, Gary G. Borisy, Zorina S. Galis, Wendy Henderson, Pedro A. Jose, Christian J. Ketchum, Johanna W. Lampe, Carl J. Pepine, Jennifer L. Pluznick, Dominic Raj, Douglas R. Seals, Rachel A. Gioscia-Ryan, W.H. Wilson Tang, Young S. Oh



(*Hypertension*. 2017;70:479-485. DOI: 10.1161/HYPERTENSIONAHA.117.09699.)



What we can do?

Moving From Political Declaration to Action on Reducing the Global Burden of Cardiovascular Diseases: A Statement From the Global Cardiovascular Disease Taskforce

J Am Coll Cardiol. 2013;():. doi:10.1016/j.jacc.2013.08.722

Reducing cardiovascular disease through a World Heart Federation global target of 25% by 2025 (6). CVD indicates cardiovascular disease; NCDs, noncommunicable diseases; and WHF, World Heart Federation.

Circulation

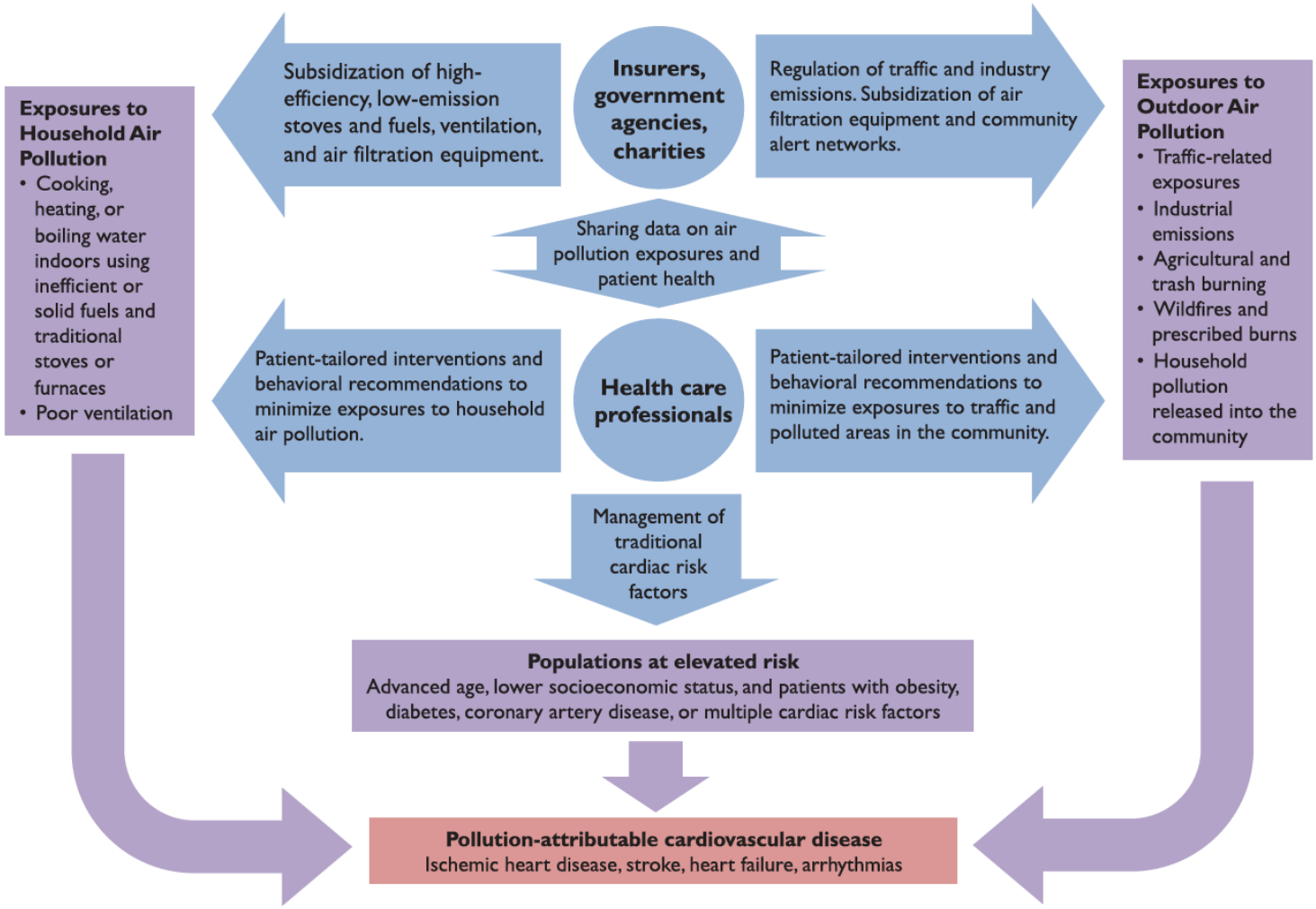
IN DEPTH

Developing a Clinical Approach to Air Pollution and Cardiovascular Health

Michael B. Hadley, MD, MScPH
Jill Baumgartner, PhD
Rajesh Vedanthan, MD, MPH

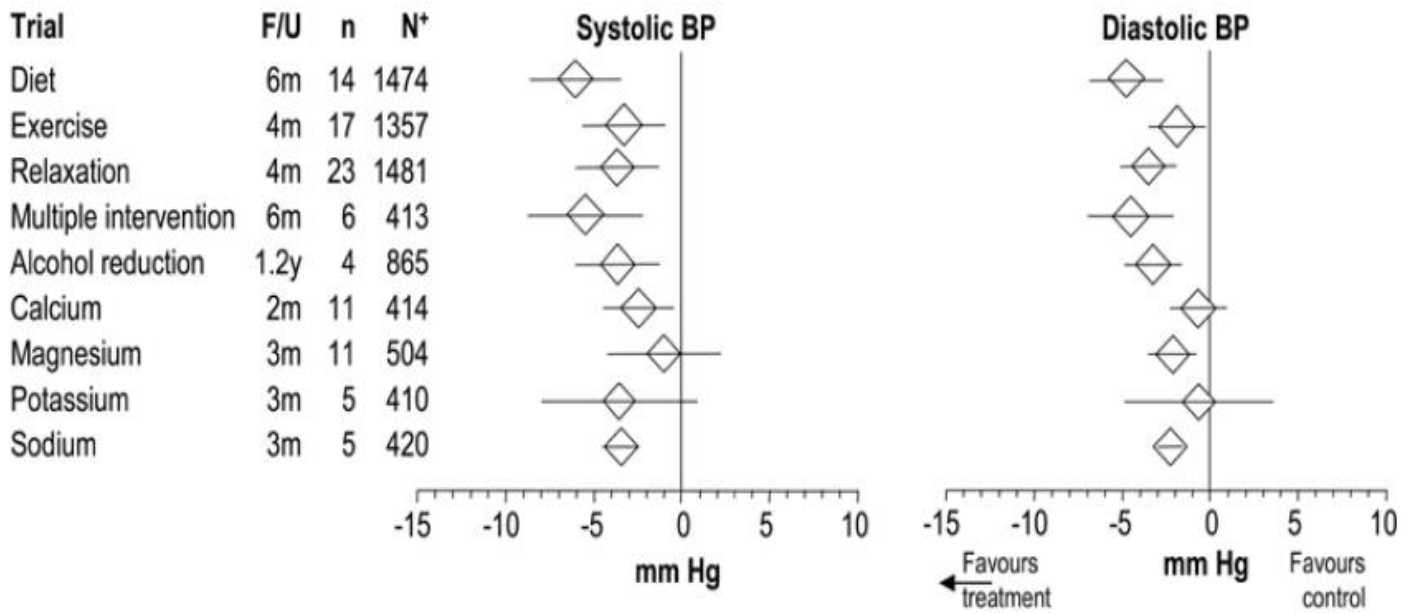
ABSTRACT: Nearly 3 billion people are exposed to household air pollution emitted from inefficient cooking and heating stoves, and almost the entire global population is exposed to detectable levels of outdoor air pollution from traffic, industry, and other sources. Over 3 million people die annually of ischemic heart disease or stroke attributed to air pollution, more than from traditional cardiac risk factors such as obesity, diabetes mellitus, or smoking. Clinicians have a role to play in reducing the burden of pollution-attributable cardiovascular disease. However, there currently exists no clear clinical approach to this problem. Here, we provide a blueprint for an evidence-based clinical approach to assessing and mitigating cardiovascular risk from exposure to air pollution. We begin with a discussion of the global burden of pollution-attributable cardiovascular disease, including a review of the mechanisms by which particulate matter air pollution leads to cardiovascular outcomes. Next, we offer a simple patient-screening tool using known risk factors for pollution exposure. We then discuss approaches to quantifying air pollution exposures and cardiovascular risk, including the development of risk maps for clinical catchment areas. We review a collection of interventions for household and outdoor air pollution, which clinicians can tailor to patients and populations at risk. Finally, we identify future research needed to quantify pollution exposures and validate clinical interventions. Overall, we demonstrate that clinicians can be empowered to mitigate the global burden of cardiovascular disease attributable to air pollution.

Partnerships in the reduction of pollution-attributable cardiovascular disease



Hadley MH et al, Circulation 2018

Effects of different lifestyle changes on blood pressure values



NICE Guidelines, 2011

Nutrition, Metabolism & Cardiovascular Diseases (2021) **31**, 2766–2778

Available online at www.sciencedirect.com

Nutrition, Metabolism & Cardiovascular Diseases

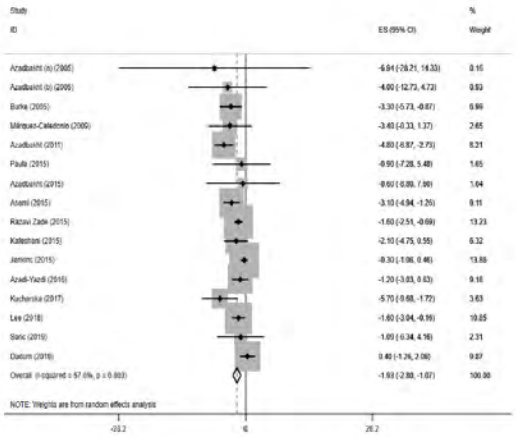
journal homepage: www.elsevier.com/locate/nmcd

SYSTEMATIC REVIEWS AND META-ANALYSES

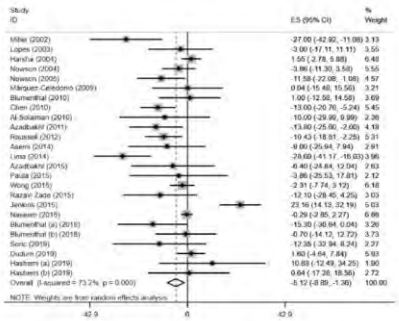
The effects of the Dietary Approaches to Stop Hypertension (DASH) diet on metabolic risk factors in patients with chronic disease: A systematic review and meta-analysis of randomized controlled trials

Abolfazl Lari [a,b,1], Mohammad H. Sohouli [a,c,1], Somaye Fatahi [a,d], Henrique S. Cerqueira [e], Heitor O. Santos [f], Behnaz Pourrajab [b], Mahshid Rezaei [g], Solaleh Saneie [b], Seyedeh T. Rahideh [b,*]

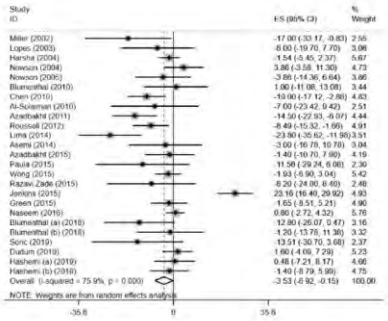
c) WC



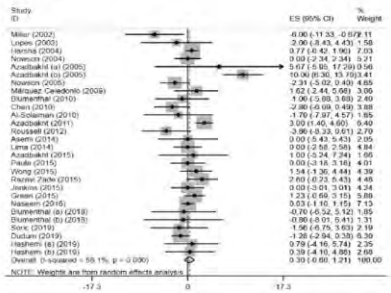
a) TC



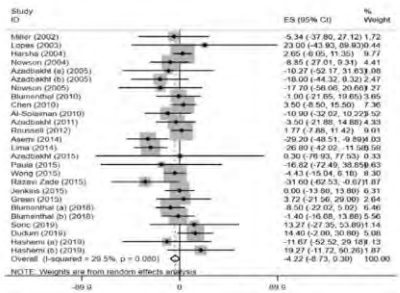
b) LDL-C



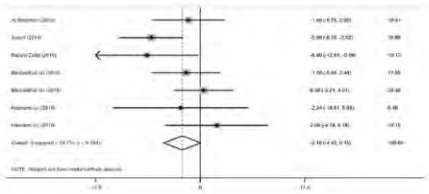
c) HDL-C



d) TG



e) VLDL



To live in a clear environment
To reduce the pollution in the cities
To live far from heavy traffic/heavy noise