



The Powerful Contribution of Primary Care Databases to Epidemiology: A Reflection on the VHM&PP

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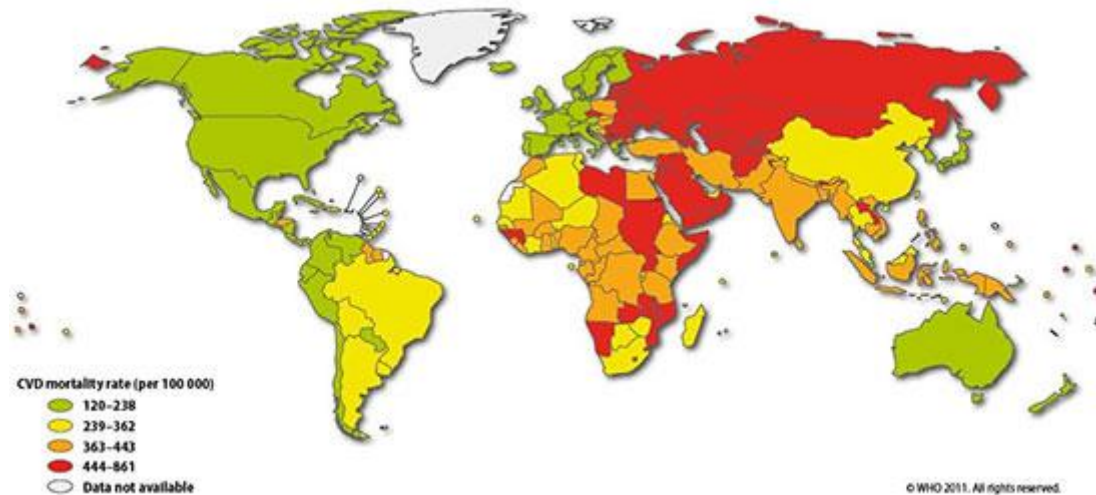
In this talk

- Some general background on Population databases
- A focus on Vorarlberg Health Monitoring & Promotion Programme (VHM&PP)

Introduction

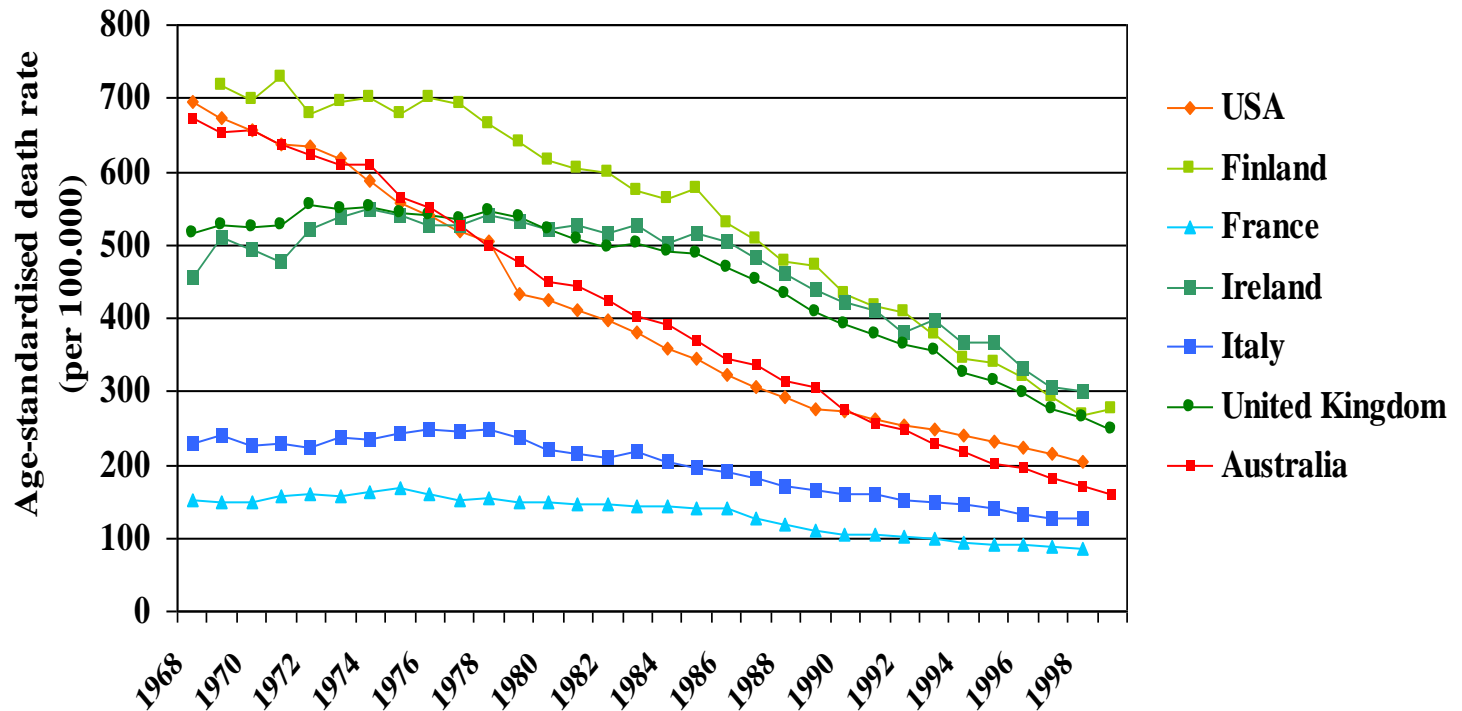
- Global patterns of adult chronic disease present an ongoing challenge
- These patterns are determined across the lifecourse and vary within and between countries
- Large-scale datasets with the power to address long-term outcomes are of continuing major importance
- Linkage data, especially in primary care and related to mortality outcomes are a particularly rich resource

Global Burden of Cardiovascular Diseases



International Context of Downward Trends (* ICD Codes 410-414, 8th/9th Division and 120-125, 10th Revision WHO 2002)

Age-standardised death rates per 100.000 population from CHD*, men 1968-1999,
selected countries



Potential uses of Large-scale Data

- Descriptive research of natural history and epidemiology
- Surveillance purposes
- Monitoring of routine management protocols
- Assessment of impact of health promotion policy Interventions

Birth cohort evidence of population influences on blood pressure in the United States, 1887-1994

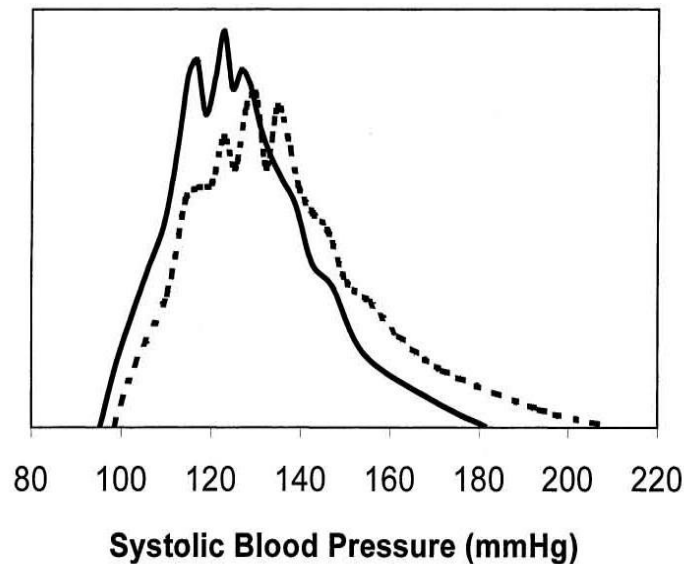
Goff DC, Howard G, Russel GB, Labarthe DR. AEP Vol. 11, No. 4 May 2001: 271-279.

AEP Vol. 11, No. 4
May 2001: 271-279

Goff et al.
PRIMARY PREVENTION OF HIGH BLOOD PRESSURE

277

FIGURE 3. The estimated systolic blood pressure (SBP) distributions for 50-year-old persons born in 1910 and in 1940. The models used to derive these estimates included the following independent variables: age, age², birth-year, age*birth-year, and age²*birth-year.



SCORE estimates of CVD risk

1: [Eur Heart J. 2003 Jun;24\(11\):987-1003.](#)

[Related Articles, Links](#)

Comment in:

- [Eur Heart J. 2003 Nov;24\(22\):2070-1; author reply 2071.](#)
- [Eur Heart J. 2004 Apr;25\(7\):619; author reply 620.](#)

FREE full text article at
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Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project.

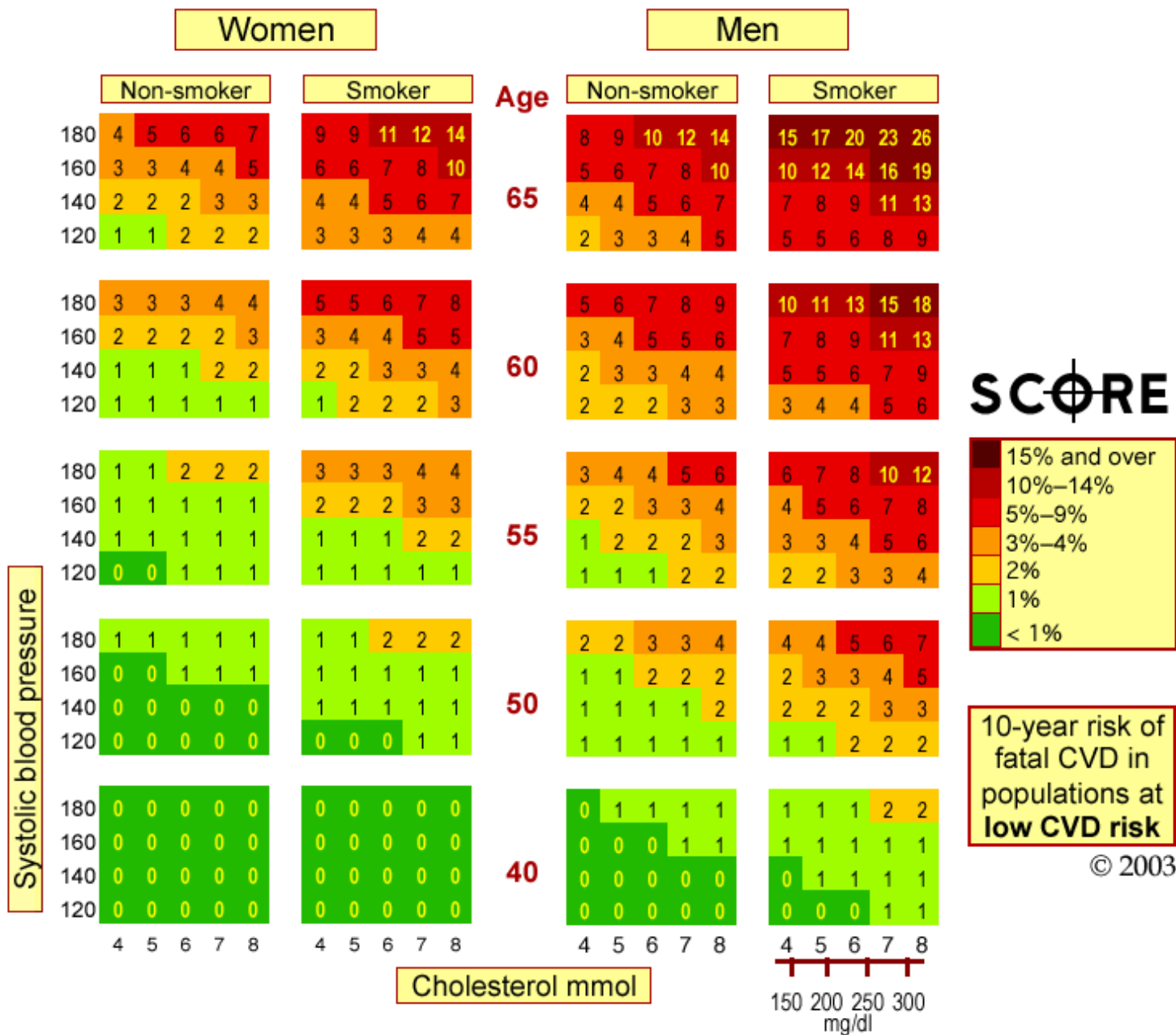
Conroy RM, Pyorala K, Fitzgerald AP, Sans S, Menotti A, De Backer G, De Bacquer D, Ducimetiere P, Jousilahti P, Keil U, Njolstad I, Oganov RG, Thomsen T, Tunstall-Pedoe H, Tverdal A, Wedel H, Whincup P, Wilhelmsen L, Graham IM; SCORE project group.

Department of Epidemiology & Public Health Medicine, Royal College of Surgeons in Ireland, Dublin, Ireland.

European Guidelines on CVD Prevention 2012

Countries at *low risk* using SCORE risk chart include Austria, Belgium, France, Ireland, Spain, United Kingdom

Parameters needed to assess SCORE are gender, age, smoking habits, blood pressure and total cholesterol (mmol/l)



Thrombosis Prevention Trial

Lancet 1998; 351: 233-241

5499 men at high risk of IHD recruited from 108 practices in the MRC GPRF. Allocation to Warfarin, Aspirin, the combination or placebo.

WA reduced events by 39% compared to Placebo.

These results add evidence that Aspirin reduces non-fatal IHD. Warfarin reduced all IHD chiefly because of an effect on fatal events.

ARTICLES

Articles

Thrombosis prevention trial: randomised trial of low-intensity oral anticoagulation with warfarin and low-dose aspirin in the primary prevention of ischaemic heart disease in men at increased risk

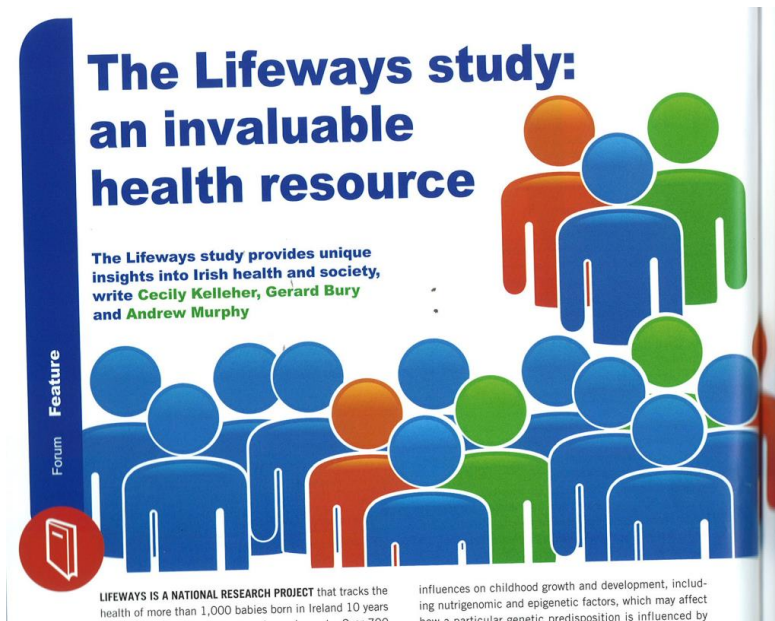
*The Medical Research Council's General Practice Research Framework**



Lifeways Cross-Generation Study of a Thousand Families in the Republic of Ireland 2001-2017

Aims:

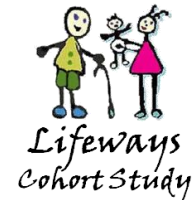
- Determine health status, diet and lifestyle in families
- Establish patterns and links across generations
- Document primary care utilisation patterns across the social spectrum and across generations



Lifeways: Three Year olds follow-up in General Practice

Fitzsimon et al, IMJ 2007

“In logistic regression models, based on quartiles of intake, which adjusted for maternal lifestyle and socio-economic circumstances, relatively higher maternal fruit and vegetable intake and oily fish consumption were associated with lower risk of children developing asthma.”



Mothers' Dietary Patterns during Pregnancy and Risk of Asthma Symptoms in Children at 3 Years

N Fitzsimon¹, U Fallon¹, D O'Mahony¹, BG Loftus², G Bury³, AW Murphy⁴, CC Kelleher¹

For the Lifeways Cross Generation Cohort Study Steering Group

¹UCD School of Public Health and Population Science

²Department of Paediatrics, National University of Ireland, Galway

³General Practice, UCD School of Medicine and Biomedical Sciences

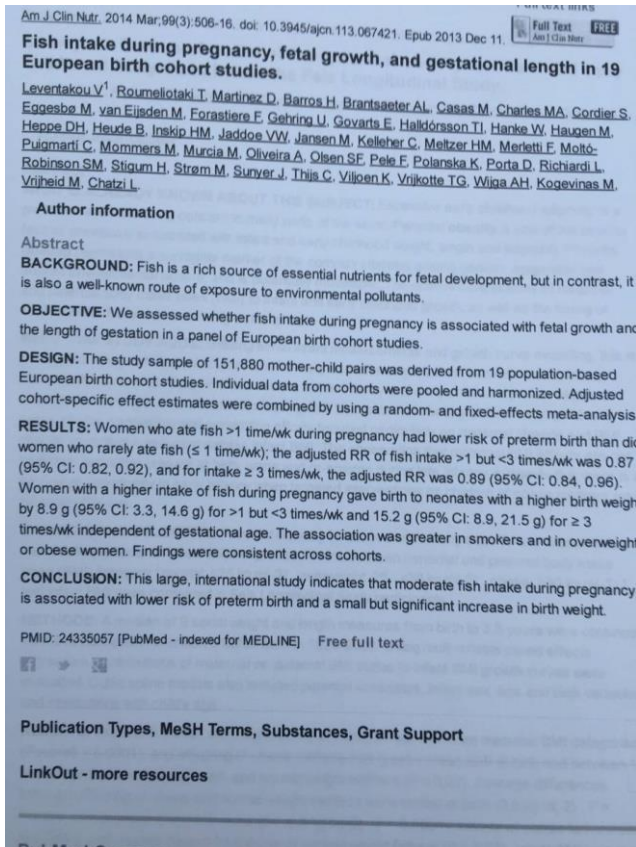
⁴Department of General Practice, National University of Ireland, Galway

Abstract

There is increasing evidence that dietary factors in early life play a role in the aetiology of childhood asthma. Our objective in this analysis was to assess whether maternal dietary patterns during pregnancy, as measured by a validated food frequency questionnaire, influenced general practitioner diagnosis of asthma by the age of 3 years in the Life-ways cohort of children. General Practice follow-up records were available for 631 of 1001 singleton children, twins having been excluded (63% follow-up rate). Overall 10.4% of children had diagnosed asthma, a prevalence rate comparable with other studies. In logistic regression models, based on quartiles of intake, which adjusted for maternal lifestyle and socio-economic circumstances, relatively higher maternal fruit and vegetable intake and oily fish consumption were associated with lower risk of children developing asthma, whilst those with relatively higher spreadable fat intake had a higher risk of asthma. These findings warrant further investigation as they imply an important role for maternal diet in childhood asthma, though the confounding effect of other social and lifestyle factors should be assessed as the children get older.

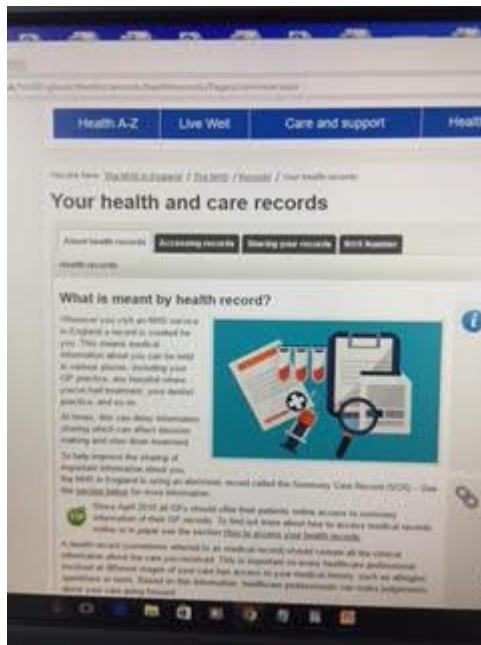
Fish intake and Birth Outcomes

Sonnenschein-van der Voort et al 2014, J Allergy Clin Immunol 133: 1317-29



- Meta-analysis of 147,252 children of 31 birth cohort studies
- Women who eat fish more than once a week during pregnancy had lower risk of preterm birth
- Moderate fish intake during pregnancy is associated with lower risk of preterm birth and a small but significant increase in birth weight

Data access and sharing in the UK NHS



Each NHS visit experience is held in a Summary Care Record (SCR)

Since April 2015 all GPs should offer their patients online access to summary information

Only authorised healthcare professionals can access SCR

One can opt out at any time by filling an opt out form

Evolution of primary care databases in UK

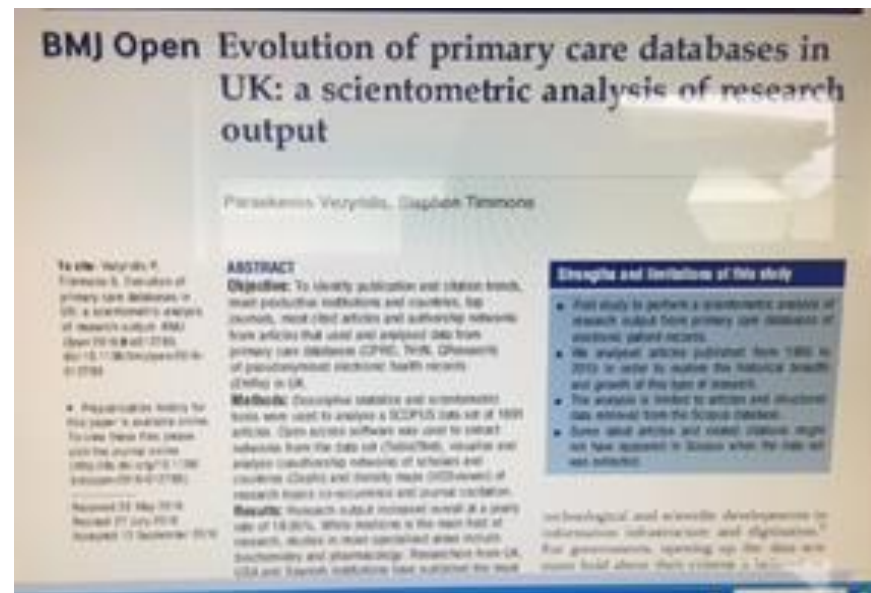
Vezyridis and Timmons BMJ Open 2016; 6(10):e012785

UK databases include:

CPRD (formerly known as the General Practice Research Database)

The Health Improvement Network (THIN)

Qresearch



Evolution of primary care databases

Vezyridis and Timmons BMJ Open 2016; 6(10):e012785

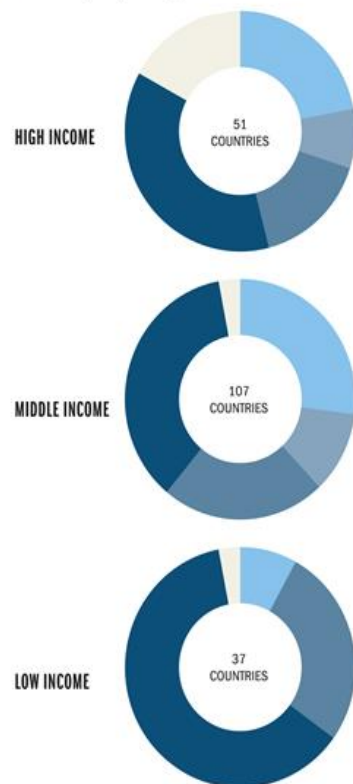
- Big data (analytics) refer to the aggregation and interrogation of-high volume, high velocity, high variety-data sets so as to reveal new, non obvious information and patterns
- In the UK, big data have been at the forefront of research activity and policy-making, termed as one of the eight great technologies
- These population based databases contain data originating from routine general practice
- They include good information on morbidity and lifestyle, prescribing, preventive care and inter-practice variation.
- Since they are continuously and automatically updated, they are ideal for researchers to monitor healthcare trends and effectiveness of new interventions and treatments, at minimum cost

The Tobacco Atlas 2015

SMOKE-FREE LEGISLATION BY INCOME LEVEL; HIGH, MIDDLE, LOW INCOME COUNTRIES, 2012

NUMBER OF PUBLIC PLACES COMPLETELY SMOKE-FREE:

- All (or at least 90% of the population covered by complete subnational smoke-free legislation)
- Six to seven
- Three to five
- Up to two
- Data not reported/not categorized



Source: tobaccoatlas.org

FIFTH EDITION

Revised, Expanded, and Updated

THE TOBACCO ATLAS



tobaccoatlas.org

Michael Eriksen
Judith Mackay
Neil Schluger
Farhad Islami Gomehtapeh
Jeffrey Drope



AUSTRIA: New tobacco control law adopted

World Tobacco Control Framework

Date of publication:

3 August 2015

The Austrian Parliament has imposed a complete smoking ban in all Austrian restaurants and other food providers and will be enforced beginning on 1 May 2018. Besides that, incentives of a fiscal premium of 30 percent for effected conversion investments are provided if companies switch prior to 1 July 2016. As of May 2016, the smoking ban also includes water pipes, e-cigarettes and traditional tobacco products.

With the beginning of May 2018, there is an exception for hotels to provide strictly separated smoking rooms for guests, given the generally long duration of hotel stays, but however, bringing, serving and/or consuming food and/or beverages is prohibited at all.

Prior to this ban, a partial ban on tobacco smoking was in place in Austria since 2009.

If the law is violated, for smokers fines of up to 100 Euros (and of up to EUR 1.000 in the event of recurrence) will be applied, whereas for owners the fine can be up to 2.000 Euros or up to 10.000 Euros in the event of recurrence.

Updated Review 2016

Legislative smoking bans for reducing harms from secondhand smoke exposure, smoking prevalence and tobacco consumption (Review)

Frazer K, Callinan JE, McHugh J, van Baarsel S, Clarke A, Doherty K, Kelleher C



**THE COCHRANE
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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library*
2016, Issue 2

<http://www.thecochranelibrary.com>

WILEY

Legislative Smoking Bans

Frazer K, Callinan JE, McHugh J, van Baarsel S, Clarke A, Doherty K, Kelleher C.
Cochrane Database Syst Rev. 2016 Feb 4;2:CD005992

PICO

- **Population:** Smokers and non-smokers
- **Intervention:** Comprehensive or partial smoking bans implemented by legislation
- **Comparison:** No bans
- **Outcomes:** health outcomes associated with second-hand smoke exposure. Active smoking, tobacco consumption

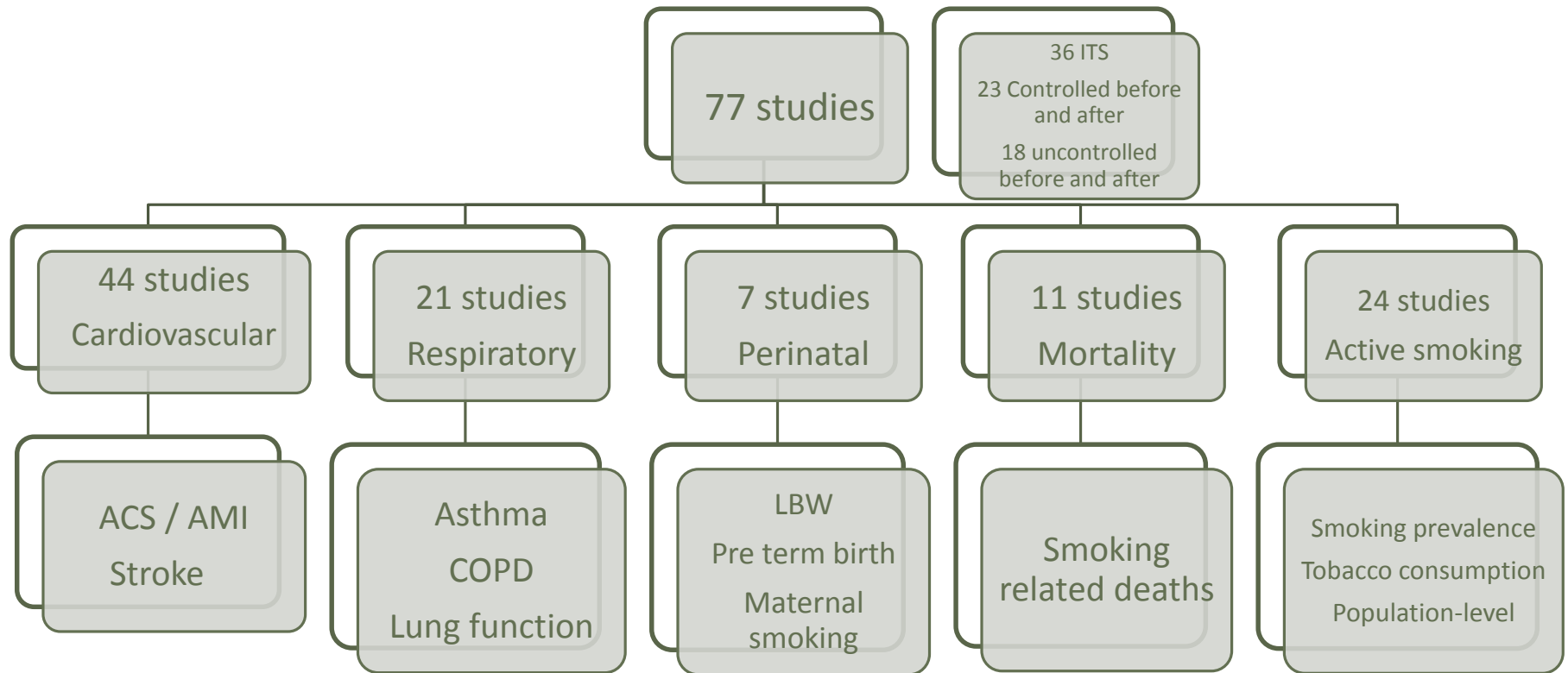
Eligibility Criteria

- Settings: Country, Region or State
- Minimum standard was having indoor smoking ban explicitly stated in the study
- 6 months follow up period
- Measured health outcomes
- Population smoking prevalence rates

Legislative Smoking Bans

Frazer K, Callinan JE, McHugh J, van Baarsel S, Clarke A, Doherty K, Kelleher C.
Cochrane Database Syst Rev. 2016 Feb 4;2:CD005992

A number of studies provided evidence for multiple outcomes



Key Message

Frazer K, Callinan JE, McHugh J, van Baarsel S, Clarke A, Doherty K, Kelleher C.
Cochrane Database Syst Rev. 2016 Feb 4;2:CD005992

Introduction of a legislative smoking ban leads to improved health outcomes through a reduction in second-hand smoke exposure for countries and their populations

European Health Risk Monitoring Project

National Principal Investigators (NPI) and other contributors

Austria: Günter Diem (NPI), Hanno Ulmer; aks, Arbeitskreis für Vorsorge- und Sozialmedizin, Bregenz

Ireland: Cecily Kelleher (NPI); University College Galway, Sharon Friel; National University of Ireland, Galway





Examples of VHM & PP analyses

- Tracking of Risk Factors for CVD over time
- Secular and Cohort trends in Risk Factors over time
- Gender differences in Lifecourse risk for men and women in relation to risk factor exposures
- Novel application of routinely measured parameters as biomarkers for risk (e.g. Serum Uric Acid and GGT)

Tracking of CVD Risk Factors in Adults

45,4448 standardised
examinations between
1985-1999.

All CVD risk factors
showed significant
tracking over time.

Effects were most
marked for Body Mass
Index (0.87 in Men and
0.89 in women)

Largest study yet to
demonstrate significant
tracking in adults of CVD
risk factors

PubMed

Format: Abstract

Eur Heart J. 2003 Jun;24(11):1004-13.

Long-term tracking of cardiovascular risk factors among men and women in a large population-based health system: the Vorarlberg Health Monitoring & Promotion Programme.

Ulmer H¹, Kelleher C, Diem G, Concin H.

Author information

The role of GGT as a predictor of incident Diabetes

These results provide clear evidence of a positive, independent association between high GGT and incident diabetes expressed by fasting hyperglycaemia, being markedly stronger in older individuals. No significant interaction of GGT with BMI

*Ulmer et al, Eur Heart J
2008; 29(Suppl): 477*

The role of gamma-glutamyltransferase as a predictor of incident diabetes in a cohort of 98,059 men and women

Hanno Ulmer¹, Cecily C. Kelleher², Hans Concini³, Guenter Diem⁴, Larry J. Brant⁴, Alexander M. Strasak¹, Monika Lechleitner⁵, Elfriede Ruttmann⁶

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GESUNDHEITSÖKONOMIE

Why Eve is not Adam

Patterns of cholesterol levels showed marked differences between men and women in relation to age and cause of death.

The role of high cholesterol in predicting death from CHD could be confirmed in men of all ages and in women >50 years old.

Low cholesterol occurs even among younger respondents and is not a marker for frailty of age.

PubMed

Format: Abstract

Full text links

Mary Ann Liebert

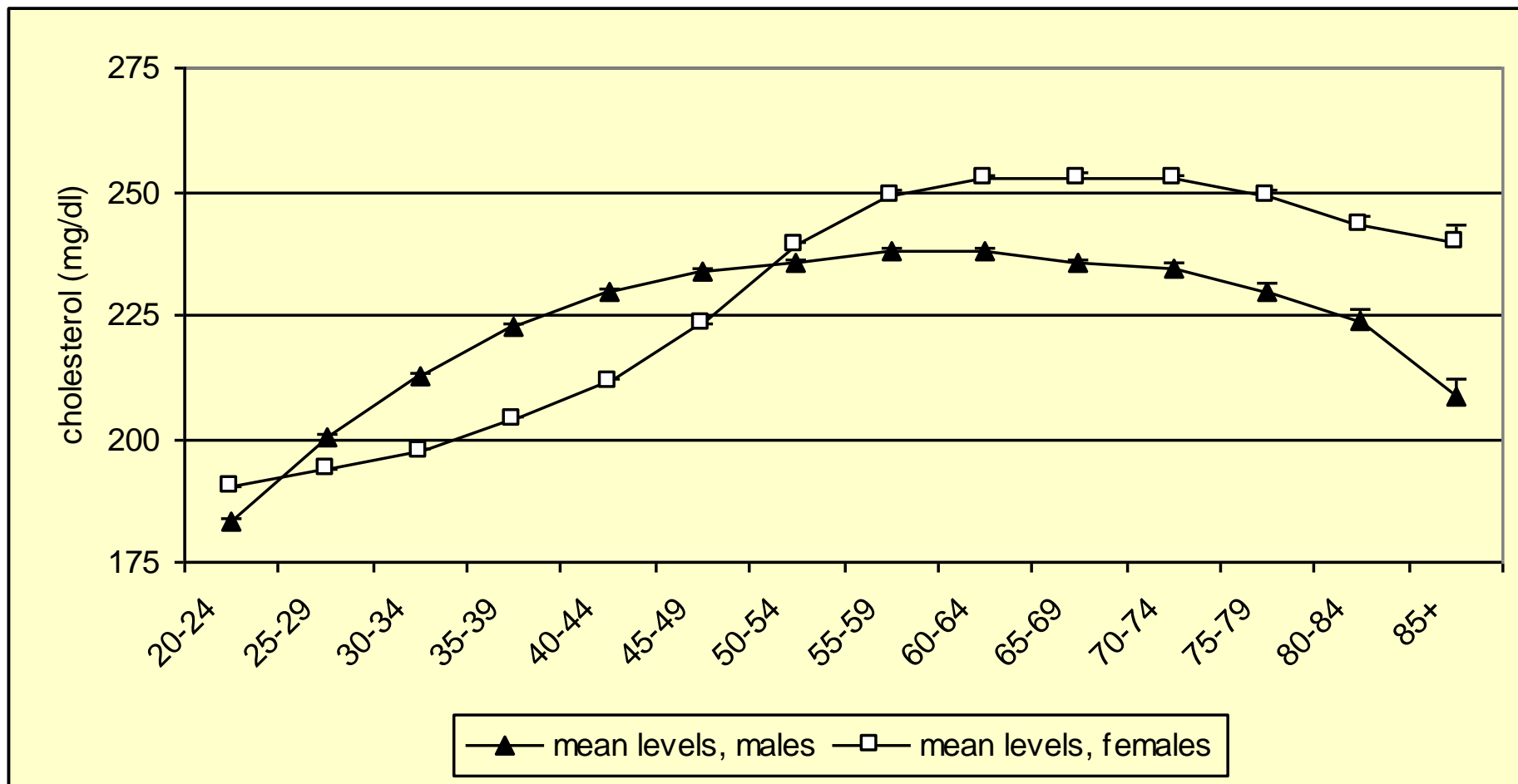
J Womens Health (Larchmt). 2004 Jan-Feb;13(1):41-53.

Why Eve is not Adam: prospective follow-up in 149650 women and men of cholesterol and other risk factors related to cardiovascular and all-cause mortality.

Ulmer H¹, Kelleher C, Diem G, Concin H.

Author information

Mean levels of cholesterol by age for men and women, first visit, *Ulmer et al, J Women's Health 2004*



Cardiovascular risk assessment and mortality outcome

The prognosis among re-attenders at all levels of risk is significantly better than non-returners, with both CVD and all-cause mortality over 10 years being significantly lower among re-attenders than those who never return, even when accounting for baseline risk factor profile

Ulmer et al, 2016

Ulmer/Kelleher/Diem/Concin

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CARDIOVASCULAR RISK ASSESSMENT AND MORTALITY OUTCOME RELATED TO PARTICIPATION IN A LONG-TERM PRIMARY PREVENTION PROGRAMME IN GENERAL PRACTICE

Hanno Ulmer^{1,3}
Cecily Kelleher²
Guenter Diem³
Hans Concin³

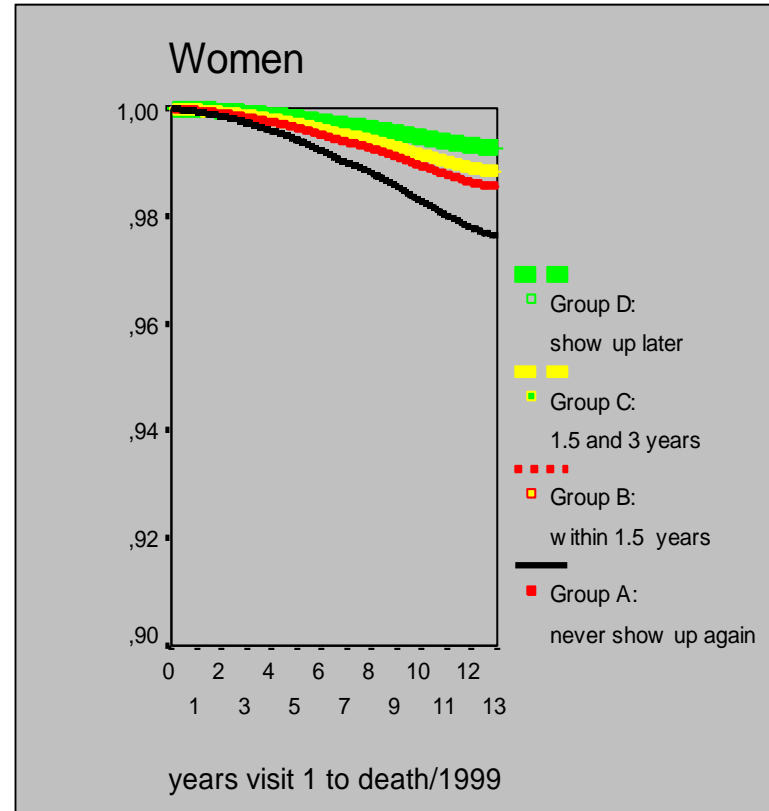
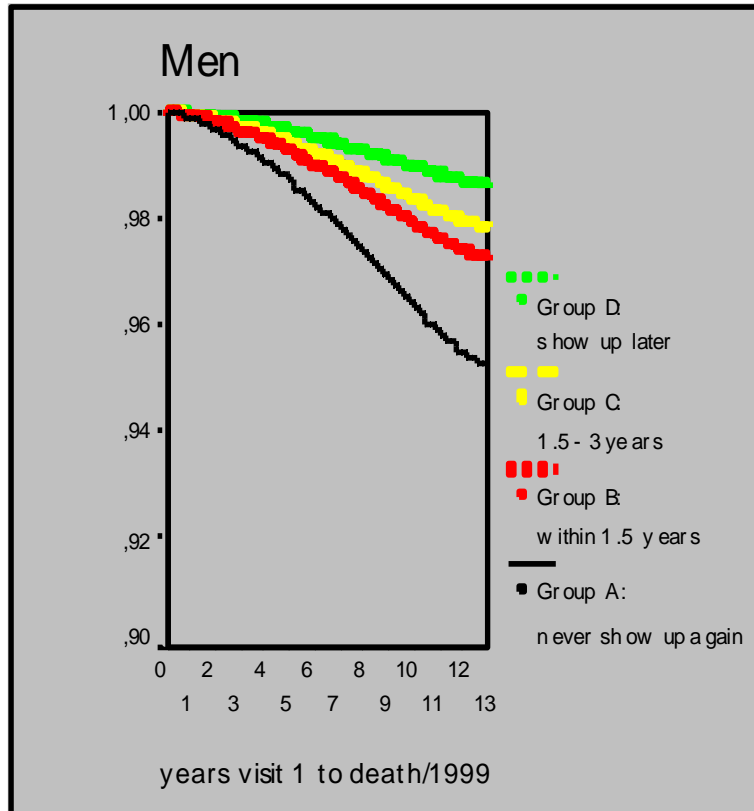
¹*Department of Medical Statistics, Informatics and Health Economics Innsbruck Medical University, Innsbruck, Austria*

²*Department of Public Health Medicine and Epidemiology, University College Dublin, Dublin, Republic of Ireland*

³*Agency for Social- and Preventive Medicine, Bregenz, Austria*

Mortality Experience in Men and Women according to follow-up Category in VHM &PP

(Ulmer et al, 2016)



Predictive accuracy of the SCORE risk function for cardiovascular disease in clinical practice: a prospective evaluation of 44,649 Austrian men and women

Ulmer H, Kollerits B, Kelleher C, Diem G, Concin H

The SCORE overpredicted the mortality pattern in the cohort as a whole, its predictive ability at the individual level still demonstrates a potentially widespread utility in clinical practice.

In 2003, a new risk function for cardiovascular risk in clinical practice was developed by the SCORE project group. The aim of this paper was to evaluate the predictive accuracy of the SCORE in a large Austrian population.

Using the 'SCORE risk function for low-risk regions', we calculated the risk of death from cardiovascular and coronary heart disease events over a 10-year period for 44 649 participants aged 40–65 years in the Vorarlberg Health Monitoring and Promotion Programme (VHM&PP). The predicted risks were compared with the 95% confidence intervals (CI) of the observed events.

We observed a total of 487 deaths (1.1%; 95% CI 1.0–1.2) for all cardiovascular disease within 10 years, 371 (1.8%; 95% CI 1.6–2.0) in men and 116 (0.5%; 95% CI 0.4–0.6) in women. The SCORE function overestimated cardiovascular mortality and predicted 666 (1.5%) events, 444 (2.2%) in men and 222 (0.9%) in women. Receiver operating characteristics analyses revealed area under the curve values of 0.76 (95% CI 0.74–0.79) for men and 0.78 (95% CI 0.74–0.82) for women. Multivariable analyses showed that obesity (in men only) increased levels of glucose, gamma-glutamyl transferase, triglycerides (in women only), and blue-collar job status (in women only) significantly contributed to the SCORE as additional independent risk factors.

Although the SCORE overpredicted the mortality pattern in the cohort as a whole, its predictive ability at the individual level still demonstrates a potentially widespread utility in clinical practice.

Secular trends in CVD risk factors

J Intern Med 2007; 261: 566-576

Trends in risk factors for 181,350 adults aged 20-79 years born between 1905 and 1975.

Clear evidence of cohort-related shifts in all risk factors.

Average Glucose levels were between 4 and 15 mg/dl higher in individuals at the same age born 20 years earlier.

Strong evidence of population wide secular shifts.

Original Article

Journal of INTERNAL MEDICINE

doi: 10.1111/j.1365-2796.2007.01779.x

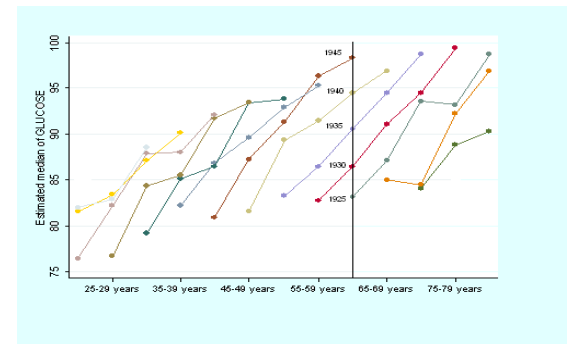
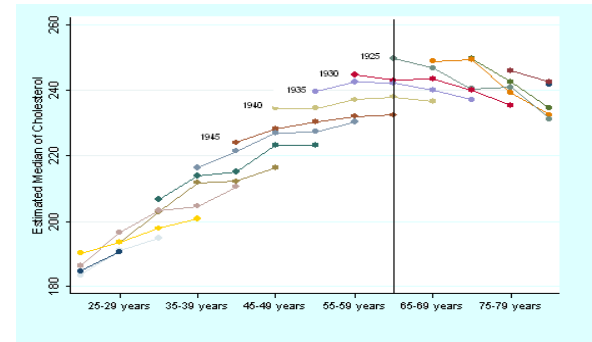
Secular trends in cardiovascular risk factors: an age-period cohort analysis of 6 98 954 health examinations in 1 81 350 Austrian men and women

■ H. Ulmer^{1,2}, C. C. Kelleher³, N. Fitz-Simon³, G. Diem² & H. Concin²

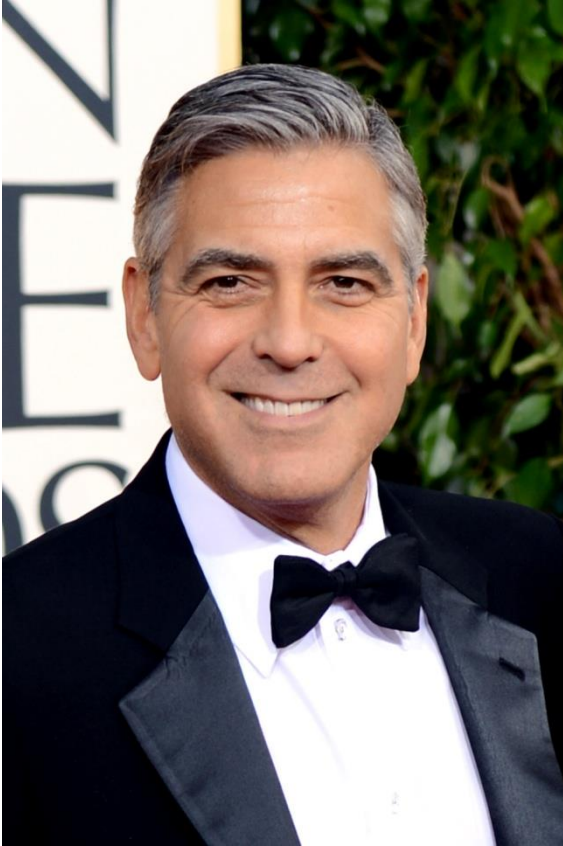
¹Department of Medical Statistics, Informatics and Health Economics, Innsbruck Medical University, Innsbruck, ²Agency for Preventive and Social Medicine, Bregenz, Austria, and ³School of Public Health and Population Sciences, University College Dublin, Dublin, Ireland

VHM&PP 1985-2002 :Contrast of secular patterns of cholesterol and glucose (Ulmer et al, J Intern Med 2007)

- Over the period of the study, for any given age group, total serum cholesterol has been *declining* and total glucose level has been *rising* over time



What do these two have in common?

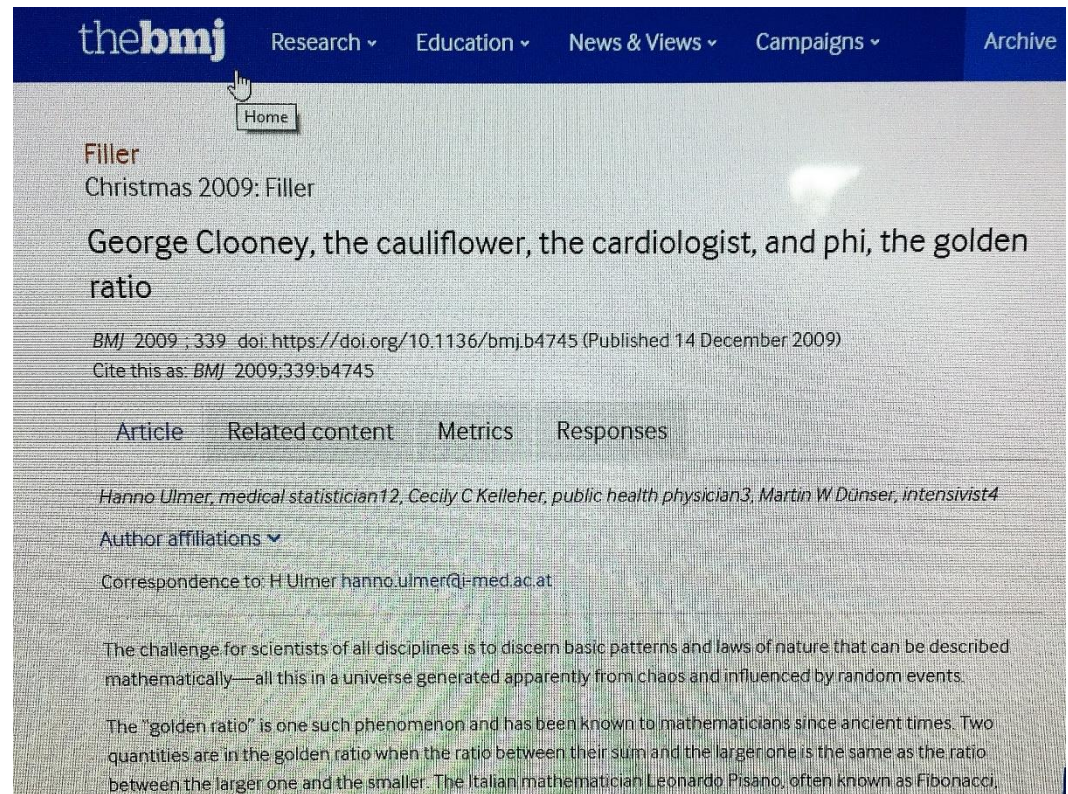


George Clooney, the cauliflower, the cardiologist and phi, the golden ratio

Ulmer et al, BMJ 2009; 339:
b4745

“Although the systolic:
diastolic BP ratio in
whole population was
1.6235, the mean ratio
in those who did not
die during the 20-year
observation period was
1.6180 and was 1.7459
in those who did.

BP values in well
individuals exhibit the
golden ratio”



Conclusions

The VHM&PP has made a major contribution to public health as a systematic linkage database in primary care

It is also a key contributor to a number of International consortia.

The story continues....

Danke!

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