Public Health England

Protecting and improving the nation's health

NHS Health Check programme:

Annotated Bibliography: March 16th 2018 – June 19th 2018

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

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A review of NHS Health Check literature

1. Introduction

The NHS Health Check is a National programme that aims to prevent heart disease, stroke, diabetes and kidney disease, and raise awareness of dementia both across the population and within high risk and vulnerable groups.

A key part of the programme's governance structure is the expert scientific and clinical advisory group (ESCAP). The ESCAP provides an expert forum for the NHS Health Check policy, acting in an advisory capacity to support successful roll-out, maintenance, evaluation and continued improvement based on emerging and best evidence. In its first meeting ESCAP agreed to progress an initial, broad literature review to identify evidence relevant to the NHS Health Check programme. This remit was later expanded to include identification of evidence on general health checks, diabetes/ cardiovascular disease (CVD) risk screening in the population and CVD prevention in primary care . The methods and findings of that review are set out here.

2. Methods

Medline, PubMed, Embase, Health Management Information Consortium (HMIC), Cumulative Index of Nursing and Allied Health Literature (CINAHL), Global Health, PsycInfo, the Cochrane Library, NICE Evidence Search, TRIP database, Google Scholar, Google, Clinical Trials.gov, ISRCTN registry and Prospero were searched for references relevant to the NHS Health Check programme, general health checks, diabetes and cardiovascular screening and cardiovascular disease prevention.

Previous searches had identified references from between January 1996 and March 15th 2018. This search identifies references from **March 16th 2018 – June 19th 2018**. The cut-off date for internet searches was **June 20th 2018**.

Table 1. Search strategies

Database	Search strategy
Ovid Medline	1. health check*.tw. 2. (diabetes adj3 screen*).tw. 3. (cardiovascular adj3 screen*).tw. 4. (population adj2 screen*).tw. 5. (risk factor adj3 screen*).tw. 6. (opportunistic adj3 screen*).tw. 7. medical check*.tw. 8. general check*.tw. 9. periodic health exam*.tw. 10. annual exam*.tw. 11. annual review*.tw. 12. NHSHC.tw. 13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 14. cardiovascular adj3 prevention.tw. 15. (primary care or general practice or primary healthcare).tw 16. 14 and 15 17. Cardiovascular Diseases/ AND Primary Prevention/ 18. 16 or 17 19. 13 or 18 20. 2018 03*.dt. 21. 2018 04*.dt. 22. 2018 05*.dt. 23. 2018 06*.dt. 24. 20 or 21 or 22 or 23 25. 19 and 24
PubMed	1. health check* 2. diabetes screen* 3. cardiovascular screen* 4. population screen* 5. risk factor screen* 6. opportunistic screen* 7. medical check* 8. general check* 9. periodic health exam* 10. annual exam* 11. annual review* 12. NHSHC 13. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 14. Cardiovascular Diseases AND Primary Prevention[MeSH Terms] 15. "primary care"[Text Word] OR "general practice"[Text Word] OR "primary healthcare"[Text Word]) 16. (cardiovascular[Text Word] AND prevention[Text Word]) 17. #15 and #16 18. #14 or #17 19. #13 or #18 Filters: Publication date from 2018/03/16 to 2018/06/19

Ovid Embase

1. health check*.tw.
2. (diabetes adj3 screen*).tw.
3. (cardiovascular adj3 screen*).tw.
4. (population adj2 screen*).tw.
5. (risk factor adj3 screen*).tw.
6. (opportunistic adj3 screen*).tw.
7. medical check*.tw.
8. general check*.tw.
9. periodic health exam*.tw.
10. annual exam*.tw.
11. annual review*.tw.
12. NHSHC.tw.
13. periodic medical examination/
14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13
15. cardiovascular adj3 prevention.tw.
16. (primary care or general practice or primary healthcare).tw
17. 15 and 16
18. cardiovascular disease/ AND primary prevention/
19. 17 or 18
20. 14 or 19
21. limit 20 to dc=20180316-20180619

Ovid HMIC

1 "health check*".af.
2 health checks/
3 (cardiovascular or vascular or heart or diabetes or stroke).af.
4 (screen* or risk).af.
5 3 AND 4
6 1 OR 2 or 5
7 cardiovascular adj3 prevention.tw.
8 (primary care or general practice or primary healthcare).tw
9 7 and 8
10 Cardiovascular diseases/ AND exp preventive medicine/
11 9 or 10
12 6 or 11
13 limit 12 to yr="2018"

EBSCO CINAHL	S12 S10 AND S11 S11 S1 OR S2 OR S9 S10 EM 20180316-20180619 S9 S5 OR S8 S8 S6 AND S7 S7 (MH "Preventive Health Care+") S6 (MH "Cardiovascular Diseases+") S5 S3 AND S4 S4 "primary care" or "general practice" or "primary healthcare" S3 TX cardiovascular N3 prevention S2 (diabetes N3 screen*) OR (cardiovascular N3 screen*) OR (population N2 screen*) OR (risk factor N3 screen*) OR (opportunistic N3 screen*) OR “medical check*” OR “general check*” OR “periodic health exam*” OR “annual exam*” OR "annual review*" OR NHSHC S1 health check*
EBSCO Global Health	S10 S6 OR S19 OR S3 Limiters - Publication Year: 2018 S9 S7 AND S8 S8 DE "preventive medicine" S7 DE "cardiovascular diseases" S6 S4 AND S5 S5 "primary care" or "general practice" or "primary healthcare" S4 TX cardiovascular N3 prevention S3 S1 OR S2 S2 (diabetes N3 screen*) OR (cardiovascular N3 screen*) OR (population N2 screen*) OR (risk factor N3 screen*) OR (opportunistic N3 screen*) OR “medical check*” OR “general check*” OR “periodic health exam*” OR “annual exam*” OR "annual review*" OR NHSHC S1 health check*
Ovid PsycInfo	1. health check*.tw. 2. (diabetes adj3 screen*).tw. 3. (cardiovascular adj3 screen*).tw. 4. (population adj2 screen*).tw 5. (risk factor adj3 screen*).tw. 6. (opportunistic adj3 screen*).tw. 7. medical check*.tw. 8. general check*.tw. 9. periodic health exam*.tw. 10. annual exam*.tw. 11. annual review*.tw. 12. NHSHC.tw. 13. health screening/ or physical examination/ 14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 15. (cardiovascular adj3 prevention).tw. 16. (primary care or general practice or primary healthcare).tw. 17. 15 and 16 18. CARDIOVASCULAR DISORDERS/ and PREVENTIVE MEDICINE/ 19. 17 or 18 20. 14 or 19 21. limit 20 to up=20180316-20180619

Cochrane Library (Wiley)	#1 "health check*" #2 (diabetes next/3 screen*) or (cardiovascular next/3 screen*) or (population next/2 screen*) or (opportunistic next/2 screen*) or ("risk factor" next/3 screen*) or "medical check*" or "general check*" or "periodic health exam*" or "annual exam*" or "annual review*" or NHSHC #3 cardiovascular adj3 prevention.tw. #4 (primary care or general practice or primary healthcare).tw #5 #3 and #4 #6 MeSH descriptor: [Cardiovascular Diseases] this term only #7 MeSH descriptor: [Primary Prevention] explode all trees #8 #6 and #7 #9 #5 or #8 #10 #1 or #2 or #9 Publication Year from 2018
NHS Evidence	"*health check"* OR *cardiovascular prevention primary* Limited to 16/03/2018 to 19/06/2018
TRIP database	"*health check*"* OR *cardiovascular prevention primary* Since 2018
Google Scholar	*"nhs health check"* *cardiovascular "health check"* *cardiovascular prevention primary care* *nhs health check program* Since 2018, sorted by date.
Google	"*nhs health check*" *cardiovascular prevention "primary care"* *cardiovascular "health check*" *CVD risk prediction* *nhs health check program* Limited to 16/03/2018 to 19/06/2018
Clinical trials.gov, ISRCDN, Prospero	*"health check",* Limited to 16/03/2018 to 20/06/2018

Citation titles and abstracts were then screened in order to determine whether or not they were relevant. Those citations considered relevant were categorised using the PHE Types of Information, and are listed below in section 4. Categorisation has been based on information provided by authors/indexers and has not been independently verified. No appraisal of individual resources has been undertaken. A summary of the main aim, methods and results of each citation is provided, as well as a link to the abstract or full text, if available. If the full text of an article is not freely available online, it may be available via the PHE Knowledge & Library Services or OpenAthens.

3. Results

The number of references identified are shown in table 2 and 2a.

Table 2. Citations published/entered between March 16th 2018 and June 19th 2018

Database	No. of hits	Exclusive (non duplicates)
Ovid Medline (March 16th – June 19th 2018)	580	576
PubMed (March 16th – June 19th 2018)	407	143
Ovid Embase (March 16th – June 19th 2018)	514	427
Ovid HMIC (up to latest edition May 2018)	14	11
EBSCO CINAHL (March 16th – June 19th 2018)	369	351
EBSCO Global Health (2018)	63	50
Ovid PsycInfo (March 16th – June 19th 2018)	67	57
Cochrane Library (June 19th 2018)	49	31
NICE Evidence (June 19th 2018)	738	717
TRIP database (June 19th 2018)	381	300
TOTAL		**2663**

Table 2a. Citations added to internet sources between March 16th and June 20th 2018

Internet sources	No. of hits
Google Scholar (June 20th 2018)	256*
Google (June 20th 2018)	524*
Trials registers, Prospero (June 20th 2018)	15
TOTAL	**795**

**Note: it is not possible to know how many of these are unique citations.*

From these results, 8 were identified as being relevant to the NHS Health Check programme, 9 to general health checks and 53 to diabetes/cardiovascular disease risk screening or prevention.

Total relevant references = 70

- **NHS Health Checks = 8**
- **general health checks = 9**
- **diabetes/cardiovascular disease screening or prevention = 53**

4. References on the NHS Health Check Programme (8)

Systematic reviews

Martin, A., Saunders, C. L., Harte, E., et al. 2018. **Delivery and impact of the NHS Health Check in the first 8 years: a systematic review**. *British Journal of General Practice*.
AIM: to review quantitative evidence on coverage (the proportion of eligible individuals who attend), uptake (proportion of invitees who attend), and impact of NHS Health Checks.
METHODS: A systematic review and quantitative data synthesis. Included were studies or data reporting coverage or uptake and studies reporting any health-related impact that used an appropriate comparison group or before-and-after study design. Eleven databases and additional internet sources were searched to November 2016.
RESULTS: Twenty-six observational studies and one additional dataset were included. Since 2013, 45.6% of eligible individuals have received a health check. Coverage is higher among older people, those with a family history of coronary heart disease, those living in the most deprived areas, and some ethnic minority groups. Just under half (48.2%) of those invited have taken up the invitation. Data on uptake and impact (especially regarding health-related behaviours) are limited. Uptake is higher in older people and females, but lower in those living in the most deprived areas. Attendance is associated with small increases in disease detection, decreases in modelled cardiovascular disease risk, and increased statin and antihypertensive prescribing.
View abstract

Trials

McDermott, L., Cornelius, V., Wright, A. J., et al. 2018. **Enhanced Invitations Using the Question-Behavior Effect and Financial Incentives to Promote Health Check Uptake in Primary Care**. *Annals of Behavioral Medicine* 52(7) 594-605.
AIM: to evaluate the effectiveness of enhanced invitation methods employing the Question-Behavior Effect (QBE), with or without a financial incentive to return the questionnaire, at increasing uptake of health checks.
METHOD: a three-arm randomized trial including all patients at 18 general practices in two London boroughs, who were invited for health checks from July 2013 to December 2014. Participants were randomized to three trial arms: (i) Standard health check invitation letter only; (ii) QBE questionnaire followed by standard invitation letter; or (iii) QBE questionnaire with offer of a financial incentive to return the questionnaire, followed by standard invitation letter. In intention to treat analysis, the primary outcome of completion of health check within 6 months of invitation, was evaluated using a p value of .0167 for significance.
RRESULTS: 12,459 participants were randomized. Health check uptake was evaluated for 12,052 (97%) with outcome data collected. Health check uptake within 6 months of invitation was: standard invitation, 590 / 4,095 (14.41%); QBE questionnaire, 630 / 3,988 (15.80%); QBE questionnaire and financial incentive, 629 / 3,969 (15.85%). Difference following QBE questionnaire, 1.43% (95% confidence interval -0.12 to 2.97%, p = .070); following QBE questionnaire and financial incentive, 1.52% (-0.03 to 3.07%, p = .054).
View abstract

Cross-sectional studies

Coghill, N., Garside, L., Montgomery, A. A., et al. 2018. **NHS health checks: a cross- sectional observational study on equity of uptake and outcomes**. *BMC Health Services Research* 18(1) 238.
AIM: to assess equity of uptake and outcomes from NHS Health Checks in general practices in Bristol, UK.
METHOD: A cross-sectional study using patient-level data, from 38 general practices. We descriptively analysed the socioeconomic status (SES) of patients invited and the SES and ethnicity of those attending. Logistic regression was used to test associations between invitation and attendance, with population characteristics.
RESULTS: Between June 2010 to October 2014, 31,881 patients were invited, and 13,733 NHS Health Checks completed. 47% of patients invited from the three least and 39% from the two most-deprived index of multiple deprivation quintiles, completed a Check. Proportions of invited patients, by ethnicity were 64% non-black and Asian and 31% black and Asian. Men were less likely to attend than women (OR 0.73, 95% confidence interval 0.67 to 0.80), as were patients <=49 compared to >=70 years (OR 0.40, 95% confidence interval 0.65 to 0.83). After controlling for SES and population characteristics, compared to patients with low CVD risk, high risk patients were more likely to be prescribed cardiovascular drugs (OR 6.2, 95% confidence interval 4.51 to 8.40). Compared

to men, women (OR 01.18, 95% confidence interval 1.03 to 1.35) were more likely to be prescribed cardiovascular drugs, as were those <=49 years (50-59 years, OR 1.42, 95% confidence intervals 1.13-1.79, 60-69 years, OR 1.60, 95% confidence intervals, 1.22-2.10, >=70 years, OR 1.64, 95% confidence intervals, 1.14 to 2.35). Controlling for population characteristics, the following groups were most likely to be referred to lifestyle services: younger women (OR 2.22, 95% CI 1.69 to 2.94), those in the most deprived IMD quintile (OR 3.22, 95% CI 1.63 to 6.36) and those at highest risk of CVD (OR, 2.77, 95% CI 1.91 to 4.02).
View full text

Riley, V. A., Gidlow, C. & Ellis, N. J. 2018. **Understanding implementation and uptake in the National Health Service Health Check Programme**. *Public Health* 159 63-66.
AIM: to understand national variation in implementation of NHSHCs and to explore the relationship between uptake and different components of implementation.
METHOD: Data were collected via an online survey between November 2015 and August 2016. The survey was distributed nationally to practice managers in the Midlands and East of England, South of England, North of England and London via local NHSHC leads with the help of the national programme manager.
RESULTS: Responses were received from 153 participants, half of who were practice managers (49.7%). Common components of implementation included using postal invitations accompanied by the national leaflet, delivering NHSHCs routinely with other appointments, offering NHSHC outside of working hours and taking blood samples during the consultation. Meaningful exploration of the relationship between uptake and components of implementation was not possible given the inaccuracy of self-reported uptake data, which was confirmed by comparison with public health data in a subsample (n = 18). The comparison also found that a number of practices were reporting more completed health checks than the total number of patients invited, which again indicates problems that may have implications for uptake figures locally and nationally.
View abstract

Palladino, R., Vamos, E., Chang, K. C. M., et al. 2017. **Impact of a national diabetes risk assessment and screening programme in England: A quasi-experimental study**. *The Lancet* 390 (SPEC.ISS 1) S65.
AIM: to assess the impact of a national diabetes risk assessment and screening programme, NHS Health Checks, on detection of incident cases of non-diabetic hyperglycaemia and type 2 diabetes and on management of cardiovascular risk factors in newly diagnosed cases.
METHOD: In a quasi-experimental propensity score adjusted study, we extracted data on 370 454 individuals aged 40-74 years registered with 455 general practices in England between 2009 and 2016 without pre-existing type 2 diabetes. Individuals were characterised into three groups on the basis of their general practice's programme coverage (low, medium, high). We assessed differences in diagnosis of non-diabetic hyperglycaemia and type 2 diabetes and changes in cardiovascular risk (QRISK2 algorithm) using multilevel Cox and linear regression models. Propensity score, based on the probability of individuals being registered with a low, medium, or high coverage practice, was calculated. Analyses were by intention to screen.
RESULTS: There were 138 364, 131 679, and 100 411 individuals in the low, medium, and high coverage groups, respectively. The incidence rate of detected non-diabetic hyperglycaemia was 19% higher in the high coverage group than in the low coverage group (2781 vs 2479 cases; hazard ratio 1.19, 95% CI 1.01 to 1.41), and rates of type 2 diabetes diagnosis (4058, 4657, and 3827 cases in low, medium, and high coverage groups) were 10% higher in the medium coverage group (1.10, 1.03 to 1.18) and 11% higher in the high coverage group (1.11, 1.03 to 1.19). Individuals with detected non-diabetic hyperglycaemia in the high coverage group had a 1.1% larger reduction in cardiovascular risk than did those in the low coverage group (beta=-1.12, 95% CI -1.61 to -0.63; mean follow-up 43.9 months), and those with detected type 2 diabetes a 0.4% larger reduction (-0.42, -0.78 to -0.06; 49.8 months).
View abstract

Economic evaluation

Kypridemos, C., Collins, B., McHale, P., et al. 2018. **Future cost-effectiveness and equity of the NHS Health Check cardiovascular disease prevention programme: Microsimulation modelling using data from Liverpool, UK**. *PLoS Medicine / Public Library of Science* 15(5) e1002573.
AIM: to determine whether the NHS Health Check programme is cost-effective and equitable in a city with high levels of deprivation and CVD.
METHOD: IMPACTNCD is a dynamic stochastic microsimulation policy model, calibrated to Liverpool demographics, risk factor exposure, and CVD epidemiology. Using local and national data, as well as drawing on health and social care disease costs and health-state utilities, we modelled 5 scenarios from 2017 to 2040:

Scenario (A): continuing current implementation of NHS Health Check;Scenario (B): implementation 'targeted' toward areas in the most deprived quintile with increased coverage and uptake;Scenario (C): 'optimal' implementation assuming optimal coverage, uptake, treatment, and lifestyle change;Scenario (D): scenario A combined with structural population-wide interventions targeting unhealthy diet and smoking;Scenario (E): scenario B combined with the structural interventions as above. We compared all scenarios with a counterfactual of no-NHS Health Check.
RESULTS: Compared with no-NHS Health Check, the model estimated cumulative incremental cost-effectiveness ratio (ICER) (discounted /quality-adjusted life year [QALY]) to be 11,000 (95% uncertainty interval [UI] -270,000 to 320,000) for scenario A, 1,500 (-91,000 to 100,000) for scenario B, -2,400 (-6,500 to 5,700) for scenario C, -5,100 (-7,400 to -3,200) for scenario D, and -5,000 (-7,400 to -3,100) for scenario E. Overall, scenario A is unlikely to become cost-effective or equitable, and scenario B is likely to become cost-effective by 2040 and equitable by 2039. Scenario C is likely to become cost-effective by 2030 and cost-saving by 2040. Scenarios D and E are likely to be cost-saving by 2021 and 2023, respectively, and equitable by 2025. The main limitation of the analysis is that we explicitly modelled CVD and diabetes mellitus only.
View full text

Qualitative

McMillan, B., Fox, S., Lyons, M., et al. 2018. **Using patient and public involvement to improve the research design and funding application for a project aimed at fostering a more collaborative approach to the NHS health check: the CaVIAR project (better Care Via Improved Access to Records)**. *Research Involvement and Engagement* 4(1) 18.
AIM: to seek the views of patients and members of the public about a digital adjunct that could give patients the opportunity to interact with their NHS Health Check results from home before returning to see their GP
METHOD: We consulted the Primary Care Research in Manchester Engagement Resource (PRIMER), an established departmental Patient and Public Involvement (PPI) group (N = 9) and then ran a workshop with 19 members of the public, co-facilitated by 4 members of PRIMER. Following a brief presentation on the background to the project, attendees were split into four groups and introduced to Ketso, a toolkit for creative engagement. Ketso was used to encourage group discussions regarding the project idea.
RESULTS: This PPI work improved the study design and proposed intervention. Discussions focussed on three themes: 1) positive feedback, 2) challenges and solutions, and 3) improvements/alternatives. Positive feedback included benefits to the NHS and patients. Challenges identified related to: 1) access, 2) data security, 3) engagement, and 4) negative consequences. Workshop members generated various solutions to these challenges and made additional suggestions for improvement relating to: 1) population (e.g. also including those with QRISK2 scores ≤10%), 2) duration (e.g. ongoing access to provide continued feedback), and 3) platform content (e.g. signposting to relevant services).
View full text

Ongoing research

Public Health England 2018. **Randomized Controlled Trial on Uptake of NHS Health Checks**. *Clinical Trials*. ClinicalTrials.gov Identifier: NCT03524131. May 14th, 2018.
AIM: to test whether a shorter risk-framed leaflet or a shorter benefits-framed leaflet will be more effective than the current national leaflet at encouraging uptake of the NHS Health Check
METHOD: this study will assess the impact of two new behaviourally informed NHS Health Check leaflets on the uptake of NHS Health Checks, by randomizing patients in Lewisham and North East Lincolnshire to the different leaflets and comparing patient-level uptake data. Currently enrolling by invitation.
View details

References relating to general health checks (9)

Cross-sectional studies

Goto, E., Ishikawa, H., Okuhara, T., et al. 2018. **Factors associated with adherence to recommendations to visit a physician after annual health checkups among Japanese employees: a cross-sectional observational study**. *Ind Health* 56(2) 155-159.
AIM: to examine the factors related to adherence to recommendations to undergo further medical examination after annual health checkups, among Japanese employees.
METHOD: We conducted a cross-sectional study of 219 employees who had ignored recommendations to visit a physician for the previous 3 yr; we assessed their work- and life-related factors, health status, and health literacy. We analyzed the data of 103 employees who met the inclusion criteria.
RESULTS: Participants who lived alone and had a primary doctor, lower job demand, and lower self-rated health were significantly more likely to adhere to recommendations, suggesting that work- and life-related factors-rather than individual health literacy-may be more important.
View full text

Iseki, K., Konta, T., Asahi, K., et al. 2018. **Association of dipstick hematuria with all-cause mortality in the general population: results from the specific health check and guidance program in Japan**. *Nephrol Dial Transplant* 33(5) 825-832.
AIM: to examine the effects of general health screening with dipstick urine tests on mortality, especially with regard to hematuria
METHOD: Subjects were those who participated in the 2008 Tokutei-Kenshin (nationwide specific health check and guidance program) in six districts in Japan. Using the national database of death certificates from 2008 to 2012, we identified subjects who might have died. We verified the candidates in collaboration with the regional National Health Insurance agency and public health nurses. Data were released to the research team supported by the Ministry of Health, Labor, and Welfare of Japan. Dipstick results of 1+ and higher were defined as hematuria (+). Hazard ratio (HR) [95% confidence interval (CI)] was calculated using the Cox proportional hazard analysis.
RESULTS: Among 112 115 subjects, we identified that 1290 had died by the end of 2012. In hematuria (-) subjects, the crude mortality rates were 1.2% (1.8% in men, 0.7% in women), whereas in hematuria (+) subjects, they were 1.1% (2.9% in men, 0.7% in women). After adjusting for age, body mass index, estimated glomerular filtration rate, proteinuria, comorbid condition (diabetes mellitus, hypertension and dyslipidemia), past history (stroke, heart disease and kidney disease) and lifestyle (smoking, drinking, walking and exercise), the HR (95% CI) for dipstick hematuria (+) in men was 1.464 (1.147-1.846; P = 0.003), whereas that for hematuria (-) was 0.820 (0.617-1.073; P = 0.151). Dipstick hematuria is significantly associated with mortality in men among Japanese community-based screening participants.
View abstract

Iseki, K., Konta, T., Asahi, K., et al. 2018. **Dipstick proteinuria and all-cause mortality among the general population**. *Clinical & Experimental Nephrology* 05 05.
AIM: to determine how the results of dipstick proteinuria tests correlate with mortality in general health screening in Japan
METHOD: Subjects were participants of the 2008 Tokutei-Kenshin (Specific Health Check and Guidance program) in six districts in Japan. On the basis of the national database of death certificates from 2008 to 2012, we used a personal identifier in two computer registries to identify participants who might have died. The hazard ratio (95% confidence interval, CI) was calculated by Cox-proportional hazard analysis.
RESULTS: Among a total of 140,761 subjects, we identified 1641 mortalities that occurred by the end of 2012. The crude mortality rates were 1.1% for subjects who were proteinuria (-), 1.5% for those with proteinuria (+/-), 2.0% for those with proteinuria (1+), 3.5% for those with proteinuria (2+), and 3.7% for those with proteinuria (>=3+). After adjusting for sex, age, body mass index, estimated glomerular filtration rate, comorbid condition, past history, and lifestyle, the hazard ratio (95% CI) for dipstick proteinuria was 1.262 (1.079-1.467) for those with proteinuria (+/-), 1.437 (1.168-1.748) for those with proteinuria (1+), 2.201 (1.688-2.867) for those with proteinuria

(2+), and 2.222 (1.418-3.301) for those with proteinuria (>=3+) compared with the reference of proteinuria (-). Dipstick proteinuria is an independent predictor of death among Japanese community-based screening participants.
View abstract

Kim, Y. H., Kim, H. & Jee, H. 2018. **Effects of socioeconomic status, health behavior, and physical activity on the prevalence of metabolic syndrome**. *Journal of Exercise Rehabilitation* 14(2) 183-191.
AIM: to investigate the effects of sex, economic status, educational level, smoking, drinking, and physical activity intensity and frequency with prevalence of metabolic syndrome
METHODS: Routine health checkup results of the National Health and Nutrition Survey (1,593 men, 2,180 women) and a private hospital (12,823 men, 7,070 women) of the year 2012 were used for the study. Education level and monthly household income were used to assess the socioeconomic status. Alcohol consumption, smoking, and International Physical Activity Questionnaire were used to assess health behaviors. Logistic regression analysis was applied (P<0.05).
RESULTS: Participants of the private hospital had significantly greater household income, education level, amount of physical activity and intensity, and number of nonsmokers. Women showed no differences in the amount of vigorous physical activity. The prevalence rates of metabolic syndrome showed similar results. Education level, physical activity, and alcohol consumption were significantly associated in men of the government group. Smoking showed significant influence in men of both groups. Education level, alcohol consumption, and smoking showed significant influence in women of the government group. Participants who conducted government-led health examinations showed stronger influence of socioeconomic level and health behaviors on metabolic syndrome especially in men.
View full text

Larsen, L. B., Sandbaek, A., Thomsen, J. L., et al. 2018. **Uptake of health checks by residents from the Danish social housing sector–a register-based cross-sectional study of patient characteristics in the 'Your Life–Your Health'program**. *BMC public health* 18(1) 585.
AIM : to report on patient characteristics among attendees and non-attendees of health checks made available to residents in the social housing sector of the municipality of Aarhus
METHOD: Cross-sectionally in a sample of 6650 residents of the Aarhus social housing sector who were invited for a health check in the first year of the 'Your Life - Your Health' program. The analyses consisted of 1) descriptive analysis of the characteristics of attenders/non-attenders, 2) unadjusted and adjusted Poisson regression to examine associations of patient characteristics and uptake of health checks, and 3) decision tree analyses (CHAID) to examine interaction and homogeneity in patient characteristics among attenders.
RESULTS: Of the overall population 30% attended. In a nested cohort of people residing in a particularly deprived social housing settlement, 25% attended. Further, in the overall population, we found an association between the likelihood of taking up a health check and age, sex, country of origin, educational attainment, cohabitation, occupational status, and past medical treatment. In the nested cohort the association between uptake and medical treatment was non-significant, while the association between uptake and occupation was limited to people who were employed.. The results suggest that a targeted approach in the social housing sector could be more effective than a mass screening approach.
View abstract

Shimoda, A., Ichikawa, D. & Oyama, H. 2018. **Using machine-learning approaches to predict non-participation in a nationwide general health check-up scheme**. *Computer Methods and Programs in Biomedicine* 163 39-46.
AIM: to develop and evaluate models identifying those who are unlikely to undergo general health check-ups.
METHOD: We used information from a local government database of Japan. The study population included 7290 individuals aged 40-74 years who underwent at least one general health check-up between 2012 and 2015. We developed four predictive models based on the extreme gradient boosting (XGBoost), random forest (RF), support vector machines (SVMs), and logistic regression (LR) algorithms, using machine-learning techniques, and compared the areas under the curves (AUCs) of the models with those of the heuristic method (which presumes that the individuals who underwent a general health check-up in the previous year will do so again in the following year).
RESULTS: The AUCs for the XGBoost, RF, SVMs, LR, and heuristic models/method were 0.829 (95% confidence interval [CI]: 0.806-0.853), 0.821 (95% CI: 0.797-0.845), 0.812 (95% CI: 0.787-0.837), 0.816 (95% CI: 0.791-0.841), and 0.683 (95% CI: 0.657-0.708), respectively. XGBoost model exhibited the best AUC, and the performance was significantly better than that of SVMs (p = 0.034), LR (p = 0.017), and heuristic method (p < 0.001). However, the performance of XGBoost did not differ significantly from that of RF (p = 0.229). Predictive models using machine-

learning techniques outperformed the existing heuristic method when used to predict participation in a general health check-up system by eligible participants.
View abstract

Qualitative

Robinson, L., Dickinson, C., Magklara, E., et al. 2018. **Proactive approaches to identifying dementia and dementia risk : a qualitative study of public attitudes and preferences**. *BMJ Open* 8 e018677.
AIM: to critically explore the views of the public about the acceptability and feasibility of proactive approaches to earlier dementia diagnosis and also identification of people at high risk of dementia.
METHOD: Qualitative study using task group methodology and thematic data analysis. Task groups were held either at the university (n=5) or at a carers' centre (n=1). A convenience sample of 31 of 54 participants identified by local non-statutory agencies took part in a task group. All were aged between 40 years and 80 years, 21 were women and ten men participated.
RESULTS: Despite the use of task group methodology, participants expressed limited understandings of dementia and confusion between proactive approaches. Nevertheless, they highlighted a range of potential benefits and limitations of proactive approaches and the ethical issues raised. There was a preference to embed risk assessment within routine health checks, which focused on achieving a healthier lifestyle, rather than specifically on dementia. Participants emphasised the need to ensure informed consent prior to use of proactive approaches and to provide appropriate support. They also suggested alternative approaches that could potentially facilitate the early detection of dementia or reduce risk at a population level.
View full text

Economic

Lindholm, L., Stenling, A., Norberg, M., et al. 2018. **A cost-effectiveness analysis of a community based CVD program in Sweden based on a retrospective register cohort**. *BMC public health* 18(1) 452.
AIM: to estimate the costs of running Västerbotten Intervention Programme (a large scale community-based cardiovascular disease prevention program) from 1990 to 2006, versus the health gains and savings reasonably attributable to the program during the same time period.
METHOD: A previous study estimated the number of prevented deaths during the period 1990–2006 which can be attributed to the programme. We used this estimate and calculated the number of QALYs gained, as well as savings in resources due to prevented non-fatal cases during the time period 1990 to 2006. Costs for the programmes were based on previously published scientific articles as well as current cost data from the county council, who is responsible for the programme.
RESULTS: The cost per QALY gained from a societal perspective is SEK 650 (Euro 68). From a health care sector perspective, the savings attributable to the VIP exceeded its costs. Our analysis shows that Västerbotten Intervention Programme is extremely cost-effective in relation to the Swedish threshold value (SEK 500000 per QALY gained or Euro 53,000 per QALY gained). Other research has also shown a favorable effect of Västerbotten Intervention Programme on population health and the health gap.
View full text

Diagnostic studies

Cheong, A. T., Chinna, K., Khoo, E. M., et al. 2017. **Determinants for cardiovascular disease health check questionnaire: A validation study**. *PLoS ONE Vol 12(11), 2017, ArtID e0188259* 12(11).
AIM: to develop and validate an instrument that assess determinants that influence individuals' intention to undergo CVD health checks.
METHOD: The concepts and items were developed based on findings from our prior exploratory qualitative study on factors influencing individuals' intention to undergo CVD health checks. Content validity of the questionnaire was assessed by a panel of six experts and the item-level content validity index (I-CVI) was determined. After pretesting the questionnaire was pilot tested to check reliability of the items. Exploratory factor analysis was used to test for dimensionality using a sample of 240 participants.
RESULTS: The finalized questionnaire consists of 36 items, covering nine concepts. The I-CVI for all items was satisfactory with values ranging from 0.83 to 1.00. The exploratory factor analysis showed that the number of factors extracted was consistent with the theoretical concepts. Correlations values between items ranged from 0.30 to 0.85 and all the factor loadings were more than 0.40, indicating satisfactory structural validity. All concepts showed good internal consistency, Cronbach's alpha values ranged 0.66-0.85. The determinants for CVD health check questionnaire has good content and structural validity, and its reliability was established.
View full text

References relating to diabetes and cardiovascular disease risk screening or prevention (53)

Guidance

American Heart Association 2018. **Health Literacy and Cardiovascular Disease: Fundamental Relevance to Primary and Secondary Prevention: A Scientific Statement From the American Heart Association**. *Circulation* 137(25).
AIM: (1) to summarize the relevance of health literacy to cardiovascular health; (2) to present the adverse associations of health literacy with cardiovascular risk factors, conditions, and treatments; (3) to suggest strategies that address barriers imposed by limited health literacy on the management and prevention of cardiovascular disease; (4) to demonstrate the contributions of health literacy to health disparities, given its association with social determinants of health; and (5) to propose future directions for how health literacy can be integrated into the American Heart Association's mandate to advance cardiovascular treatment and research
METHOD: The studies presented are a synthesis of the existing literature, informed by existing systematic reviews and the diverse perspectives of the experts on the writing group. Inadequate health literacy is a barrier to the American Heart Association meeting its 2020 Impact Goals, and this statement articulates the rationale to anticipate and address the adverse cardiovascular effects associated with health literacy.
View full text

American Heart Association 2018. **Promoting risk identification and reduction of cardiovascular disease in women through collaboration with obstetricians and gynecologists**. *Circulation* 137(25).
AIM: to promote risk identification and reduction of cardiovascular disease in women through collaboration with obstetricians and gynecologists
METHOD: unclear – described as a presidential advisory and clinical guideline, possibly a non-systematic review
View full text

Best Practice Advocacy Centre 2018. **What's new in cardiovascular disease risk assessment and management for primary care clinicians**.
AIM: to summarise updated recommendations in the 2018 Cardiovascular Disease Risk Assessment and Management for clinicians in primary care
METHOD: Management recommendations in the consensus statement are based on newly derived risk equations for the New Zealand population.
RESULTS: Key changes include revised definitions for high risk, based on pre-existing cardiovascular disease or an equivalent risk factor, changes to the ages at which risk assessment should commence and the addition of serious mental illness as a risk factor.
View full text

Diabetes Canada Clinical Practice Guidelines Expert, C., Ekoe, J. M., Goldenberg, R., et al. 2018. **Screening for Diabetes in Adults. Clinical Practice Guidelines**. *Canadian Journal of Diabetes* 42 Suppl 1 S16-S19. Part of Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. Canadian Journal of Diabetes Volume 42, Suppl 1, Pages A1-A18, S1-S326.
AIM: to guide practice; inform general patterns of care; enhance diabetes prevention efforts in Canada; and reduce the burden of diabetes complications
METHOD: For these 2018 Clinical Practice Guidelines, volunteer members of the Clinical Practice Guidelines Expert Committee have assessed the relevant peer reviewed evidence published since the last guidelines in 2013 through a rigorous systematic review process. They have then incorporated the evidence into revised diagnostic, prognostic and therapeutic recommendations for the care of Canadians living with diabetes, as well as recommendations to delay the onset of diabetes for at risk populations
RESULTS: In the absence of evidence for interventions to prevent or delay type 1 diabetes, routine screening for type 1 diabetes is not recommended. Screen for type 2 diabetes using a fasting plasma glucose and/or glycated hemoglobin (A1C) every 3 years in individuals ≥40 years of age or in individuals at high risk on a risk calculator

(33% chance of developing diabetes over 10 years). Diagnose diabetes in the absence of symptomatic hyperglycemia if A1C is ≥6.5% on 2 tests, fasting plasma glucose ≥7.0 mmol/L on 2 tests, or A1C ≥6.5% and fasting plasma glucose ≥7.0 mmol/
View full text

NICE 2018. **NICEimpact. Cardiovascular disease prevention**.
AIM: to highlight progress made by the healthcare system in implementing NICE guidance on cardiovascular disease prevention
METHOD: We routinely collect data which give us information about the uptake of our guidance. To produce this report, we have worked with national partners to select data which tell us how NICE guidance can make a difference in priority areas of CVD prevention. The data also highlight areas where there remains room for improvement.
RESULTS: The proportion of people who smoke continues to reduce, but data suggest that more could be done to implement NICE's recommendations on preventing smoking in schools and in secondary care settings. Data suggest that more could be done to help people manage their weight and get physically active. NICE's updated recommendation for offering statins appears to be associated with a change in prescribing practice. An increasing proportion of people with atrial fibrillation and a risk score above 2 are receiving anticoagulation as recommended by NICE. Data from the National CKD Audit show that, in 2016, 69% of people with identified CKD received statins in line with NICE guidance. Lower uptake of these recommendations was seen among younger people without diabetes, a group that may have the most to gain from statin therapy for CVD prevention. Systems have been set up to encourage better monitoring of patients' physical health parameters in line with NICE guidance, and to improve recording in electronic patient records.
View full text

U. S. Preventive Services Task Force, Curry, S. J., Krist, A. H., et al. 2018. **Screening for Cardiovascular Disease Risk With Electrocardiography: US Preventive Services Task Force Recommendation Statement**. *JAMA* 319(22) 2308-2314.
AIM: to update the 2012 US Preventive Services Task Force (USPSTF) recommendation on screening for coronary heart disease with electrocardiography (ECG).
METHOD: The USPSTF reviewed the evidence on whether screening with resting or exercise ECG improves health outcomes compared with the use of traditional CVD risk assessment alone in asymptomatic adults.
RESULTS: For asymptomatic adults at low risk of CVD events (individuals with a 10-year CVD event risk less than 10%), it is very unlikely that the information from resting or exercise ECG (beyond that obtained with conventional CVD risk factors) will result in a change in the patient's risk category as assessed by the Framingham Risk Score or Pooled Cohort Equations that would lead to a change in treatment and ultimately improve health outcomes. Possible harms are associated with screening with resting or exercise ECG, specifically the potential adverse effects of subsequent invasive testing. For asymptomatic adults at intermediate or high risk of CVD events, there is insufficient evidence to determine the extent to which information from resting or exercise ECG adds to current CVD risk assessment models and whether information from the ECG results in a change in risk management and ultimately reduces CVD events. As with low-risk adults, possible harms are associated with screening with resting or exercise ECG in asymptomatic adults at intermediate or high risk of CVD events. The USPSTF recommends against screening with resting or exercise ECG to prevent CVD events in asymptomatic adults at low risk of CVD events. (D recommendation)
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Evidence summaries

National Institute for Health (NIHR) 2018. **NIHR Signal: Multi-morbidity predicted to increase in the UK over the next 20 years**. March 2018.
AIM: NIHR Signals explain why the study was needed, what the researchers did, what the study found, how this relates to current guidelines and what the implications are of the findings. They are accompanied by commentary from experts in their field, researchers and those working in practice.
METHOD: This study, partly supported by NIHR, ran a computer model using data on over 300,000 people from three UK population surveys to predict changes in multi-morbidity between 2015 and 2035. The estimates have limitations, including self-reporting of conditions and assumptions made around changes in health status.
RESULTS: In 2015, 54.0% of people aged over 65 had two or more conditions (multi-morbidity). By 2035 this is predicted to have risen to 67.8%. By age group, the prevalence of multi-morbidity was predicted at 52.8% for people aged 65-74, 75.9% for those aged 75-84, and 90.5% for those above the age of 85. By 2035, there will be

double the number of people aged over 65 living with four or more conditions: 17.0% compared with 9.8% in 2015. People aged over 75 contribute most to this number. By disease, most people over 65 will be affected by arthritis (62.6%), followed by high blood pressure (55.9%), respiratory disease (24.4%), cancer (23.7%) and diabetes (21.6%). The greatest prevalence increase was for cancer which had doubled from 12.6% in 2015. The contribution of mental illness (depression, dementia or cognitive impairment) to overall multi-morbidity increases with the number of diseases or impairments. In 2015, 4.1% of people with two or more conditions had mental ill-health, to 34.1% of people with four or more conditions. This pattern is expected to change little by 2035. Life expectancy is predicted to increase by 3.6 years for men and 2.9 years for women by 2035. This extra life comprises a reduction in years lived with no or only one health condition and an increase in years lived with multi-morbidity.
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Note: the paper below was published in Feb 2018 (outside the dates of the current search) but was not retrieved in the previous update. It was suggested by a member of the ESCAP group as being relevant for discussion, so is included here.

Bonner, C., Bell, K., Jansen, J., et al. 2018. **Should heart age calculators be used alongside absolute cardiovascular disease risk assessment?** *BMC Cardiovascular Disorders* 18(1) 19.
AIM: to: 1) explain how heart age calculation methods relate to absolute risk guidelines; 2) summarise research investigating whether heart age improves risk communication; and 3) discuss implications for the use of medication and shared decision making in clinical practice.
METHOD: not clear, includes a summary of research
RESULTS: Different heart age calculators can lead to different medication recommendations. This suggests that patients with the same risk factors may perceive their risk differently and receive different treatment recommendations depending on which calculator their doctor uses; potentially leading to unwarranted practice variation. The risk communication and decision aid literature provides clear directions for alternative absolute risk formats that could be used to explain CVD risk and the benefits of both lifestyle and medication interventions. This should be based on outcomes that are meaningful to patients, focusing on the likelihood of experiencing a CVD event rather than how far blood pressure or cholesterol deviates from an arbitrary 'ideal' threshold
View full text

Systematic reviews

Aminde, L. N., Takah, N. F., Zapata-Diomedi, B., et al. 2018. **Primary and secondary prevention interventions for cardiovascular disease in low-income and middle-income countries (LMICs): a systematic review of economic evaluations**. *Cost Effectiveness and Resource Allocation* 16(1) 22.
AIM: to examine current evidence on which interventions offer good value for money in CVD prevention in LMICs
METHOD: In this systematic review, we included studies reporting full economic evaluations of individual and population-based interventions (pharmacologic and non-pharmacologic), for primary and secondary prevention of CVD among adults in LMIC. Several medical (PubMed, EMBASE, SCOPUS, Web of Science) and economic (EconLit, NHS EED) databases and grey literature were searched. Screening of studies and data extraction was done independently by two reviewers.
RESULTS: From a pool of 4059 records, 94 full texts were read and 50 studies, which met our inclusion criteria, were retained for our narrative synthesis. Most of the studies were from middle-income countries and predominantly of high quality. The majority were modelled evaluations, and there was significant heterogeneity in methods. Primary prevention studies dominated secondary prevention. Most of the economic evaluations were performed for pharmacological interventions focusing on blood pressure, cholesterol lowering and antiplatelet aggregants. The greatest majority were cost-effective. Compared to individual-based interventions, population-based interventions were few and mostly targeted reduction in sodium intake and tobacco control strategies. These were very cost-effective with many being cost-saving.
View full text

Baker, R., Wilson, A., Nockels, K., et al. 2018. **Levels of detection of hypertension in primary medical care and interventions to improve detection: a systematic review of the evidence since 2000**. *BMJ open* 8(3) e019965.
AIM: to summarise recent evidence on detection of hypertension and interventions to improve detection in order to inform policies to improve care.
METHOD: Systematic review of articles published since 2000. Searches of Medline and Embase were undertaken. Eligibility criteria: published in English, any study design, the setting was general practice and studies included patients aged 18 or over. Exclusion criteria: screening schemes, studies in primary care settings other than general

practice, discussion or comment pieces. Participants: adult patients of primary medical care services. Synthesis: study heterogeneity precluded a statistical synthesis, and papers were described in summary tables.
RESULTS: Seventeen quantitative and one qualitative studies were included. Detection rates varied by gender and ethnic group, but longitudinal studies indicated an improvement in detection over time. Patient socioeconomic factors did not influence detection, but living alone was associated with lower detection. Few health system factors were associated with detection, but in two studies higher numbers of general practitioners per 1000 population were associated with higher detection. Three studies investigated interventions to improve detection, but none showed evidence of effectiveness.
View full text

Brown, C., Raglin Bignall, W. & Ammerman, R. 2018. **Preventive Behavioral Health Programs in Primary Care: A Systematic Review**. *Pediatrics* Apr 9 Apr 9. pii: e20180611.
AIM: to identify gaps in the literature on effectiveness and readiness for scale-up of behavioral health programs in primary care.
METHOD: PubMed, PsycINFO, Cumulative Index to Nursing and Allied Health Literature, Embase, Evidence-Based Medicine Reviews, and Scopus databases were searched for articles published in English in the past 15 years. Search terms included terms to describe intervention content, setting, target population, and names of specific programs known to fit inclusion criteria. Inclusion criteria were: (1) enrolled children 0 to 5 years old, (2) primary care setting, (3) measured parenting or child behavior outcomes, and (4) clinical trial, quasi-experimental trial, pilot study, or pre-post design. Data were abstracted from 44 studies.
RESULTS: Gaps in the literature include: study findings do not always support hypotheses about interventions' mechanisms, trust in primary care as a mediator has not been sufficiently studied, it is unclear to which target populations study findings can be applied, parent participation remains an important challenge, and the long-term impact requires further evaluation.
View abstract

Colpani, V., Baena, C., Jaspers, L., et al. 2018. **Lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women: a systematic review and meta-analysis**. *European journal of epidemiology* Mar 10.
AIM: to evaluate the association between modifiable lifestyle factors (specifically smoking, physical activity, alcohol intake, and obesity), with CVD and mortality in middle-aged and elderly women.
METHOD: A systematic review and meta-analysis of prospective cohort studies. Pubmed, Embase, among other databases and reference lists were searched until February 29th, 2016. Study specific relative risks (RR) were meta-analyzed using random effect models. We included 59 studies involving 5,358,902 women.
RESULTS: Comparing current versus never smokers, pooled RR were 3.12 (95% CI 2.15-4.52) for CHD incidence, 2.09 (95% CI 1.51-2.89) for stroke incidence, 2.76 (95% CI 1.62-4.71) for CVD mortality and 2.22 (95% CI 1.92-2.57) for all-cause mortality. Physical activity was associated with a decreased risk of 0.74 (95% CI 0.67-0.80) for overall CVD, 0.71 (95% CI 0.67-0.75) for CHD, 0.77 (95% CI 0.70-0.85) for stroke, 0.70 (95% CI 0.58-0.84) for CVD mortality and 0.71 (95% CI 0.65-0.78) for all-cause mortality. Comparing moderate drinkers versus non-drinkers, the RR was 0.72 (95% CI 0.56-0.91) for CHD, 0.63 (95% CI 0.57-0.71) for CVD mortality and 0.80 (95% CI 0.76-0.84) for all-cause mortality. For women with BMI 30-35 kg/m2 the risk was 1.67 (95% CI 1.24-2.25) for CHD and 2.3 (95% CI 1.56-3.40) for CVD mortality, compared to normal weight. Each 5 kg/m2 increase in BMI was associated with 24% (95% CI 16-33%) higher risk for all-cause mortality. This meta-analysis suggests that physical activity and moderate alcohol intake were associated with a reduced risk for CVD and mortality. Smoking and higher BMI were associated with an increased risk of these endpoints.
View abstract

Gheewala, P. A., Zaidi, S. T. R., Jose, M. D., et al. 2018. **Effectiveness of targeted screening for chronic kidney disease in the community setting: a systematic review**. *Journal of Nephrology* 31(1) 27-36.
AIM: to determine whether targeted screening is effective in detecting people with undiagnosed CKD
METHOD: We performed a systematic literature review, and included studies of targeted screening intervention implemented in any community-based setting. Studies were required to have targeted people aged ≥18 years, and multiple CKD risk factors from the following: diabetes, hypertension, cardiovascular disease and family history of kidney disease. The outcome measures were percentages of participants with positive screening test results and diagnosed with CKD at follow-up.
RESULTS: Nine studies met the inclusion criteria. Eight studies reported the percentage of participants with positive screening test results, which ranged from 7 to 60.3%. Only two studies repeated the diagnostic tests to detect CKD, and confirmed the chronicity of CKD in 20.5 and 17.1% of screened participants. The most commonly

used screening tests were albumin creatinine ratio (≥3.4 mg/mmol), and estimated glomerular filtration rate (eGFR) (<60 ml/min/1.73 m2). All studies classified CKD stage 3 and above based on eGFR alone. Characteristics of the interventions responsible for inconsistencies in the outcome measures included CKD risk factors targeted, and screening tests used to detect CKD. This systematic review found significant variation in the methods that were used to detect CKD, with the majority of studies reporting results based on only single albuminuria or eGFR values.
View abstract

Jonas, D. E., Reddy, S., Middleton, J. C., et al. 2018. **Screening for Cardiovascular Disease Risk With Resting or Exercise Electrocardiography: Evidence Report and Systematic Review for the US Preventive Services Task Force**. *JAMA* 319(22) 2315-2328.
AIM: to review the evidence on screening asymptomatic adults for CVD risk using electrocardiography (ECG) to inform the US Preventive Services Task Force.
METHOD: MEDLINE, Cochrane Library, and trial registries through May 2017; references; experts; literature surveillance through April 4, 2018. Study Selection: English-language randomized clinical trials (RCTs); prospective cohort studies reporting reclassification, calibration, or discrimination that compared risk assessment using ECG plus traditional risk factors vs traditional risk factors alone. For harms, additional study designs were eligible. Studies of persons with symptoms or a CVD diagnosis were excluded. Data Extraction and Synthesis: Dual review of abstracts, full-text articles, and study quality; qualitative synthesis of findings. Main Outcomes and Measures: Mortality, cardiovascular events, reclassification, calibration, discrimination, and harms.
RESULTS: Sixteen studies were included (N=77140). Two RCTs (n=1151) found no significant improvement for screening with exercise ECG (vs no screening) in adults aged 50 to 75 years with diabetes for the primary cardiovascular composite outcomes (hazard ratios, 1.00 [95% CI, 0.59-1.71] and 0.85 [95% CI, 0.39-1.84] for each study). No RCTs evaluated screening with resting ECG. Evidence from 5 cohort studies (n=9582) showed that adding exercise ECG to traditional risk factors such as age, sex, current smoking, diabetes, total cholesterol level, and high-density lipoprotein cholesterol level produced small improvements in discrimination (absolute improvements in area under the curve [AUC] or C statistics, 0.02-0.03, reported by 3 studies); whether calibration or appropriate risk classification improves is uncertain. Evidence from 9 cohort studies (n=66407) showed that adding resting ECG to traditional risk factors produced small improvements in discrimination (absolute improvement in AUC or C statistics, 0.001-0.05) and appropriate risk classification for prediction of multiple cardiovascular outcomes, although evidence was limited by imprecision, quality, considerable heterogeneity, and inconsistent use of risk thresholds used for clinical decision making. Total net reclassification improvements ranged from 3.6% (2.7% event; 0.6% nonevent) to 30% (17% event; 19% nonevent) for studies using the Framingham Risk Score or Pooled Cohort Equations base models. Evidence on potential harms (eg, from subsequent angiography or revascularization) in asymptomatic persons was limited.
View full text

Ju, A., Hanson, C., Banks, E., et al. 2018. **Patient beliefs and attitudes to taking statins: systematic review of qualitative studies**. *British Journal of General Practice* 21 May.
AIM: to describe patients' perspectives, experiences, and attitudes towards taking statins.
METHOD: Systematic review of qualitative studies reporting perspectives of patients on statins. PsycINFO, CINAHL, Embase, MEDLINE, and PhD dissertations from inception to 6 October 2016 were searched for qualitative studies on adult patients' perspectives on statins. All text and participant quotations were extracted from each article and analysed by thematic synthesis.
RESULTS: Thirty-two studies involving 888 participants aged 22–93 years across eight countries were included. Seven themes were identified: confidence in prevention (trust in efficacy, minimising long-term catastrophic CVD, taking control, easing anxiety about high cholesterol); routinising into daily life; questioning utility (imperceptible benefits, uncertainties about pharmacological mechanisms); medical distrust (scepticism about overprescribing, pressure to start therapy); threatening health (competing priorities and risks, debilitating side effects, toxicity to body); signifying sickness (fear of perpetual dependence, losing the battle); and financial strain.
View full text

Khanji, M., Waardhuizen, C. & Bicalho, V. 2018. **Lifestyle advice and interventions for cardiovascular risk reduction: A systematic review of guidelines**. *International Journal Of Cardiology* 263 142-151.
AIM: to systematically review guidelines on primary prevention of CVD and their recommendations on lifestyle advice or intervention, in order to guide primary prevention programs.
METHODS: Publications in MEDLINE, CINAHL over 7 years since May 3, 2009 were identified. G-I-N International Guideline Library, National Guidelines Clearinghouse, National Library for Health Guideline finder, Canadian

Medical Association InfoBase were searched. On the February 8, 2017, we updated the search from Websites of organizations responsible for guidelines development. 2 reviewers screened the titles and abstracts to identify Guidelines from Western countries containing recommendations for lifestyle advice and interventions in primary prevention of CVD. 2 reviewers independently assessed rigor of guideline development using the AGREEII instrument, and one extracted recommendations.
RESULTS: Of the 7 guidelines identified, 6 showed good rigor of development (range 45-86%). The guidelines were consistent in recommendations for smoking cessation, limiting saturated fat and salt intake, avoiding transaturated-fat and sugar, with particular emphasis on sugar-sweetened beverages. Guidelines generally agreed on recommendations for physical activity levels and diets rich in fruit, vegetables, fish and wholegrains. Guidelines differed on recommendations for specific dietary patterns and alcohol consumption. Recommendations on psychological factors and sleep are currently limited.
View abstract

Kunal, N. K., Donald, M. L.-J., Joep van der, L., et al. 2018. **Blood pressure-lowering treatment strategies based on cardiovascular risk versus blood pressure: A meta-analysis of individual participant data**. *PLoS medicine* 15(3) 1002538.
AIM: to compare outcomes from a blood pressure-lowering treatment strategy based on predicted cardiovascular risk with one based on systolic blood pressure (SBP) level.
METHOD: We used individual participant data from the Blood Pressure Lowering Treatment Trialists' Collaboration (BPLTTC) from 1995 to 2013. Trials randomly assigned participants to either blood pressure-lowering drugs versus placebo or more intensive versus less intensive blood pressure-lowering regimens. We estimated 5-y risk of CVD events using a multivariable Weibull model previously developed in this dataset. We compared the two strategies at specific SBP thresholds and across the spectrum of risk and blood pressure levels studied in BPLTTC trials. The primary outcome was number of CVD events avoided per persons treated.
RESULTS: We included data from 11 trials (47,872 participants). During a median of 4.0 y of follow-up, 3,566 participants (7.5%) experienced a major cardiovascular event. Areas under the curve comparing the two treatment strategies throughout the range of possible thresholds for CVD risk and SBP demonstrated that, on average, a greater number of CVD events would be avoided for a given number of persons treated with the CVD risk strategy compared with the SBP strategy (area under the curve 0.71 [95% confidence interval (CI) 0.70-0.72] for the CVD risk strategy versus 0.54 [95% CI 0.53-0.55] for the SBP strategy). Compared with treating everyone with SBP ≥ 150 mmHg, a CVD risk strategy would require treatment of 29% (95% CI 26%-31%) fewer persons to prevent the same number of events or would prevent 16% (95% CI 14%-18%) more events for the same number of persons treated. Compared with treating everyone with SBP ≥ 140 mmHg, a CVD risk strategy would require treatment of 3.8% (95% CI 12.5% fewer to 7.2% more) fewer persons to prevent the same number of events or would prevent 3.1% (95% CI 1.5%-5.0%) more events for the same number of persons treated, although the former estimate was not statistically significant. In subgroup analyses, the CVD risk strategy did not appear to be more beneficial than the SBP strategy in patients with diabetes mellitus or established CVD.
View abstract

Martin-Ruiz, E., Olry-de-Labry-Lima, A., Ocaña-Riola, R., et al. 2018. **Systematic Review of the Effect of Adherence to Statin Treatment on Critical Cardiovascular Events and Mortality in Primary Prevention**. *Journal of cardiovascular pharmacology and therapeutics* 23(3) 200-215.
AIM: to analyse the relative risks of critical cardiovascular outcomes and mortality associated with adherence to statin treatment in a clinical setting in people with no history of prior cardiovascular disease (CVD).
METHODS: A systematic review of the literature was conducted up to December 2016. The outcomes of interest were cardiovascular fatal or nonfatal events and all-cause mortality.
RESULTS: A total of 17 articles were included in a qualitative synthesis. Four were case-control nested in a retrospective cohort design and the other 11 were a cohort design. Seven studies compared the best adherer patients with the worst adherers. In the 3 studies (317 603 participants) that considered ischemic heart disease in this group, the pooled reduction in risk was 18% (95% confidence interval [CI]: 14%-22%, I2 = 0%); for the CVD outcome, 2 studies (131 477 participants) showed a pooled reduction in risk of 47% (95% CI: 36%-56%, I2 = 84.7%) with 1 included study showing a much larger reduction than the others; for the cerebrovascular event (CeVD) outcome, 2 studies (155 726 participants) showed a pooled reduction in risk of 26% (95% CI: 18%-34%, I2 = 0%); and for mortality, the reduction in risk was 49% (95% CI: 39%-57%, I2 = 62.4%). The other 4 studies (147 859 participants) compared the most adherent group with the rest. These showed a pooled risk reduction of CVD of 22% (95% CI: 6%-27%, I2 = 0).
View abstract

Mills, K., Obst, K., Shen, W., et al. 2018. **Comparative Effectiveness of Implementation Strategies for Blood Pressure Control in Hypertensive Patients: A Systematic Review and Meta-analysis**. *Ann Intern Med.* 168(2) 110-120.
AIM: to determine the effectiveness of implementation strategies for blood pressure (BP) reduction in patients with hypertension
METHOD: MEDLINE, EMBASE/Excerpta Medica, and ClinicalTrials.gov (all to Sep 2017), and reference lists were searched for randomized controlled trials (RCTs) that lasted ≥6 months and reported variance of BP changes. Cluster RCTs were included if their statistical analyses accounted for clustering. 100 articles reporting 121 comparisons (n=55920, median age 60 y, median SBP 148 mm Hg, median DBP 86 mm Hg) met the selection criteria. Median study duration was 6 months (6 mo to 5 y). Multilevel strategies included team-based care with nonphysicians titrating medications, team-based care with physicians titrating medications, and multilevel strategies without team-based care; patient-level strategies included health coaching and home BP monitoring; and provider-level strategies included provider training, audit and feedback, and electronic decision support systems.
RESULTS: In patients with hypertension, multilevel and patient-level implementation strategies reduce blood pressure more than usual care.
View abstract

Navarese, E., Robinson, J. & Kowalewski, M. 2018. **Association Between Baseline LDL-C Level and Total and Cardiovascular Mortality After LDL-C Lowering A Systematic Review and Meta-analysis**. *Journal of the American Medical Association* 319(15) 1566-1579.
AIM: to evaluate whether baseline LDL-C level is associated with total and cardiovascular mortality risk reductions.
METHOD: Electronic databases (Cochrane, MEDLINE, EMBASE, TCTMD, ClinicalTrials.gov, major congress proceedings) were searched through February 2, 2018, to identify randomized clinical trials of statins, ezetimibe, and PCSK9-inhibiting monoclonal antibodies. Two investigators abstracted data and appraised risks of bias. Intervention groups were categorized as "more intensive" (more potent pharmacologic intervention) or "less intensive" (less potent, placebo, or control group). The coprimary end points were total mortality and cardiovascular mortality. Random-effects meta-regression and meta-analyses evaluated associations between baseline LDL-C level and reductions in mortality end points and secondary end points including major adverse cardiac events (MACE).
RESULTS: In 34 trials, 136 299 patients received more intensive and 133 989 received less intensive LDL-C lowering. All-cause mortality was lower for more vs less intensive therapy (7.08% vs 7.70%; rate ratio [RR], 0.92 [95% CI, 0.88 to 0.96]), but varied by baseline LDL-C level. Meta-regression showed more intensive LDL-C lowering was associated with greater reductions in all-cause mortality with higher baseline LDL-C levels (change in RRs per 40-mg/dL increase in baseline LDL-C, 0.91 [95% CI, 0.86 to 0.96]; P = .001; absolute risk difference [ARD], −1.05 incident cases per 1000 person-years [95% CI, −1.59 to −0.51]), but only when baseline LDL-C levels were 100 mg/dL or greater (P < .001 for interaction) in a meta-analysis. Cardiovascular mortality was lower for more vs less intensive therapy (3.48% vs 4.07%; RR, 0.84 [95% CI, 0.79 to 0.89]) but varied by baseline LDL-C level. Meta-regression showed more intensive LDL-C lowering was associated with a greater reduction in cardiovascular mortality with higher baseline LDL-C levels (change in RRs per 40-mg/dL increase in baseline LDL-C, 0.86 [95% CI, 0.80 to 0.94]; P < .001; ARD, −1.0 incident cases per 1000 person-years [95% CI, −1.51 to −0.45]), but only when baseline LDL-C levels were 100 mg/dL or greater (P < .001 for interaction) in a meta-analysis. Trials with baseline LDL-C levels of 160 mg/dL or greater had the greatest reduction in all-cause mortality (RR, 0.72 [95% CI, 0.62 to 0.84]; P < .001; 4.3 fewer deaths per 1000 person-years) in a meta-analysis. More intensive LDL-C lowering was also associated with progressively greater risk reductions with higher baseline LDL-C level for myocardial infarction, revascularization, and MACE. In these meta-analyses and meta-regressions, more intensive compared with less intensive LDL-C lowering was associated with a greater reduction in risk of total and cardiovascular mortality in trials of patients with higher baseline LDL-C levels.
View full text

Singh, K., Chandrasekaran, A. M., Bhaumik, S., et al. 2018. **Cost-effectiveness of interventions to control cardiovascular diseases and diabetes mellitus in South Asia: a systematic review**. *BMJ Open* 8(4) e017809.
AIM: to systematically review the cost-effectiveness of individual-level, group-level and population-level interventions to control CVD and DM in South Asia.
METHOD: We searched 14 electronic databases up to August 2016. The search strategy consisted of terms related to 'economic evaluation', 'CVD', 'DM' and 'South Asia'. Per protocol two reviewers assessed the eligibility and methodological quality of studies using standard checklists, and extracted incremental cost-effectiveness ratios of

interventions.
RESULTS: Of the 2949 identified studies, 42 met full inclusion criteria. Critical appraisal of studies revealed 15 excellent, 18 good and 9 poor quality studies. Most studies were from India (n=37), followed by Bangladesh (n=3), Pakistan (n=2) and Bhutan (n=1). The economic evaluations were based on observational studies (n=9), randomised trials (n=12) and decision models (n=21). Together, these studies evaluated 301 policy or clinical interventions or combination of both. We found a large number of interventions were cost-effective aimed at primordial prevention (tobacco taxation, salt reduction legislation, food labelling and food advertising regulation), and primary and secondary prevention (multidrug therapy for CVD in high-risk group, lifestyle modification and metformin treatment for diabetes prevention, and screening for diabetes complications every 2-5 years). Significant heterogeneity in analytical framework and outcome measures used in these studies restricted meta-analysis and direct ranking of the interventions by their degree of cost-effectiveness.
View full text

Teo, C. H., Ling, C. J. & Ng, C. J. 2018. **Improving health screening uptake in men: A systematic review and meta-analysis**. *American Journal of Preventive Medicine* 54(1) 133-143.
AIM: to determine the effectiveness of interventions in improving men's uptake of and intention to undergo screening, including interventions using information and communication technology and a male-sensitive approach.
METHOD: Studies were sourced from five electronic databases (October 2015), experts, and references of included studies. This study included RCTs or cluster RCTs that recruited men and reported uptake of or intention to undergo screening. Two researchers independently performed study selection, appraisal, and data extraction. The interventions were grouped into those that increase uptake and those that promote informed decision making. They were further sub-analyzed according to types of intervention, male-sensitive, and web- and video-based interventions. The analysis was completed in December 2016.
RESULTS: This review included 58 studies. Most studies were on prostate cancer (k = 31) and HIV (k = 11) screening. Most of the studies had low methodologic quality (79.3%) and after excluding them from the analysis, one study found that educational intervention (which was also male-sensitive) was effective in improving men's intention to screen (risk ratio = 1.36, 95% CI = 1.23, 1.50, k = 1) and partner educational intervention increased men's screening uptake (risk ratio = 1.77, 95% CI = 1.48, 2.12, k = 1). Video-based educational interventions reduced prostate cancer screening uptake (risk ratio = 0.89, 95% CI = 0.80, 0.99, k = 1) but web-based interventions did not change men's screening intention or uptake.
View abstract

Greenberg, B. L., Glick, M. & Tavares, M. 2017. **Addressing obesity in the dental setting: What can be learned from oral health care professionals' efforts to screen for medical conditions**. *Journal of public health dentistry* 77(Supplement 1) S67-S78.
AIM: to focus on what can be learned from oral health professionals' (OHCPs) efforts to provide screenings for medical conditions in the dental setting that could guide strategies for addressing childhood obesity.
METHOD: A scoping review. PubMed, Embase, Cochrane, Grey Literature, and CINAHL were searched (limitation English language). Search terms covered OHCPs and various oral systemic conditions of interest (details provided in the paper. Nineteen unduplicated, relevant articles were categorized based on relationship to question.
RESULTS: Screening for diabetes and heart disease risk in the dental setting has been shown to be effective and patients and providers are willing to participate, although not yet routinely implemented. Screening/counseling for tobacco-cessation has been shown to be effective, but few (<10 percent) OHCPs provided this activity or received tobacco cessation training. For obesity screening/counseling, the majority of dentists (82 percent) reported they would be more willing to offer this service if obesity were directly related to oral disease. The one healthy weight intervention pilot study was well received by caregivers/patients and resulted in improved food choices. Successful implementation included a dedicated staff member, the dental hygienist. Lack of adequate training was a commonly reported barrier for all of these conditions; in addition, for obesity screening/counseling fear of appearing judgmental, and fear of patient rejection were also commonly reported.
View abstract

Trials

Barroso, M., Perez-Fernandez, S., Vila, M. M., et al. 2018. **Validity of a method for the self-screening of cardiovascular risk**. *Clinical Epidemiology* 10 549-560.
AIM: to assess the validity of a cardiovascular risk self-screening method
METHOD: Crossover clinical trial on a population-based sample from Girona (north-eastern Spain), aged 35-74,

with no cardiovascular disease at recruitment. Participants were randomized to one of the two risk assessment sequences (standard screening followed by self-screening or vice versa). Cardiovascular risk was estimated with the Framingham-REGICOR function. Concordance between methods was estimated with the intraclass correlation coefficient (ICC). Sensitivity, specificity, and positive and negative predictive values were estimated, considering 5% cardiovascular risk as the cutoff point.
RESULTS: The median cardiovascular risk in men was 2.56 (interquartile range: 1.42-4.35) estimated by standard methods and 2.25 (1.28-4.07) by self-screening with ICC=0.92 (95% CI: 0.90-0.93). In women, the cardiovascular risk was 1.14 (0.61-2.10) by standard methods and 1.10 (0.56-2.00) by self-screening, with ICC=0.89 (0.87-0.90). The sensitivity, specificity, and positive and negative predictive values for the self-screening method were 0.74 (0.63-0.82), 0.97 (0.95-0.99), 0.86 (0.77-0.93), and 0.94 (0.91-0.96), respectively, in men. In women, these values were 0.50 (0.30-0.70), 0.99 (0.98-1), 0.81 (0.54-0.96), and 0.97 (0.95-0.99), respectively. The self-screening method for assessing cardiovascular risk provided similar results to the standard method.
View full text

Brouwer, T., Vehmeijer, J., Kalkman, D., et al. 2018. **Intensive Blood Pressure Lowering in Patients With and Patients Without Type 2 Diabetes: A Pooled Analysis From Two Randomized Trials**. *Diabetes Care* 41(6) 1142-1148.
AIM: to assess the effect of both T2DM and baseline cardiovascular disease risk on the treatment effect of intensive blood pressure lowering.
METHOD: The individual patient data from the ACCORD-BP and SPRINT studies were pooled and follow-up durations harmonized. Both studies randomized hypertensive patients to an SBP target of <120 mmHg or a target of <140 mmHg. The composite primary end point consisted of unstable angina, myocardial infarction, acute heart failure, stroke, and cardiovascular death. The interaction between intensive blood pressure lowering and both T2DM and 10-year cardiovascular risk was assessed using Cox proportional hazards models.
RESULTS: The cohort consisted of 14,094 patients with mean age 66 ± 8.9 years and mean baseline SBP 139.5 ± 15.6 mmHg; 33.6% had T2DM. The hazard ratio for the primary composite end point was 0.82 (95% CI 0.73-0.93), P = 0.0017. The interaction between intensive blood pressure lowering and T2DM was nonsignificant (P = 0.13). The 10-year cardiovascular risk was higher in primary prevention patients with T2DM, but risk did not interact with the treatment effect (P = 0.84). Intensive blood pressure lowering may have a similar favorable effect and appears to decrease cardiovascular events in both patients with and patients without T2DM.
View abstract

Lidin, M., Hellenius, M. L., Rydell-Karlsson, M., et al. 2018. **Long-term effects on cardiovascular risk of a structured multidisciplinary lifestyle program in clinical practice**. *BMC Cardiovascular Disorders* 18(1) 59.
AIM: to investigate the effects on cardiovascular risk factors and cardiovascular risk after 6 months and 1 year, in individuals with increased cardiovascular risk enrolled in a lifestyle multidisciplinary program in a clinical setting.
METHOD: Individuals with increased cardiovascular risk were referred from primary health care and hospitals to a program at an outpatient clinic at a department of cardiology. The program consisted of three individual visits including a health check-up with a physical examination and blood sampling, and a person-centered dialogue for support in behavioural change of unhealthy lifestyle habits (at baseline, 6 months and 1 year). Furthermore, five educational group sessions were given at baseline. Cardiovascular risk was assessed according to Framingham cardiovascular risk predicting model.
RESULTS: One hundred individuals (mean age 59 years, 64% women) enrolled between 2008 and 2014 were included in the study. Waist circumference, systolic and diastolic blood pressure and total cholesterol decreased significantly over 1 year. In parallel, cardiovascular risk according to the cardiovascular risk profile based on Framingham 10-year risk prediction model, decreased with 15%. The risk reduction was seen in both men and women, and in participants with or without previous cardiovascular disease. Participating in a structured lifestyle program over a year was associated with significant improvement in multiple cardiovascular risk factors and decreased overall cardiovascular risk.
View full text

Prescrire 2018. **Primary prevention of cardiovascular disease: Statins and hypotensive drugs: not for everyone** *Prescrire International* 27(189).
AIM: to evaluate two treatments in comparison to placebo for the prevention of a first cardiovascular event
METHOD: A large-scale placebo-controlled trial, where about 13 000 patients at risk of a first cardiovascular event were followed for approximately six years. This trial included 12 705 patients: men aged 55 years or older and women aged 65 years or older who had at least one cardiovascular risk factor, and women aged 60 years or older who had at least two cardiovascular risk factors. After randomisation, the patients were assigned to one of four

groups: rosuvastatin (10 mg per day) plus a fixed-dose combination of candesartan (16 mg per day) +hydrochlorothiazide (12.5 mg per day), versus rosuvastatin plus placebo, versus candesartan + hydrochlorothiazide plus placebo, versus double placebo.
RESULTS: Low-dose rosuvastatin and the combination of candesartan + hydrochlorothiazide did not reduce total mortality or cardiovascular mortality. The addition of candesartan + hydrochlorothiazide, without taking blood pressure into account, was not effective in primary cardiovascular prevention for patients with several cardiovascular risk factors. In this trial, the addition of rosuvastatin, irrespective of LDL-cholesterol levels, prevented one vascular event for every 91 patients treated for nearly 6 years, without reducing either cardiovascular mortality or total mortality. These findings do not justify routinely exposing all patients at cardiovascular risk due to tobacco use or family history to the adverse effects of these drugs.
View full text

Sortso, C., Komkova, A., Sandbaek, A., et al. 2018. **Effect of screening for type 2 diabetes on healthcare costs: a register-based study among 139,075 individuals diagnosed with diabetes in Denmark between 2001 and 2009**. *Diabetologia* 61(6) 1306-1314.
AIM: to compare healthcare costs among individuals with incident type 2 diabetes in a screened group with those in an unscreened group.
METHOD: In this register-based, non-randomised controlled trial, eligible individuals were men and women aged 40-69 years without known diabetes who were registered with a general practice in Denmark (n=1,912,392). Between 2001 and 2006, 153,107 individuals registered with 181 practices participating in the Anglo-Danish-Dutch Study of Intensive Treatment in People with Screen Detected Diabetes in Primary Care (ADDITION)-Denmark study were sent a diabetes risk-score questionnaire. Individuals with a moderate-to-high risk were invited to visit their family doctor for assessment of diabetes status and cardiovascular risk (screening group). The 1,759,285 individuals registered with all other practices in Denmark constituted the retrospectively constructed no-screening (control) group. In this post hoc analysis, we identified individuals from the screening and no-screening groups who were diagnosed with diabetes between 2001 and 2009 (n=139,075). Using national registry data, we quantified the cost of healthcare services in these two groups between 2001 and 2012. From a healthcare sector perspective, we estimated the potential healthcare cost savings for individuals with diabetes that were attributable to the screening programme.
RESULTS: In the screening group, 27,177 of 153,107 individuals (18% of those sent a risk-score questionnaire) attended for screening, 1533 of whom were diagnosed with diabetes. Between 2001 and 2009, 13,992 people were newly diagnosed with diabetes in the screening group (including those diagnosed by screening) and 125,083 in the no-screening group. Healthcare costs were significantly lower in the screening group compared with the no-screening group (difference in mean total annual healthcare costs -889 per individual with incident diabetes; 95% CI -1196, -581). The screening programme was associated with a cost saving per person with incident diabetes over a 5-year period of 2688 (95% CI 1421, 3995). Healthcare costs were lower among individuals with incident type 2 diabetes in the screened group compared with the unscreened group. The relatively modest cost of screening per person discovered to have developed diabetes was offset within 2 years by savings in the healthcare system.
View abstract

Cohort studies

Dahl, M., Sogaard, R., Frost, L., et al. 2018. **Effectiveness of Screening Postmenopausal Women for Cardiovascular Diseases: A Population Based, Prospective Parallel Cohort Study**. *European Journal of Vascular & Endovascular Surgery* 55(5) 721-729.
AIM: to investigate the effectiveness of systematic screening for multifaceted cardiovascular disease (CVD) in postmenopausal women on all cause mortality and, secondarily, on CVD morbidity.
METHOD: This was a population based, prospective, parallel cohort study. In total, 107,491 women born in 1936-1951 living in the Central Denmark region were identified in the Danish Civil Registration System. From this population, all women born in 1936, 1941, 1946, and 1951 (n = 1984) living in the Viborg municipality were invited to attend screening. Of those invited to the screening, 1474 (74.3%) attended. The control group included all women from the general population born in 1936-1951 and living in the Central Denmark Region, excluding those invited for the screening. Information on medication and comorbidities prior to inclusion and study outcomes were retrieved from national registries for both groups. The screening included examination for abdominal aortic aneurysm (AAA), peripheral arterial disease (PAD), carotid plaque (CP), potential hypertension (HT), atrial fibrillation (AF), diabetes mellitus (DM), and dyslipidaemia. The adjusted Cox proportional hazards model with the intention to screen principle was used to assess effectiveness for the total population and across

age groups.
RESULTS: During follow up (median 3.3 years, IQR 2.9-3.9), the adjusted hazard ratios (HRs) for invited versus controls were the following: all cause mortality, 0.89 (95% CI 0.71-1.12); myocardial infarction (MI), 1.26 (95% CI 0.52-3.07); ischaemic heart disease (IHD), 0.72 (95% CI 0.49-1.05); PAD, 1.07 (95% CI 0.49-2.31); and ischaemic stroke, 1.20 (95% CI 0.78-1.85). A substantial number of women with AAA, PAD, and/or CP declined prophylactic therapy: 45% for antiplatelet and 35% for cholesterol lowering agents.
View abstract

Gronhoj, M. H., Gerke, O., Mickley, H., et al. 2018. **External validity of a cardiovascular screening including a coronary artery calcium examination in middle-aged individuals from the general population**. *European Journal of Preventive Cardiology* 2047487318774850.
AIM: to evaluate the external validity of a screening programme including coronary artery calcium examination, and the association between coronary artery calcium and cardiovascular events.
METHOD: Multi-centre population based study. Randomly selected middle-aged men and women (N=1751) free of cardiovascular disease were invited to the examination during 2009-2010. Participation rate in the examination was 70%. Participants (n=1227) and non-participants (n=524) were compared regarding: cardiovascular medical treatment, Charlson comorbidity index and socioeconomic status (evaluated by cohabitation, gross income and education). Study endpoints were cardiovascular events and mortality.
RESULTS: Non-participants had a significant higher comorbidity (p=0.003) and a lower socioeconomic status (p<0.0001), while cardiovascular medical treatment was alike. Over a median follow-up time of 6.5 years the cardiovascular event and mortality rates were equal (6.7% vs. 6.4%, p=0.80 and 0.4% vs. 0.5%, p=0.76, respectively). Adjusted hazard ratio was 0.90 (95% confidence interval (CI) 0.63-1.37). Among participants, the extent of coronary artery calcium was significantly associated with increased risk of cardiovascular events (hazard ratio 1.92, 95% CI 1.03-3.54, hazard ratio 3.66, 95% CI 1.82-7.32, hazard ratio 6.51, 95% CI 3.17-13.36 for coronary artery calcium scores 1-99, 100-399, >=400 AU, respectively).
View abstract

Jegan, N. R. A., Kürwitz, S. A., Kramer, L. K., et al. 2018. **The effect of a new lifetime-cardiovascular-risk display on patients' motivation to participate in shared decision-making**. *BMC family practice* 19(1) 84.
AIM: to investigate the effects of three different risk displays used in a cardiovascular risk calculator on patients' motivation for shared decision-making (SDM).
METHOD: We analysed a sample of 353 patients recruited in general practices. After giving consent, patients were introduced to one of three fictional vignettes with low, medium or high cardiovascular risk. All three risk displays were shown in a randomized order. Patients were asked to rate each display with regard to motivation for SDM and accessibility. Two-factorial repeated measures analyses of variance were conducted to compare the displays and investigate possible interactions with age.
RESULTS: Regarding motivation for SDM, the TTE elicited the highest motivation, followed by the emoticons and bar chart ($p < .001$). The displays had no differential influence on the age groups ($p = .445$). While the TTE was generally rated more accessible than the emoticons and bar chart ($p < .001$), the emoticons were only superior to the bar chart in the younger subsample. However, this was only to a small effect (interaction between display and age, $p < .01$, $\eta 2 = 0.018$).
View full text

Liu, L., Li, Q., Yuan, Z., et al. 2018. **Non-high-density lipoprotein cholesterol is more informative than traditional cholesterol indices in predicting diabetes risk for women with normal glucose tolerance**. *Journal of Diabetes Investigation* 14 14.
AIM: to analyze the association between non-HDL and development of diabetes, and to estimate the cut-off point of non-HDL for discriminating incident diabetes in people with normal glucose tolerance.
METHOD: Of 3,653 middle-aged and elderly Chinese with normal glucose tolerance at enrollment, 1,025 men and 1,805 women returned to the 3-year follow up and were involved in the final analysis. Logistic regression analysis was used to test the association between cholesterol indices and incident diabetes, and receiver operating characteristic analyses were used to identify the optimal cut-off of each cholesterol variable for incident diabetes.
RESULTS: Non-HDL was an independent risk factor for diabetes for women, but not for men. In women, a 1-standard deviation increment in non-HDL was associated with a 1.43-fold higher risk of diabetes (95% confidence interval 1.14-1.79; P = 0.002), whereas odds ratios for total cholesterol and low-density lipoprotein cholesterol were 1.33 (95% confidence interval 1.06-1.67; P = 0.015) and 1.30 (95% confidence interval 1.04-1.64; P = 0.024), respectively. The discriminatory power and the optimal cut-off value of non-HDL for incident diabetes increased across body mass index categories. For women with obesity, the threshold of non-HDL for screening of diabetes

was estimated as 3.51 mmol/L.
View full text

Oliveira, M. G., De Medeiros, D. S., Amorim, W. W., et al. 2018. **Evaluation and screening of diabetes mellitus in health fairs: Preliminary results of healthrise vitoria da conquista**. *Diabetology and Metabolic Syndrome. Conference: 21st Brazilian Diabetes Society Congress. Brazil.* 10(Supplement 1) A144.
AIM: to describe the proportion of individuals without previous diagnosis or with self-reported DM, identified in health fairs with altered glycated hemoglobin (HbA1c).
METHOD: This research was conducted as part of the HealthRise project. Five health fairs were held in areas with family health strategy coverage in the city of Vitoria da Conquista, Bahia, from April to July 2017. Community health agents delivered invitations to patients with DM and their families. There were also announcements on local radio. At the health fairs, questionnaires with demographic data and self-reported DM diagnosis were applied, capillary blood glucose test and blood collection for glycated hemoglobin (HbA1c) measurements were performed. The latter is for individuals with capillary blood glucose > 100 mg/dL (fasting) or 140 mg/dL (non-fasting). Samples were sent to a clinical laboratory. Individuals without a DM diagnosis with HbA1c values >= 6.5% were later referred for another measurement and medical assessment. Uncontrolled patients were those with a diagnosis of DM and HbA1c > 7% (adults) and > 8.5% (elderly). Data was analyzed through descriptive statistics.
RESULTS: Among the 151 patients whose HbA1c results had already been released by the laboratory, 110 (72.8%) were female and 89 (58.9%) were older adults. 36 (23.8%) of the patients had no previous diagnosis of DM, of which 6 (16.7%) presented HbA1c >= 6.5%. Between 115 patients with self-reported DM, 46 (40%) had uncontrolled HbA1c, according to the study criteria. A high proportion of people with uncontrolled DM was found.
View abstract

Pylypchuk, R., Wells, S., Kerr, A., et al. 2018. **Cardiovascular disease risk prediction equations in 400,000 primary care patients in New Zealand: a derivation and validation study**. *The Lancet* 391(10133) 1897-1907.
AIM: to develop equations relevant to patients in contemporary primary care and compare the performance of these new equations to equations that are recommended in the USA.
METHOD: The PREDICT study automatically recruits participants in routine primary care when general practitioners in New Zealand use PREDICT software to assess their patients' risk profiles for cardiovascular disease, which are prospectively linked to national ICD-coded hospitalisation and mortality databases. The study population included male and female patients in primary care who had no prior cardiovascular disease, renal disease, or congestive heart failure. New equations predicting total cardiovascular disease risk were developed using Cox regression models, which included clinical predictors plus an area-based deprivation index and self-identified ethnicity. Calibration and discrimination performance of the equations were assessed and compared with 2013 American College of Cardiology/American Heart Association Pooled Cohort Equations (PCEs). The additional predictors included in new PREDICT equations were also appended to the PCEs to determine whether they were independent predictors in the equations from the USA.
RESULTS: Outcome events were derived for 401 752 people aged 30–74 years at the time of their first PREDICT risk assessment between Aug 27, 2002, and Oct 12, 2015, representing about 90% of the eligible population. The mean follow-up was 4·2 years, and a third of participants were followed for 5 years or more. 15 386 (4%) people had cardiovascular disease events (1507 [10%] were fatal, and 8549 [56%] met the PCEs definition of hard atherosclerotic cardiovascular disease) during 1 685 521 person-years follow-up. The median 5-year risk of total cardiovascular disease events predicted by the new equations was 2·3% in women and 3·2% in men. Multivariable adjusted risk increased by about 10% per quintile of socioeconomic deprivation. Māori, Pacific, and Indian patients were at 13–48% higher risk of cardiovascular disease than Europeans, and Chinese or other Asians were at 25–33% lower risk of cardiovascular disease than Europeans. The PCEs overestimated of hard atherosclerotic cardiovascular disease by about 40% in men and by 60% in women, and the additional predictors in the new equations were also independent predictors in the PCEs. The new equations were significantly better than PCEs on all performance metrics.
View abstract

Morris, D. R., Sherliker, P., Clack, R., et al. 2017. **The association of blood glucose and diabetes with peripheral arterial disease involving different vascular territories: Results from 628 246 people who attended vascular screening**. *European Heart Journal* 38 (Supplement 1) 654.
AIM: to assess associations between blood glucose concentration, diabetes and arterial disease affecting different vascular territories (abdominal aortic aneurysm, carotid artery disease, lower extremity peripheral artery disease)

in a large screened population.
METHOD: Between 2008 and 2013, 3.3 million self-referred individuals attended cardiovascular screening clinics (Life Line Screening) in the US and UK. Assessment included carotid duplex screening, abdominal aortic aneurysm screening, and ankle:brachial pressure (ABI) measurement. Major cardiovascular risk factors and medical history were recorded. Participants with incomplete data, missing blood samples, or prior cardiovascular disease were excluded, yielding 628 246 individuals in the current report.
RESULTS: The mean age at screening was 63+/-10 years, and 64% of attendees were women. The prevalence of screen-detected abdominal aortic aneurysm (>=30mm) was 0.5%, the prevalence of carotid artery stenosis (peak systolic velocity >=110cm/s) was 3.5%, and the prevalence of lower extremity peripheral artery disease (ABI <0.9) was 2.6%. A prior diagnosis of diabetes was associated with an increased risk of carotid artery disease (OR 1.73 95% CI 1.68 - 1.78) and peripheral artery disease (OR 1.82 1.76 - 1.89), but with a lower risk of abdominal aortic aneurysm (OR 0.82 0.76 - 0.89). However, amongst attendees without known diabetes, there was a positive log-linear association between blood glucose levels and risk of all these types of vascular disease. Even across the normal reference range, higher blood glucose concentrations are associated with increased risk of vascular disease.
View abstract

Tarride, J. E., Smofsky, A., Nykoliation, P., et al. 2017. **Effectiveness of a Type 2 Diabetes Screening Intervention in the Canadian Workplace**. *Canadian Journal of Diabetes* 18 18.
AIM: to evaluate the effectiveness of Motivaction, a diabetes screening and education pilot program, in the workplace.
METHOD: The Motivaction program involves a voluntary web-based diabetes health-risk assessment, the Canadian Diabetes Risk Questionnaire (CANRISK), combined with an opportunity for those eligible (i.e. having diabetes or having a CANRISK score >=21) to attend 2 on-site biometric screening meetings with a registered nurse and 4 educational sessions by telephone with a certified diabetes educator. Biometric data, as well as information about self-efficacy, lifestyle changes, productivity, well-being, mental health and program satisfaction, were collected at baseline and at 6 months.
RESULTS: Attendance at the initial and 6-month clinical visits included 293 people. At baseline, 21% were identified as having prediabetes (13%) or having diabetes (8%). Statistically significant reductions in glycated hemoglobin levels from baseline to the study's end were observed in those with prediabetes or diabetes. No statistically significant changes in glycated hemoglobin levels were observed in individuals with normal levels or in those at risk for diabetes at baseline. No statistical differences were observed in terms of productivity or mental health for the full population or across diabetes-risk categories. More than 90% of employees would recommend the Motivaction program to other employers.
View abstract

Cross-sectional studies

Acharya, A., Cheng, B., Koralkar, R., et al. 2018. **Screening for Diabetes Risk Using Integrated Dental and Medical Electronic Health Record Data**. *Jdr Clinical & Translational Research* 3(2) 188-194.
AIM: to determine how the identification approach can be recalibrated to detect diabetes or prediabetes in a White, rural cohort and whether an integrated dental-medical electronic health record (iEHR) offers further value to the process.
METHOD: We analyzed iEHR data from the Marshfield Clinic, a health system providing care in rural Wisconsin, for dental patients who were >=21 y of age, reported that they had never been told they had diabetes, had an initial periodontal examination of at least 2 quadrants, and had a glycemic assessment within 3 mo of that examination. We then assessed the performance of multiple predictive models for prediabetes/diabetes. The study outcome, glycemic status, was gleaned from the medical module of the iEHR based on American Diabetes Association blood test cutoffs. The sample size was 4,560 individuals.
RESULTS: Multivariate logistic regression revealed that the best performance was achieved by a model that took advantage of the iEHR. Predictors included age, sex, race, ethnicity, number of missing teeth, percentage of teeth with at least 1 pocket >=5 mm from the dental EHR, and overweight/obesity, hypertension, hyperlipidemia, and smoking status from the medical EHR. The model achieved an area under the receiver operating characteristic curve of 0.71 (95% confidence interval, 0.69-0.72), yielding a sensitivity of 0.70 and a specificity of 0.62. Across a range of populations, informed by certain patient characteristics, dental care team members can play a role in helping to identify dental patients with undiagnosed diabetes or prediabetes. The accuracy of the prediction increases when dental findings are combined with information from the medical EHR.
View abstract

Andersen, J. W., Dahl, M., Yderstraede, K. B., et al. 2018. **Use of point-of-care HbA1c measurement to estimate the level of undiagnosed diabetes mellitus among 67-year-old participants in a cardiovascular screening programme in the municipality of Viborg, Denmark**. *Diabet Med*.
AIM: to determine the prevalence of unidentified diabetes mellitus among 67-year-olds in Denmark participating in a screening programme focusing on cardiovascular disease and diabetes, and to describe glycaemic levels in individuals according to point-of-care HbA1c combined with self-reported diabetes status.
METHOD: In this cross-sectional, retrospective, population-based study, all people aged 67 years living in the Viborg municipality were invited to take part in the Viborg Inter-sectorial Screening Programme (VISP), which focuses on cardiovascular disease and diabetes. The VISP study was initiated in August 2014 and is ongoing. During the first 2 years of the programme, we stratified participants into groups based on their self-reported diabetes status and a single HbA1c measurement.
RESULTS: A total of 1802 individuals were invited to participate, and 1501 consented, seven of whom were excluded because of missing data (HbA1c or diabetes status), resulting in an 82.9% participation rate (n=1494). Among those reporting not to have diabetes, 3.3% (n=45) had an HbA1c level >/=48 mmol/mol (6.5%). In the same group, 16.7% (n=226) had an HbA1c level of 41-48 mmol/mol (5.9-6.5%). Among those self-reporting the presence of diabetes, 30.1% (n=43) had an HbA1c level >/=58 mmol/mol (7.5%).
View abstract

Chandrupatla, S. G., Ramachandra, R., Dantala, S., et al. 2018. **Importance and potential of dentists' in identifying patients at high risk of diabetes**. *Current Diabetes Reviews* May 31.
AIM: to assess the utilization of medical and dental services by dental patients at two dental school hospitals and to approximate the number of patients having no known previous diagnosis of type 2 diabetes but are at high risk of acquiring it.
METHOD: A cross sectional study was conducted at two dental school hospitals in India. A 20-item questionnaire was administered as interviews among the dental patients aged 35 to 55 years. Data was collected on past dental and medical visits, medical history, family history relevant to diabetes, cardiovascular health, BMI and waist circumference (measured).
RESULTS: A total of 413 adult patients (males 61.26%, females 38.74%) participated in the surveys. The mean age was 43.06 years. Results revealed that nearly 50% did not have a medical or a dental visit in the last 1 year, 33% had cardiovascular diseases (CVD). Among those who did not have medical visit in last one year 45% had BMI >25 kg, 55% had waist circumference above the normal range and 38% were at high risk of diabetes.
View abstract

Gawlik, K. S., Melnyk, B. M. & Tan, A. 2018. **An Epidemiological Study of Population Health Reveals Social Smoking as a Major Cardiovascular Risk Factor**. *Am J Health Promot* 32(5) 1221-1227.
AIM: to present nationally representative data on the prevalence of "social" smoking and its relationship to cardiovascular health.
METHOD: A population-based, cross-sectional survey on cardiovascular health and its risk factors across the United States. Million Hearts((R)) cardiovascular screenings that took place in community settings. De-identified data were collected on a convenient sample of 39, 555 participants. Reported smoking status, blood pressure, and total cholesterol. The prevalence of current smoking, social smoking, and non-smoking were cross-tabulated and stratified by sample characteristics. The adjusted estimates were derived from multiple logistic regression models, adjusting for demographics and other biometric measures.
RESULTS: Ten percent identified as social smokers. Social smokers were more likely to be aged between 21 and 40, male, and Hispanic. Social smokers had significantly higher risks of having hypertension (odds ratio [OR]: 2.08, 95% confidence interval [CI]: 1.80-2.41) and elevated cholesterol (OR: 1.53, 95% CI: 1.33-1.75) than non-smokers. There was no significant difference between social smokers and current smokers (OR = 0.94, 95% CI = 0.80-1.14 for hypertension and OR = 0.95, 95% CI = 0.81-1.11 for elevated cholesterol). Although previous smoking behavior was not controlled for in the analysis, this study demonstrates there is no significant difference in the prevalence of elevated blood pressure or cholesterol among the 2 smoking groups.
View abstract

Jaspers, N. E. M., Visseren, F. L. J., Numans, M. E., et al. 2018. **Variation in minimum desired cardiovascular disease-free longevity benefit from statin and antihypertensive medications: a cross-sectional study of patient and primary care physician perspectives**. *BMJ Open* 8(5) e021309.
AIM: to quantify lifetime and 10-year benefit thresholds at which physicians and patients perceive statin and antihypertensive therapy as meaningful, and compare the thresholds with clinically attainable benefit.
METHOD: Cross-sectional study at (1) continuing medical education conference in December 2016 for primary

care physicians;(2) information session in April 2017 for patients. 400 primary care physicians and 523 patients in the Netherlands. Outcomes were months gain of CVD-free life expectancy at which lifelong statin therapy is perceived as meaningful, and months gain at which 10years of statin and antihypertensive therapy is perceived as meaningful. Physicians were framed as users for lifelong and prescribers for 10-year therapy.
RESULTS: Meaningful benefit was reported as median (IQR). Meaningful lifetime statin benefit was 24 months (IQR 23-36) in physicians (as users) and 42 months (IQR 12-42) in patients willing to consider therapy. Meaningful 10-year statin benefit was 12 months (IQR 10-12) for prescribing (physicians) and 14 months (IQR 10-14) for using (patients). Meaningful 10-year antihypertensive benefit was 12 months (IQR 8-12) for prescribing (physicians) and 14 months (IQR 10-14) for using (patients). Women desired greater benefit than men. Age, CVD status and co-medication had minimal effects on outcomes.
View full text

Leung, A. Y., Xu, X. Y., Chau, P. H., et al. 2018. **A Mobile App for Identifying Individuals With Undiagnosed Diabetes and Prediabetes and for Promoting Behavior Change: 2-Year Prospective Study**. *JMIR MHealth and UHealth* 6(5) e10662.
AIM: to (1) assess the profile of Diabetes Risk Score mobile app users, (2) determine the optimal cutoff value of the Finnish Diabetes Risk Score to identify undiagnosed diabetes and prediabetes in the Chinese population, (3) estimate users' chance of developing diabetes within 2 years of using the app, and (4) investigate high-risk app users' lifestyle behavior changes after ascertaining their risk level from the app.
METHOD: We conducted this 2-phase study among adults via mobile app and online survey from August 2014 to December 2016. Phase 1 adopted a cross-sectional design, with a descriptive analysis of the app users' profile. We used a Cohen kappa score to show the agreement between the risk level (as shown in the app) and glycated hemoglobin test results. We used sensitivity, specificity, and area under the curve to determine the optimal cutoff value of the diabetes risk score in this population. Phase 2 was a prospective cohort study. We used a logistic regression model to estimate the chance of developing diabetes after using the app. Paired t tests compared high-risk app users' lifestyle changes.
RESULTS: A total of 13,289 people used the app in phase 1a. After data cleaning, we considered 4549 of these as valid data. Most users were male, and 1811 (39.81%) had tertiary education or above. Among them, 188 (10.4%) users agreed to attend the health assessment in phase 1b. We recommend the optimal value of the diabetes risk score for identifying persons with undiagnosed diabetes and prediabetes to be 9, with an area under the receiver operating characteristic curve of 0.67 (95% CI 0.60-0.74), sensitivity of 0.70 (95% CI 0.58-0.80), and specificity of 0.57 (95% CI 0.47-0.66). At the 2-year follow-up, people in the high-risk group had a higher chance of developing diabetes (odds ratio 4.59, P=.048) than the low-risk group. The high-risk app users improved their daily intake of vegetables (baseline: mean 0.76, SD 0.43; follow-up: mean 0.93, SD 0.26; t₈₁=-3.77, P<.001) and daily exercise (baseline: mean 0.40, SD 0.49; follow-up: mean 0.54, SD 0.50; t₈₁=-2.08, P=.04).
View full text

Molinero, A., Fornos, J. A., Andres, N. F., et al. 2018. **Identifying risk for type 2 diabetes through Spanish community pharmacies: A new pharmacist service**. *International Journal of Clinical Pharmacy* 40 (2) 492.
AIM: to detect people visiting community pharmacies who have a high to very high risk of developing diabetes, to study the relationship between the risk indicated by test scores and the risk factors and to refer to a doctor any individuals with a high or very high risk and elevated basal glucose levels.
METHOD: An observational, cross-sectional study carried out on November 7-13, 2016 in community pharmacies. Inclusion: Users >= 40 years, not diagnosed with diabetes, with the capacity to consent, who agreed to complete the questionnaire. Primary endpoint: FINDRISK test score, expressed as mean +/- SD, and qualitatively by risk category: low: < 8 points; slightly elevated: 8-11 points; moderate: 12-14 points; high: 15-20 points; very high: > 20 points. Consensual referral protocol for patients with 15 or more points on the FINDRISK questionnaire and basal glucose >= 110 mg/dL. The relative frequencies of each of the other categorical variables in the questionnaire were calculated for the full sample, for men and women, and for age. Mean +/- SD was also calculated for the quantitative variables: body mass index, waist circumference, capillary blood glucose.
RESULTS: 174 pharmacists took part across Spain. The average number of questionnaires per pharmacy was 16.1 (SD = 7.2). 2802 users were included. Age: < 45 years 406 (14.49%); 45-55 years 714 (25.48%); 55-64 years 752 (26.84%); > 64 years 930 (33.10%). 2079 (74.20%) were overweight/obese: 70.81% of the women and 81.43% of the men (p < 0.0001). 84.12% of the women and 80.54% of the men had a waist circumference above normal values (p < 0.001). 64.77% of the men and 59.49% of the women said they exercise (p < 0.01). The number of users with a high or very high risk (F >= 15) was 745 (26.56%). Of these, 309 were referred to a doctor, which represents 41.48% of those with a high or very high risk, and 11.03% of the total number of people surveyed. 436 random blood glucose tests (110.8 +/- 29.1, from 50 to 299) and 858 basal blood glucose tests (89.2 +/- 12.3)

were carried out. Given that a high number of users were surveyed within a short time period and a high percentage of high-risk patients was detected, we can conclude that pharmacies are an effective location for professional screening.
View abstract

O'Brien, M. J., Bullard, K. M., Zhang, Y., et al. 2018. **Performance of the 2015 US Preventive Services Task Force Screening Criteria for Prediabetes and Undiagnosed Diabetes**. *Journal of General Internal Medicine* 12 12.
AIM: to compare the performance of limited and expanded screening criteria recommended by the USPSTF for detecting dysglycemia among US adults.
METHOD: Cross-sectional analysis of survey and laboratory data collected from nationally representative samples of the civilian, noninstitutionalized US adult population. A total of 3643 adults without diagnosed diabetes who underwent measurement of hemoglobin A1c (A1c), fasting plasma glucose (FPG), and 2-h plasma glucose (2-h PG). Screening eligibility according to the limited criteria was based on age 40 to 70 years old and overweight/obesity. Screening eligibility according to the expanded criteria was determined by meeting the limited criteria or having >=1 of the following risk factors: family history of diabetes, history of gestational diabetes or polycystic ovarian syndrome, and non-white race/ethnicity. Dysglycemia was defined by A1c >=5.7%, FPG >=100 mg/dL, and/or 2-h PG >=140 mg/dL.
RESULTS: Among the US adult population without diagnosed diabetes, 49.7% had dysglycemia. Screening based on the limited criteria demonstrated a sensitivity of 47.3% (95% CI, 44.7-50.0%) and specificity of 71.4% (95% CI, 67.3-75.2%). The expanded criteria yielded higher sensitivity [76.8% (95% CI, 73.5-79.8%)] and lower specificity [33.8% (95% CI, 30.1-37.7%)]. Point estimates for the sensitivity of the limited criteria were lower in all minority groups and significantly different for Asians compared to non-Hispanic whites [29.9% (95% CI, 23.4-37.2%) vs. 49.8% (95% CI, 45.9-53.7%); P<.001]. Diabetes screening that follows the limited USPSTF criteria will identify approximately half of US adults with dysglycemia.
View abstract

Peer, N., Balakrishna, Y., de Villiers, A., et al. 2018. **Effectiveness of a screening programme in identifying individuals with increased risk of cardiovascular disease in South Africa**. *Journal of Public Health* 40(1) e34-e45.
AIM: to determine the proportion of participants identified with previously undiagnosed diabetes and untreated hypertension in the Heart and Stroke Foundation South Africa's screening programme.
METHOD: This cross-sectional study was conducted nationally in 2013 among ≥18-year-old adults self-selected for screening. Data collection included medical history and behaviours related to diet, physical activity, smoking and alcohol use. Clinical measurements comprised blood pressure, anthropometry and point-of-care random blood glucose and cholesterol assessments.
RESULTS: Among the 7711 participants, 2488 men and 5223 women, mean ages were 47.6 years and 48.6 years, respectively. Prevalence of diabetes was 13.8% in men and 12.8% in women but only 1.8% (45) and 0.9% (47), respectively, were newly diagnosed. Another 14.5% (men) and 12.4% (women) had impaired glycaemia. Only 32.9% and 36.3% with known diabetes were controlled. Hypertension was prevalent in 51.8% of men and 48.9% of women, 52.0% and 63.1% of whom were using anti-hypertensive medication; 43.2% of men and 45.5% of women on anti-hypertensive medication were controlled. Very few individuals with newly diagnosed diabetes were identified, which underscores the need for cost-effective targeted screening of high-risk individuals to optimize diagnosis.
View abstract

Singh, S. S., Pilkerton, C. S., Shrader, C. D., Jr., et al. 2018. **Subclinical atherosclerosis, cardiovascular health, and disease risk: is there a case for the Cardiovascular Health Index in the primary prevention population?** *BMC Public Health* 18(1) 429.
AIM: to answer a challenge commonly faced by primary care practitioners: in patients with no known CVD, how can individuals likely to have subclinical atherosclerosis be easily identified using existing clinical data and/or information provided by the patient?
METHOD: Using NHANES (1999-2004), 6091 men and women aged >=40 years without any CVD comprised the primary prevention population for this study. Subclinical atherosclerosis was determined via ankle-brachial index (ABI) using established cutoffs (subclinical atherosclerosis defined as ABI (0.91-0.99); normal defined as ABI (1.00-1.30)). Three common scores were calculated: the Framingham Risk Score (FRS), the Metabolic Syndrome (MetS), and the Cardiovascular Health Index (CVHI). Logistic regression analysis assessed the association between these scores and subclinical atherosclerosis. The sensitively and specificity of these scores in identifying subclinical atherosclerosis was determined.

RESULTS: In eligible participants, 3.8% had subclinical atherosclerosis. Optimum and average CVHI was associated with decreased odds for subclinical atherosclerosis. High, but not intermediate-risk, FRS was associated with increased odds for subclinical atherosclerosis. MetS was not associated with subclinical atherosclerosis. Of the 3 scores, CVHI was the most sensitive in identifying subclinical atherosclerosis and had the lowest number of missed cases. The FRS was the most specific but least sensitive of the 3 scores, and had almost 10-fold more missed cases vs. the CVHI. The MetS had "middle" sensitivity and specificity, and 10-fold more missed cases vs. the CVHI. Results from this study suggest that routine administration of the CVHI in a primary prevention population would yield the benefits of identifying patients with existing subclinical CVD not identified through traditional CVD risk factors or scores, and bring physical activity and nutrition to the forefront of provider-patient discussions about lifestyle factors critical to maintaining and prolonging cardiovascular health.
View full text

González-Chica, D. A., Dal Grande, E., Bowden, J., et al. 2017. **Are we reducing the risk of cardiovascular disease and improving the quality of life through preventive health care? Results of a population-based study in South Australia**. *Preventive Medicine* 99 164-170.
AIM: to investigate the achievement of lifestyle recommendations and use of preventive medication in people who 1) are obese, 2) or have metabolic risk factors (hypertension, dyslipidaemia, and/or diabetes), 3) or have cardiovascular disease (CVD), 4) or are healthy, and the impact this preventive health care had on their 'Health-Related Quality of Life' (HRQoL).
METHOD: Cross-sectional survey conducted in 2015 with 2379 South Australian adults (57.1±14years; 51.7% females). Physical (PCS) and mental components scores (MCS) of HRQoL were assessed using the SF-12 questionnaire.
RESULTS: Although adequate fruit/vegetable intake was lower among individuals with CVD (29.8%; p=0.049), this behaviour was associated with a better MCS. Adequate physical activity level was lower among those with metabolic risk factors (29.5%) or CVD (31.0%; p=0.008), but independent of their clinical condition, this behaviour was associated with a higher PCS. Individuals with CVD were less likely to have adequate alcohol consumption (63.4%; p=0.026), but those achieving this recommendation had poorer PCS. Non-smoking was similar in all groups (85%; p=0.768) and was associated with a better MCS only among healthy individuals and those with CVD. In all the groups, individuals achieving all the lifestyle recommendations had a better PCS. Only 48.2% of individuals with CVD reported combined use of antithrombotic, antihypertensive, and antilipidemic drugs, but the use of these medications was not associated with HRQoL. In conclusion, the vast majority of individuals at risk of or with CVD did not achieve preventive recommendations, and only the adequacy of uptake of all recommended lifestyle behaviours showed consistent benefits for PCS and MCS.
View abstract

Case control studies

Eliasson, M., Eriksson, M., Lundqvist, R., et al. 2018. **Comparison of trends in cardiovascular risk factors between two regions with and without a community and primary care prevention programme**. *European Journal of Preventive Cardiology*. May 30.
AIM: to compare cardiovascular risk factors between two regions with and without a community and primary care prevention programme (the Vasterbotten Intervention Programme (VIP))
METHOD: Between 1994 and 2014, five surveys were performed in the two counties on persons aged 40 to 75 years within the Northern Sweden MONICA Study. The number of subjects participating was 6600 (75.4%). We compared time trends in risk factors between the two counties using regression models including age, county and year of survey. To test whether time trends differed between counties, the interaction between county and year was included in the models.
RESULTS: Systolic blood pressure declined in both counties, and the decline was faster in Vasterbotten than in Norrbotten (p = 0.043 for interaction county*year). Diastolic blood pressure declined in VB but increased in NB (p < 0.001). Cholesterol levels declined at a similar rate in both counties whereas body mass index increased in both counties. Fasting glucose decreased in VB (p = 0.003) and increased in NB. The prevalence of regular smokers decreased faster in VB than in NB (p = 0.01). Trend in waist and hip circumference, known diabetes, having an academic degree, being physically inactive or 10 year cardiovascular mortality according to SCORE did not differ. Blood pressure, glucose and smoking improved at a faster rate in the county with a community and primary care-based intervention than in the county without such an intervention.
View abstract

Hansen, T. B., Lindholt, J. S. & Sogaard, R. 2018. **Role of Experience With Preventive Medication and Personal Risk Attitude in Non-Attendance at Triple Vascular Screening**. *European Journal of Vascular and Endovascular Surgery*. Jun 8.
AIM: to investigate the role of current use of preventive medication and personal risk attitude as potential factors explaining non-attendance at triple vascular screening.
METHOD: This was a case control study across 25,078 men offered screening and intervention for abdominal aortic aneurysm, peripheral artery disease, and hypertension in the Viborg Vascular (VIVA) screening trial. Data on socio-demographic and socio-economic characteristics, diagnoses, and use of preventive medication were extracted from national registries. A proxy for personal risk attitude was constructed. Logistic regression was used to estimate odds ratios with 95% confidence intervals.
RESULTS: Use of statins (0.78; 95% CI 0.71-0.85), antihypertensives (1.26, 95% CI 1.13-1.41), or antithrombotics (1.13, 95% CI 1.04-1.23) were all associated with non-attendance. With regards to personal risk attitude, a statistically significant association was found between users of preventive medication with no recent diagnosis of cardiovascular disease and non-attendance (0.82, 95% CI 0.72-0.94). The role of traditional factors explaining non-attendance at vascular screening, such as low socio-economic status and comorbidity, was confirmed
View abstract

Qualitative

Kruger, K., Leppkes, N., Gehrke-Beck, S., et al. 2018. **Improving long-term adherence to statin therapy: a qualitative study of GPs' experiences in primary care**. *Br J Gen Pract* 68(671) e401-e407.
AIM: to identify factors related to statin discontinuation and approaches for long-term statin adherence.
METHOD: A qualitative study of German GPs' experiences with statin therapy in rural and urban settings in primary care. Semi-structured interviews (n = 16) with purposefully recruited GPs were recorded, transcribed, and analysed using qualitative content analysis.
RESULTS: Sociodemographic patient factors, the nocebo effect, patient attitudes towards primary prevention, and negative media coverage had significant impacts on statin therapy according to GPs. To overcome these barriers, GPs described useful strategies combining patient motivation and education with person-centred care. GPs used computer programs for individual risk-benefit analyses in the context of shared decision making. They encouraged patients with strong concerns or perceived side effects to continue therapy with a modified medication regimen combined with individual therapy goals.
View abstract

Economic Evaluations

Shono, A., Kondo, M., Hoshi, S. L., et al. 2018. **Cost-effectiveness of a New Opportunistic Screening Strategy for Walk-in Fingertip HbA1c Testing at Community Pharmacies in Japan**. *Diabetes Care* 41(6) 1218-1226.
AIM: to assess the value-for-money of HbA1c testing services at SMOs by conducting a cost-effectiveness analysis.
METHOD: We compared two scenarios: 1) status quo, defined as HbA_{1c} testing that is available only through conventional screening, and 2) HbA_{1c} testing available at SMOs as a complement to the status quo scenario. The model consisted of a screening module with a decision tree and a disease progression module with a Markov model. We calculated incremental cost-effectiveness ratios (i.e., cost per quality-adjusted life-years [QALYs]) over the lifetime analytic horizon as the primary end point of the cost-effectiveness analysis. In this model, we assumed the participant cohort to be people 40-74 years of age who sought walk-in fingertip HbA_{1c} testing at SMOs on the premises of community pharmacies. Costs and outcomes were discounted at a rate of 3%. The cost-effectiveness was analyzed from a societal perspective.
RESULTS: The incremental cost per individual for those 40-74 years of age was estimated to be -527 U.S. dollars (USD) (-52,722 Japanese yen [JPY]) for HbA_{1c} testing at SMOs compared with the status quo. Incremental effectiveness was estimated to be 0.0203 QALYs for HbA_{1c} testing at SMOs compared with the status quo. Therefore, this cost-effectiveness analysis showed that compared with the status quo, HbA_{1c} testing at SMOs was more effective and had lower cost for the population studied.
View abstract

Sogaard, R. & Lindholt, J. S. 2018. **Cost-effectiveness of population-based vascular disease screening and intervention in men from the Viborg Vascular (VIVA) trial**. *British Journal of Surgery* 25 25.
AIM: to investigate the cost-effectiveness of vascular screening versus usual care (ad hoc primary care-based risk assessment) from a national health service perspective.
METHOD: A cost-effectiveness evaluation was conducted alongside an RCT involving all men from a region in

Denmark (50156) who were allocated to screening (25078) or no screening (25078) and followed for up to 5years. Mobile nurse teams provided screening locally and, for individuals with positive test results, referrals were made to general practices or hospital-based specialized centres for vascular surgery. Intention-to-treat-based, censoring-adjusted incremental costs (2014 euros), life-years and quality-adjusted life-years (QALYs) were estimated using Lin's average estimator method. Incremental net benefit was estimated using Willan's estimator and sensitivity analyses were conducted.
RESULTS: The cost of screening was estimated at 148 (95 per cent c.i. 126 to 169), and the effectiveness at 0.022 (95 per cent c.i. 0.006 to 0.038) life-years and 0.069 (0.054 to 0.083) QALYs, generating average costs of 6872 per life-year and 2148 per QALY. At a willingness-to-pay threshold of 40000 per QALY, the probabilities of cost-effectiveness were 98 and 99 per cent respectively. The probability of cost-effectiveness was 71 per cent when all the sensitivity analyses were combined into one conservative scenario.
View abstract

Diagnostic test studies

Ulbricht, S., Gross, S., Brammen, E., et al. 2018. **Effect of blood pressure and total cholesterol measurement on risk prediction using the Systematic COronary Risk Evaluation (SCORE)**. *BMC Cardiovascular Disorders* 18(1) 84.
AIM: to compare the reproducibility in total cholesterol (TC), systolic blood pressure (BP), and the resulting Systematic COronary Risk Evaluation (SCORE) obtained by an in-office cardio-preventive screening program (SP) and a subsequent program performed in a clinical trial examination center (EP).
METHOD:A total of 307 individuals (60.3% female, mean age = 52.8 years) participated. According to TC and BP measurements at the SP and EP, three variables were created: the SCORESP = single BP reading at the SP, the SCOREEP/BP-first = first BP reading at the EP, and the SCOREEP/BP-mean = mean second/third BP reading at the EP. Differences in TC and BP were analyzed. Associations between age, sex and mean differences between the SCORESP and the SCOREEP/BP-first (M1) and the SCOREEP/BP-mean (M2) were analyzed using multivariable linear and quantile regression.
RESULTS: TC and BP values from the SP were significantly higher than those from the EP. Among individuals with a decreased SCORE value at the EP (compared to the SP), younger age was associated with a higher improvement in risk estimation compared with older age. Female sex was associated with higher risk improvement in the SCORE between the SP and the EP compared with male sex. Associations between both demographics and M1 (M2) achieved statistical significance at the 75.0th (50th) percentile. The reproducibility of results in cardiovascular risk prediction seems to be influenced by the accuracy of BP measurement. It seems that younger individuals and females are more likely to benefit from accuracy compared with older individuals and males.
View full text

Ongoing research

Yi, Z.-M., Chen, S.-D., Zhai, S.-D., et al. 2018. **Aspirin for primary and secondary prevention of cardiovascular and cerebrovascular disease: an overview of systematic reviews**. *PROSPERO*.
AIM: to perform an overview of systematic reviews to compare the efficacy and safety of different dosages of aspirin for primary and secondary prevention of cardiovascular and cerebrovascular disease.
METHOD: We will search the following sources: Cochrane Database of Systematic Reviews via the Cochrane Library—Wiley, Database of Abstracts of Reviews of Effects (DARE) via the Cochrane Library—Wiley, Health Technology Assessment Database (HTA) via the Cochrane Library—Wiley, PubMed, Embase via embase.com, and PROSPERO international prospective systematic review trial register (http://www.crd.york.ac.uk/PROSPERO/)
Types of study to be included: Systematic reviews, meta-analyses. Context: Primary outcome(s) 1. All cause mortality 2. Cardiovascular and cerebrovascular related mortality. Secondary outcome(s) 1. Fatal and non-fatal cardiovascular events, including myocardial infarction and stroke. 2. Adverse events, including major or serious bleeding. 3. Prevalence of aspirin resistance. Two authors will independently assess methodological quality of each systematic review with the Assessment of Multiple Systematic Reviews (AMSTAR) tool. Two authors will use the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to rate the overall quality of the evidence.
RESULTS: We will present the type of analysis conducted in each systematic review and the outcomes reported.
View details