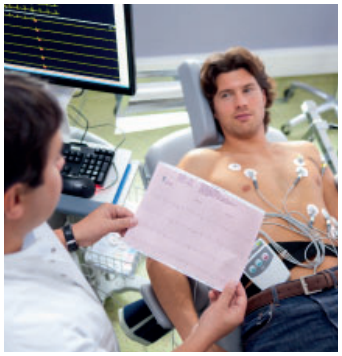
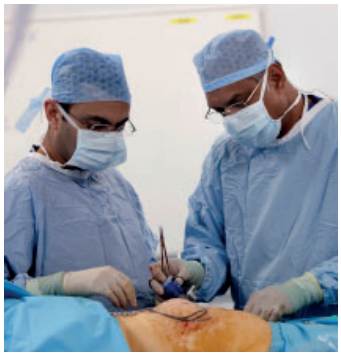
research



Link between prediabetes and cardiovascular disease p101

Implications of dietary guidelines p 102



Robotic versus laparoscopic hernia repair p 104

ORIGINAL RESEARCH Updated meta-analysis

Association between prediabetes and risk of all cause mortality and cardiovascular disease

Cai X, Zhang Y, Li M, et al

Cite this as: *BMJ* 2020;370:m2297
Find this at: http://dx.doi.org/10.1136/bmj.m2297

Study question Is prediabetes associated with an increased risk of all cause mortality and incident cardiovascular disease in the general population and in patients with a history of atherosclerotic cardiovascular disease?

Methods Prospective cohort studies or post hoc analysis of clinical trials were included in the meta-analysis if adjusted relative risks, odds ratios, or hazard ratios, along with 95% confidence intervals, were reported for all cause mortality or cardiovascular disease for prediabetes compared with normoglycaemia.

Study answer and limitations A total of 129 studies comprising 10 069 955 participants were included. In the general population, prediabetes was associated with an increased risk of all cause mortality (relative risk 1.13, 95% confidence interval 1.10 to 1.17), composite cardiovascular disease (1.15, 1.11 to 1.18), coronary heart disease (1.16, 1.11 to 1.21), and stroke (1.14, 1.08 to 1.20) during a median follow-up time of 9.8 years. In patients with atherosclerotic cardiovascular disease, prediabetes was associated with an increased risk of all cause mortality (1.36, 1.21 to 1.54), composite cardiovascular disease (1.37, 1.23 to 1.53), and coronary heart disease (1.15, 1.02 to 1.29) during a median follow-up time of 3.2 years, but no difference was seen for the risk of stroke (1.05, 0.81 to 1.36). The main limitation was that prediabetes was defined with different criteria in the studies included in the analysis.

What this study adds Findings indicate that prediabetes is associated with an increased risk of all cause mortality and cardiovascular disease in the general population and in patients with atherosclerotic cardiovascular disease. Screening and appropriate management of prediabetes might contribute to primary and secondary prevention of cardiovascular disease.

Funding, competing interests, and data sharing The project was supported by the Guangdong Basic and Applied Basic Research Fund, Science and Technology Innovation Project, and Clinical Research Startup Programme of Shunde Hospital, Southern Medical University, China. The authors have no competing interests. Additional data are available from the corresponding author.

Prognosis for prediabetes compared with normoglycaemia

Prediabetes *v* normoglycaemia	General population (relative risk (95% CI))	Patients with a history of atherosclerotic CVD (relative risk (95% CI))
All cause mortality	1.13 (1.10 to 1.17)	1.36 (1.21 to 1.54)
Composite CVD*	1.15 (1.11 to 1.18)	1.37 (1.23 to 1.53)
Coronary heart disease	1.16 (1.11 to 1.21)	1.15 (1.02 to 1.29)
Stroke	1.14 (1.08 to 1.20)	1.05 (0.81 to 1.36)

CVD=cardiovascular disease.
*See supplemental file 5 on bmj.com for definitions.

The healthiness and sustainability of dietary guidelines

ORIGINAL RESEARCH Modelling study

The healthiness and sustainability of national and global food based dietary guidelines

Springmann M, Spajic L, Clark MA, et al

Cite this as: *BMJ* 2020;370:m2322
Find this at: http://dx.doi.org/10.1136/bmj.m2322

Study question What are the health and environmental implications of adopting national food based dietary guidelines at a national level and compared with global health and environmental targets?

Methods This study used a graded coding method to extract quantitative recommendations from 85 food based dietary guidelines, and then assessed the health and environmental impacts of those guidelines by using a comparative risk assessment of chronic disease mortality and a set of country specific environmental footprints for greenhouse gas emissions, freshwater use, cropland use, and fertiliser application. For comparison, the study also analysed the impacts of adopting global dietary recommendations of the World Health Organization and the EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems.

Study answer Adoption of national food based dietary guidelines was associated with reductions in premature mortality of 15% on average (uncertainty interval 13% to 16%) and mixed changes in environmental resource demand, including a reduction in greenhouse gas emissions of 13% on average (regional range −34% to 35%). When the food based dietary guidelines were universally adopted globally, a third (29, 34%) were incompatible with the Action Agenda on Non-Communicable Diseases, and most (57 to 74, 67% to 87%) were incompatible with the Paris agreement on climate change and other environmental targets. Adoption of the WHO recommendations was associated with similar changes, whereas adoption of the EAT-Lancet recommendations was associated with 34% greater reductions in premature mortality, more than three times greater reductions in greenhouse gas emissions, and general attainment of the global health and environmental targets.

As an example, the food based dietary guidelines of the UK, US, and China were incompatible with the climate change, land use, freshwater, and nitrogen targets, and adopting guidelines in line with the EAT-Lancet recommendation could increase the number of avoided deaths from 78 000 (74 000 to 81 000) to 104 000 (96 000 to 112 000) in the UK, from 480 000 (445 000 to 516 000) to 585 000 (523 000 to 646 000) in the US, and from 1 149 000 (1 095 000 to 1 204 000) to 1 802 000 (1 664 000 to 1 941 000) in China.

What this study adds National food based dietary guidelines could be both healthier and more sustainable. Providing clearer advice on limiting the consumption of animal source foods, in particular beef and dairy, had the greatest potential for increasing environmental sustainability, whereas providing clearer advice on whole grains, nuts and legumes, and red and processed meats was associated with most of the additional health benefits.

Funding, competing interests, and data sharing The authors were funded by the Wellcome Trust, Global Panel on Agriculture and Food Systems for Nutrition, World Wildlife Fund for Nature, Climate and Land Use Alliance, and British Heart Foundation. See full paper on bmj.com for competing interests. A supplementary datafile provides the country level results of this study.

COMMENTARY Are plant based diets better for human and planetary health?

Non-communicable diseases contributed to more than 70% of total deaths worldwide in 2017,[1] with suboptimal diet accounting for 15% of disability adjusted life years.[2]

High adherence to recommended diets such as the Healthy Eating Index is usually associated with lower risk of non-communicable diseases and early death.[5] But analysis of 34 European guidelines found nothing on sustainability,[4] and it is only recently that updates have started to also include environmental aspects of food production and consumption.[6]

Lukas Schwingshackl
schwingshackl@ifem.uni-freiburg.de
Bernhard Watzl
Joerg J Meerpohl
See bmj.com for author details

In this issue, Springmann and colleagues have modelled both the health and the environmental impacts of global and national food based dietary guidelines[7] and compared these with targets for global health and environmental outcomes, such as the non-communicable diseases agenda[8] and the Paris agreement on climate change.[9]

Whole grains

The study's main dietary message is that public health strategies for nutrition should focus on increasing intake of whole grains, the food group that has previously been ranked highest in terms of reducing premature mortality, followed by fruits and vegetables.[2 13] Furthermore, the results

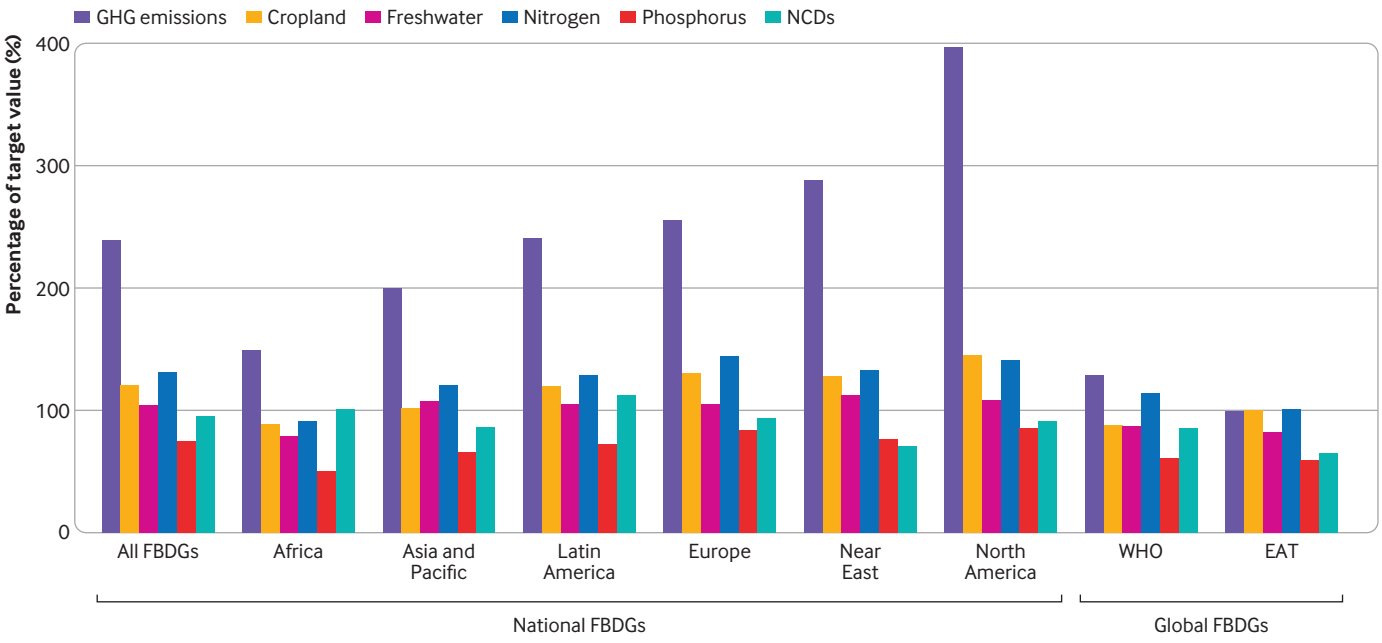
Perhaps the most important finding from this study is the uncertainty that it highlights, not least about plant based foods

confirm that most health benefits from adopting existing national guidelines would come from balancing energy intake and bodyweight.

Lastly, the modelling showed that food related greenhouse gas emissions could be reduced by an average of 13% across all countries, driven mostly by eating less beef and lamb: however, this would be offset by greater intake of milk and other dairy products.

Overall, the authors estimate that adopting national food based dietary guidelines would lead to moderate reductions in premature mortality from non-communicable diseases (15%) and mixed changes in demand for environmental resources. Adopting the EAT-Lancet recommendations could lead to a 25% reduction and much larger decreases in greenhouse gas emissions.

The study has several strengths but its limitations mean its findings should be interpreted with caution. Firstly, the modelling relied on the assumption that exposure-outcome relations are causal, yet the estimated measures of association could reflect residual confounding as they were based on data from meta-analyses of prospective cohort studies rather than from randomised controlled trials (which are



Comparison of the health and environmental impacts of universally adopting food based dietary guidelines (FBDGs) to a set of global health and environmental targets related to reducing mortality from non-communicable diseases (NCDs), limiting global warming to below 2°C (greenhouse gas (GHG) emissions), addressing land use change (cropland), conserving freshwater use, and limiting nitrogen and phosphorus pollution. Estimates are expressed as percentage of attained target value averaged across countries in FBDG regions. Values of 100% or less indicate that environmental and health impacts are in compliance with the targets, and values greater than 100% indicate that targets are exceeded. WHO=World Health Organization; EAT=EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems

rare in nutritional research).[14] Secondly, although the study graded the certainty of evidence for the selected associations between risk and disease, using the comprehensive GRADE (grading of recommendations assessment, development and evaluation) approach could have improved both transparency and trustworthiness.[15] Thirdly, the health impact of a food group is not determined solely by its associations with disease but by the provision of essential nutrients: for example, dairy products provide half of the daily calcium and iodine intake for many populations.[16]

Perhaps the most important finding from this study is the uncertainty that it highlights, not least about plant based foods. In overall terms the EAT-Lancet Commission proposals seem superior in terms of reducing mortality from non-communicable diseases and cutting greenhouse gas emissions. However, adopting the EAT-Lancet recommendations globally would not be affordable for many in low income countries without concomitant economic growth, improved local food production and supply, and expansion of the range of lower cost animal products, fruits, and vegetables.[17] We still have some way to go before diets can become healthier and more sustainable worldwide.

Cite this as: *BMJ* 2020;370:m2417

Find the full version with references at http://dx.doi.org/10.1136/bmj.m2417

ORIGINAL RESEARCH Multicentre, blinded randomised controlled trial

Robotic versus laparoscopic ventral hernia repair

Olavarria OA, Bernardi K, Shah SK, et al

Cite this as: *BMJ* 2020;370:m2457
Find this at: http://dx.doi.org/10.1136/bmj.m2457

Study question Is robotic ventral hernia repair associated with fewer days in hospital 90 days postoperatively compared with laparoscopic repair?

Methods This multicentre, blinded, randomised controlled trial in patients undergoing minimally invasive ventral hernia repair compared clinical and patient centred outcomes between robotic repair (n=65) and laparoscopic repair (n=59). The primary outcome was days in hospital within 90 days after surgery. Secondary outcomes included emergency department visits, operating theatre time, wound complications, hernia recurrence, reoperation, abdominal wall quality of life (scale ranging from 1 (poor) to 100 (perfect)), and costs from the healthcare system perspective.

Study answer and limitations No evidence was found for a difference in days in hospital between the two groups (median 0 *v* 0 days; relative rate 0.90, 95% confidence interval 0.37 to 2.19; P=0.82). For secondary outcomes, no differences were noted in emergency department visits, wound complications, hernia recurrence, or reoperation. However, robotic repair had longer operative duration (141 *v* 77 min; mean difference 62.89, 45.75 to 80.01; P≤0.001) and increased healthcare costs ($15 865 (£12 746; €14 125) *v* $12 955; cost ratio 1.21, 1.07 to 1.38; P=0.004). The median one month postoperative improvement in abdominal wall quality of life was 3 points with robotic repair versus 15 points with laparoscopic repair. The study was carried out by experts in minimally invasive surgery, so generalisability of these results to surgeons with lower volume may be limited.

MARK THOMAS/SPL

What this study adds This study found no evidence of a difference in 90 day postoperative hospital days between robotic and laparoscopic ventral hernia repair. However, robotic repair increased operative duration and healthcare costs.

Funding, competing interests, and data sharing This study was supported by a grant from Intuitive Surgical. The authors report no relevant competing interests. Data related to this publication will be available through individual requests directed to the corresponding author.

Trial registration ClinicalTrials.gov NCT03490266.

Intraoperative and one month postoperative clinical outcomes. Values are numbers (percentages) unless stated otherwise

Outcome	RVHR (n=65)	LVHR (n=58)	P value	Relative rate (95% CI)*
Median days in hospital at 90 days	0	0	0.82	0.90 (0.37 to 2.19)
Days in hospital at 90 days (categories):			0.28	-
0 days	50 (77)	49 (84)		
1 day	9 (14)	4 (7)		
2 days	4 (6)	1 (2)		
>3 days	2 (3)	4 (7)		
Mean (SD) operating room duration (mins)	141 (56)	77 (37)	<0.001	62.89† (45.75 to 80.01)
Mean (SD) costs ($)	15 865 (4879)	12 955 (5636)	0.004	1.21‡ (1.07 to 1.38)

$1.00 (£0.80; €0.88).
LVHR=laparoscopic ventral hernia repair; RVHR=robotic ventral hernia repair.
*LVHR is control for relative rate calculation.
†Mean differences are reported instead of relative rate as variable is continuous and was analysed with generalised linear model.
‡Cost ratio is reported instead of relative rate. Adjusted absolute cost difference was $2767 (95% confidence interval $910 to $4626).