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Evidence Check

Review of effectiveness of certain healthy lifestyle interventions (2014–2019)

An **Evidence Check** rapid review brokered by the Sax Institute for the Cancer Institute NSW. October 2019.

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This report was prepared by:

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Executive summary

Background

Alcohol, poor diet and lack of physical activity are key behavioural risk factors for cancer. Overweight and obesity is associated with these behaviours and in turn is itself a risk factor for a range of cancers. Finding solutions to reverse these risk factors and promote the uptake of a healthy lifestyle is therefore a priority for cancer prevention and control. This evidence review evaluates interventions operating at the community level, which are designed to reduce or control these modifiable lifestyle risk factors. It includes interventions in adult populations and excludes interventions that are part of clinical practice.

Review questions

This review aimed to address the following questions:

Question 1

What primary prevention interventions have been effective at increasing adults' adoption of healthy lifestyle behaviours including:

- Reducing alcohol consumption
- Increasing physical activity
- Increasing healthy eating
- Reducing overweight and obesity.

Question 2

Of the interventions identified in Question 1, which interventions demonstrate effectiveness in achieving participant outcomes in terms of meeting the recommended guidelines (for both maintenance of health and prevention of cancer, as defined above)?

Question 3

Are there community-level interventions that are promising, but may not be fully evaluated, in reducing alcohol consumption, increasing physical activity, increasing healthy eating and/or reducing overweight and obesity?

Summary of methods

The rapid review identified systematic reviews published between January 2014 and June 2019. Inclusion criteria were studies that evaluated primary prevention interventions addressing the three behaviours and/or overweight or obesity. In order to be included the reviews needed to predominantly evaluate studies of adults from the OECD countries. Reviews that were not in English, that predominantly addressed smoking, infection, radiation or other environmental exposures or only evaluated taxation or liquor licensing were excluded. Studies of pregnant women and people with cancer or other chronic diseases were excluded. Studies without controls or comparison groups were excluded. The reviewers searched Medline, Embase, Emcare, CINAHL, Scopus and relevant websites for grey literature. After screening titles and abstracts, full text papers were reviewed, and data was extracted. Included papers were assessed for quality using AMSTAR2. Ninety-nine reviews were included in the final synthesis.

Key findings

Question 1 and 2

Most reviews were of high or moderate quality with a low risk of bias. There were 31 reviews addressing alcohol consumption with non-digital coaching or behavioural interventions showing modest effects on consumption. The other interventions were more equivocal including digital, workplace and community interventions.

There were 36 reviews of interventions aiming to change diet or weight with the strongest evidence for digital interventions, non-digital behavioural or community education programs and moderate evidence for workplace interventions or those aiming to modify food provision and consumption in restaurants and other community settings.

There were 59 reviews targeting physical activity or sedentary behaviours. There was most evidence for digital interventions that were focused on increasing motivation, tailored to the person and involved prompts, goal setting, feedback and reinforcement. The next strongest evidence was for workplace interventions, non-digital behavioural or coaching interventions and interventions to promote physical activity in the local environment. These interventions produced significant changes in physical activity and sedentary behaviour. However, many of the changes were short term and there is need for longer-term studies of the impact of interventions on both physical activity and diet behaviours. Interventions delivered by peers and community health workers were demonstrated to improve physical activity levels and adherence.

No reviews specifically addressed standards achieved to address cancer prevention.

Question 3

Promising interventions that have not been fully evaluated include: the use of community health workers; providing better access of healthy foods to remote communities use of "Big Little Locals"; Park prescriptions; a loop walking and cycling trail; Health lenses; and community action, co-design programs and introduction of health parameters in planning decisions.

Gaps in the evidence

The promising interventions identified in this review need to be evaluated. There is a lack of strong evidence for interventions for migrant or culturally and linguistically diverse (CALD) population groups.

Discussion of key findings

Question 1 and 2

The review focuses on a very recent time period (2014–2019) and so builds on new evidence that has stronger emphasis on digital health than previous (older) reviews. These previous reviews were out of scope – not part of this review. These include the (US) Guide to Community Preventive Services (The Community Guide) which is a collection of evidence-based findings of the Community Preventive Services Task Force (CPSTF). This resource (and others) should be referred to in the final instance to identify the comparative effectiveness of some of the 'older' interventions (e.g. involving more personal or group interventions) to the new interventions (with more of a digital health focus).

Question 3

These are varied, and sometimes complex interventions, not amenable to short-term evaluations. Considered introductions of these models with a long-term commitment to evaluation should yield some innovative methods to tackle these complex lifestyle changes.

Applicability

All the interventions are applicable in the Australian context and many have been implemented in Australia although not necessarily at scale. The diet and physical activity interventions have been applied successfully across the age groups and with disadvantaged or vulnerable groups including indigenous populations. There is a lack of strong evidence for interventions for migrant or CALD populations. There are also a range of emerging interventions which have not yet been fully evaluated.

Conclusion

There is moderate to strong evidence for a range of interventions to address diet, physical activity and weight. There is a need for more research into interventions which address alcohol consumption and for interventions targeting any of the lifestyle factors that are specifically aimed at migrant or CALD populations across these healthy lifestyle factors.

Background

In addition to smoking [1] and sun exposure [2], alcohol consumption [1], poor diet [3] and physical inactivity [4], are key modifiable lifestyle behaviours that increase cancer risk. They are also associated with overweight and obesity, which is also a risk factor for cancer and a key priority in cancer prevention and control.[5]

A previous systematic literature review, conducted for the Cancer Institute NSW in 2017 [6], showed convincing recent evidence for the association between obesity and increased risks for cancers of the colorectum, liver, and thyroid among men and women, postmenopausal breast and uterine cancer in women, and advanced prostate cancer incidence in men. There is strong evidence from multicountry observational studies of a dose response effect regarding these exposures and cancer outcomes, e.g. obesity and cancer incidence and mortality.[7]

Also, convincing evidence regarding risk reductions in relation to increasing physical activity was shown for lung and colorectal cancers, and breast cancer among females.[4]

Convincing associations between alcohol consumption and cancer were identified for colorectal, liver and female breast cancer, on top of the well-known historical causal associations between alcohol and (squamous cell) oesophageal and oral cancers.[1]

The relationship between specific diets and cancer was found to be weaker, in contrast to earlier seminal reviews by Doll and Peto showing 35% of cancers being attributed to diet.[8] It is worth noting that within-population comparisons of high versus low components of diet (for example those derived from cohort studies) may not generate sufficient exposure contrasts to discern an effect. By contrast, incidence rates between different countries for cancers known to have a dietary cause (e.g. colorectal cancer) vary 10-fold between high risk countries such as Australia (~30/100,000) and low risk countries such as parts of Africa (approx. 3/100,000).[9]

From these reviews, it is clear that weight gain (over a BMI of 25) should be avoided (and weight loss encouraged for those who overweight). This requires significant multisector efforts to improve diet and enhance opportunities to increase physical activity. Alcohol is associated with increased obesity but is also carcinogenic in its own right, especially when consumed in combination with smoking. It is worth noting that the evidence regarding these exposures and non-cancer outcomes is more convincing, e.g. cardiovascular mortality.[7]

Evidence from large scale trials of lifestyle improvements on cancer outcomes is sparser and difficult to document for a number of reasons. These include a long lag phase between these changes in exposures and outcome, and problems in defining and measuring an effective dose. Using alcohol as an example, Australian national temporal data between alcohol consumption and cancer mortality reductions suggest a 20-year lag.[10] We note that current alcohol campaigns focus on binge/excessive drinking and its immediate social and health consequences. With regard to cancer outcomes, long-term drinking (more than two standard drinks per day over a lifetime) is the behaviour of interest and so a different focus is required. There is some evidence supporting adherence to specific diets and reductions in cancer incidence[11, 12], but overall results between dietary improvements and cancer outcomes have been weak or inconclusive.[13] Evidence linking weight loss and cancer incidence is again sparse, the key factor being measurement of weight across a lifespan rather than at one point in time. Further, unexplained weight loss (or gain) is sometimes predictive of cancer (e.g. oesophageal cancer).

There are significant barriers to cancer prevention. It is clear that individual autonomy, or choices, are influenced by a complex physical, social and economic environment[14, 15], so specific interventions may succeed or fail depending on the provision of an enabling environment (the setting). This is evidenced by tobacco control, for which it took more than half a century of concerted legal, educational, taxation, educational and societal effort to attain the (excellent) achievements to date. By contrast, these other lifestyle behaviours under review are far more complex, multifactorial and thus more challenging to provide a coherent picture of cause and effect, with different agencies focusing on different messaging. This can be confusing to both scientists and the public.[14] In the words of Bailar (1979): "*It is difficult to interest healthy people in preventing any chronic disease that has multiple causes, that cannot be easily prevented by a few simple steps, and that may not occur for decades anyway*".[16]

For these reasons, research on healthy lifestyle interventions has focused on intermediary outcomes such as improvements in lifestyle or anthropometry. These intermediate end points are more likely to measure shorter-term success such as changes in weight rather than longer-term disease (including cancer) prevention outcomes. The figure below [17] summarises the average weight loss in relation to different interventions across 80 studies.

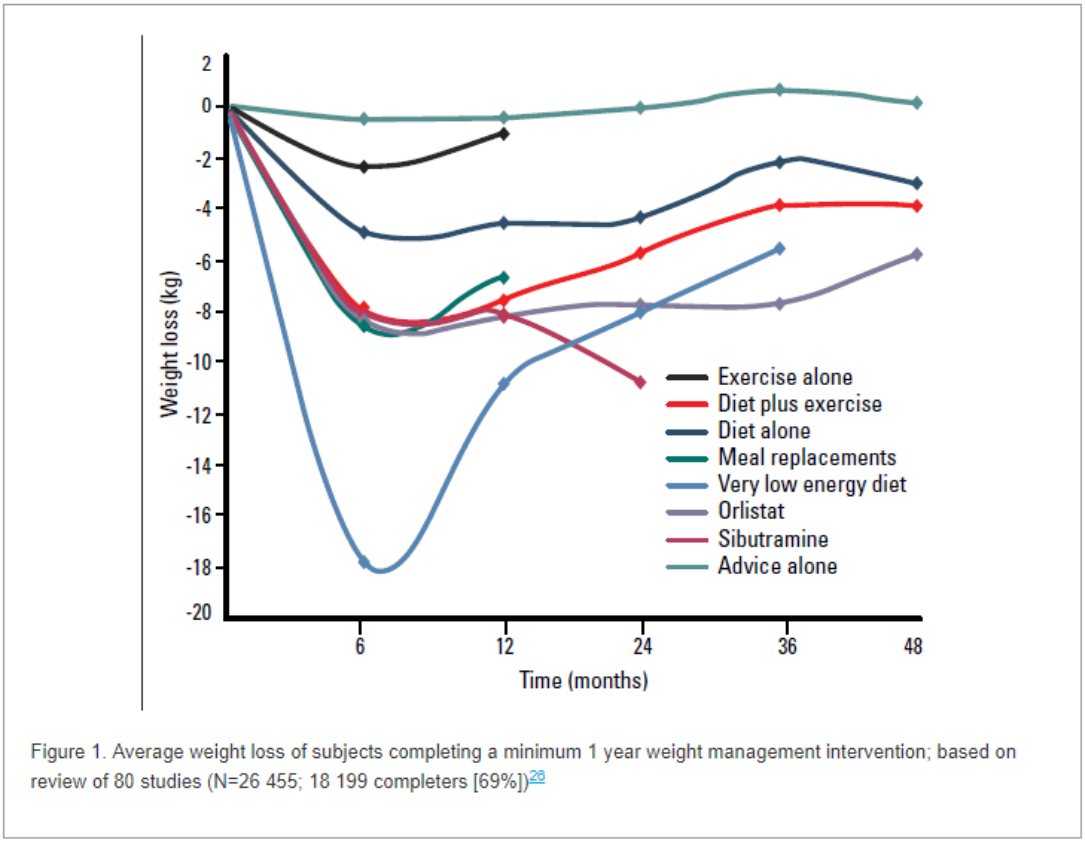

Figure 1. Average weight loss of subjects completing a minimum 1 year weight management intervention; based on review of 80 studies (N=26 455; 18 199 completers [69%])[26]

Figure 1: Average weight loss of subjects completing a minimum 1-year weight management intervention (80 study review).[13]

The review featured above focuses on programs that excluded one-on-one interventions in primary care or other clinical care settings. This review is specifically focused on what is feasible at a state level and within the remit of the Cancer Institute NSW healthy lifestyles portfolio. The reviewers included community education programs, coaching or motivational interviewing, web-based coaching, electronic health (e-health), mobile health (m-health) applications, text messaging and social media platform and telephone interventions. Settings included community or workplace interventions. Any specific social settings in which

the interventions took place and instances where specific populations were targeted, e.g. adult age groups or disadvantaged, marginalised or minority populations were noted.

Definitions

For the purposes of the review, we will adopt the following definitions:

"**Primary prevention interventions**" include public policy, legislation, projects, programs and primary prevention services:

- Settings: interventions developed and/or delivered through local state and national governments; education settings; community: sport and recreation organisations: workplaces: not-for-profit organisations. Health insurance/life insurance programs were out-of-scope
- Mode of delivery: using face-to-face (group); telephone; media; mobile technology; internet
- Age groups: all ages over 18 years were of interest. Where interventions have been developed for, or outcomes are reported by, age group (e.g. adults 65 years and over) these were noted in the report
- Interventions that may have applicability within NSW were of interest, either for interventions that could be scaled up and directly funded by government agencies or through programs run by community organisations supported with government funding.

"**Effective**" refers to increased adoption of healthy lifestyle behaviours. We provided information on the level of change, where reported:

- Where interventions had been developed for, or outcomes were reported for, priority populations (including Aboriginal people and people from culturally and linguistically diverse communities) these were summarised in the report
- The review notes which of these interventions were developed or delivered specifically to reduce the risk of cancer.

Adoption of healthy lifestyle behaviour and cancer risk factor definitions [1]

Alcohol consumption

For healthy men and women, any beverage containing ethanol, especially drinking no more than two standard drinks (where one standard drink is defined as containing 10 g of alcohol) per day or 70 g alcohol per week.[18]

For cancer prevention, the World Cancer Research Fund International (WCRF) and International Agency for Research on Cancer (IARC) recommend avoiding or limiting consumption of alcohol to no more than two standard drinks per day.[19]

Physical activity

It is a broad concept described as any body movement by large skeletal muscles that result in energy expenditure.[20] It is comprised of different domains including household, occupational, commuting and recreational physical activities.

For maintenance of health, the World Health Organization (WHO) and the Australian Physical Activity Guidelines recommend adults aged 18–64 years undertake moderate intensity physical activity for a total of at least 150 minutes (or 3–5.9 metabolic equivalent (METs)) and vigorous physical activity (6+ METs) or an

[1] These are recommended for the maintenance of health and wellbeing and the prevention of a number of lifestyle-related diseases, including cancer. However, there are particular factors that are associated with an increased or decreased risk of cancer, and the recommendations for these are also considered in the review.

equivalent combination of both moderate and vigorous activities, each week/over five separate occasions.[21, 22]

For cancer prevention, 300 minutes (five hours) of moderate intensity physical activity, or 150 minutes (2.5 hours) of vigorous intensity physical activity per week.[19]

Sedentary behaviour

Defined as time spent in sedentary state (prolonged sitting).

Healthy eating

Healthy eating means consuming the right types and quantities of food from the five food groups recommended in the Australian Guide to Healthy Eating to ensure intake of all key nutrients while obtaining the right amount of energy (kilojoules) to achieve a healthy weight. This review focused on Australian guidelines, which recommend two serves of fruit (150 g per serve), five serves of vegetables (75 g per serve) per day and fibre (approximately 25 g per day).[23, 24]

For cancer prevention, the WCRF and IARC recommend consuming very little, if any, processed meat, less than 500 g of cooked red meat per week, and limiting salt intake to less than 2000 mg per day.[19]

Healthy weight

Overweight or obesity is the accumulation of excess adipose tissue with the capacity to impair health.[25] Body mass index (BMI) status is the usual definition, derived from weight (kg) divided by the square of height (m). People with BMI status between 25 and 29.9 kg/m2 are defined as overweight and ≥30 kg/m2 are defined as obese.[26] Waist circumference is another definition derived only from waist measurement and defined as overweight or obese by >94 cm in males and >80 cm in females.[25]

Objective

The aim of this review is to explore the effectiveness of healthy lifestyle interventions designed to reduce alcohol consumption, increase levels of physical activity and healthy eating and reduce overweight and obesity. It also aims to identify interventions that have been developed specifically to reduce cancer risk, and where interventions have been effective in reducing cancer risk.

Review questions

Question 1

What primary prevention interventions have been effective at increasing adults' adoption of the following healthy lifestyle behaviours:

- Reducing alcohol consumption
- Increasing physical activity
- Increasing healthy eating
- Reducing overweight and obesity.

Question 2

Of the interventions identified in question 1, which interventions demonstrated effectiveness in achieving participant outcomes in terms of meeting the recommended guidelines (for both maintenance of health and prevention of cancer, as defined above).

Question 3

Are there community-level interventions that are promising, but may not be fully evaluated, in reducing alcohol consumption, increasing physical activity, increasing healthy eating and/or reducing overweight and obesity?

Methods

Approach

A rapid realist-informed approach was used for the systematic literature review. Figure 1 summarises the methods adopted for this review and is described below. Realist approaches lend themselves to the review of complex interventions such as primary prevention interventions including public policy, legislation, projects, programs and primary prevention services. Reporting has been guided by the Cancer Institute NSW standards for reporting realist synthesis and the PRISMA statement.[27] The scope and stages involved in this systematic review (Figure 2) were discussed and agreed with the sponsor.

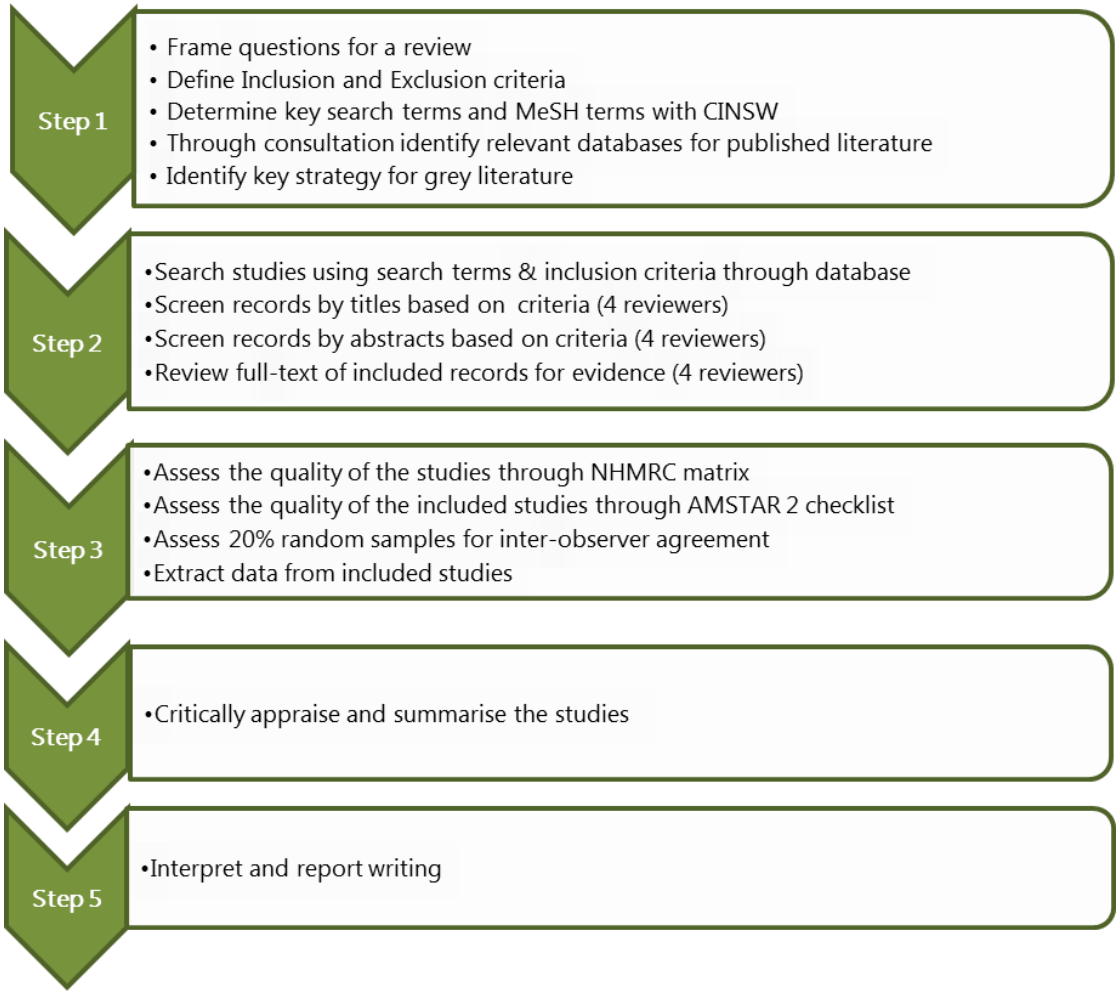

Figure 2: Framework for the methodology

Inclusion criteria

- Published between January 2014 and June 2019 (5.5 years)
- Systematic reviews of primary prevention intervention studies
- Primary prevention interventions that aimed to increase adults' adoption of healthy lifestyle behaviours to: reduce alcohol consumption, increase physical activity and healthy eating or reduce overweight or obesity

- Primary prevention interventions included public policy, legislation, projects, programs and primary prevention services that might have applicability within NSW and were either directly funded by government agencies or through programs run by community organisations
- Populations aged over 18 years in countries that are members of the Organisation for Economic Co-operation and Development (OECD) (see Table 3, Appendix 1)
- Peer-reviewed and published as grey literature
- Intervention studies included all kinds of studies except comparative studies without concurrent controls, case series with either post-test or pre-test/post-test outcomes (NHMRC Levels I to III-2).

Exclusion criteria

- Non-English language papers
- Pricing, taxation, liquor licensing, programs targeted to children
- Cancer prevention programs related to smoking, infection, UV radiation, or other environmental exposures
- Programs for people with cancer and other chronic disease
- Interventions for pregnant women
- One-to-one interventions (e.g. doctor-patient) unless included in a broader program
- Studies without a control or comparison group, descriptive studies.

Search strategy

We searched the following electronic bibliographic databases: Medline, Embase, Emcare, CINAHL, Scopus. Journal articles, conference proceedings, theses, reports, government documents and white papers in English. The search strategy included terms relating to or describing 'Healthy behaviour' or 'lifestyle' or 'wellbeing' or the remit of the literature review, i.e. obesity. The search was restricted to records published in the English language from 2014 onwards. Where possible, the search was limited to adults (18 years and over).

Grey literature

Relevant websites for grey literature [(Advanced Google search (search by domain, file type); as well as technical reports, dissertations or government publications] were searched (Table 1). These include:

Table 1: Websites searched

World Health Organization	http://www.who.int http://www.euro.who.int/en/home
The Kings Fund	https://www.kingsfund.org.uk
Community Research and Development Information Service	https://cordis.europa.eu/
Centers for Disease Control and Prevention	https://www.cdc.gov/
The Community Guide	https://www.thecommunityguide.org/
Robert Wood Johnson Foundation	https://www.rwjf.org/
Canadian Institute of Population and Public Health	http://www.cihr-irsc.gc.ca/e/13787.html
New Zealand Health Promotion Agency	https://www.hpa.org.nz/
Nuffield Foundation	https://www.nuffieldfoundation.org/
Australian Institute of Health and Welfare	https://www.aihw.gov.au/
World Cancer Research Fund International	https://www.wcrf.org/
International Agency for Research on Cancer	https://www.iarc.fr/
HealthInfo	https://healthinfonet.ecu.edu.au/

Relevant literature was identified by tracking references and authors' names from the retrieved papers and from the papers obtained through personal contacts. The titles and abstracts of the studies and publications identified were screened based on their relevance in relation to the inclusion and exclusion criteria. In cases of uncertainty on the relevance of specific references, resolution was obtained via discussion within the research team and if necessary, with the commissioning agency.

At least two members of the review team screened and selected papers for inclusion based on titles and abstracts.

The final search strategy along with the search keywords is provided in Appendix 1.

Quality appraisal

The quality appraisal was done in two phases.

In the first phase, NHMRC levels of evidence guidelines were used to determine the study quality of the included studies in the rapid systematic review. The guidelines were based on the FORM matrix [28], which consists of five components (see Appendix 2).

In the second phase, the overall methodological quality of included systematic reviews was assessed independently using the revised instrument 'A Measurement Tool to Assess Systematic Reviews' (AMSTAR 2).[29] This modified version has 16 items in total (compared to the 11 in the original version), has simpler response categories and enables assessors to make overall rating based on weaknesses in critical domains (see Appendix 2). Critical domains can significantly impact on the validity of a review and its conclusions. Five authors independently completed the methodological assessment tool and one author reviewed 20% of random samples for inter-observer agreement.

The detail quality appraisal along with the NHMRC FORM matrix and AMSTAR 2 detail is provided in Appendix 2.

Data extraction

A detailed template incorporating the various parameters of the study was prepared and used to extract the data. Major areas of extraction were as follows:

1. General information: Sources (Author's name and publication year, title and journal name);
2. Study design and quality assessment: Study type, Intervention, population, settings (i.e., worksite, school, Aboriginal health service); risk factor targeted (alcohol, diet, physical activity, weight); country/ context; N (Number of studies, number of participants); intervention/comparator; outcomes [behaviour change, risk factor change (e.g. weight)]; direction/magnitude of effect.

Three independent reviewers reviewed one-third of papers each to ensure shared understanding of extraction criteria. Where disagreements occurred or when reviewers were unsure of categorisation, they were discussed within the research team to achieve consensus.

Data synthesis

Data synthesis involved comparison of findings to address effectiveness of interventions, in terms of applicability to the Cancer Institute NSW. Short summaries were written of community-level interventions that were promising for reducing cancer risk factors, but which were not fully evaluated.

Included studies

A table summarising characteristics of the included papers is in Appendix 3. A brief overview of the characteristics of included studies is provided below in Table 2. Table 3 shows the overall summary of the quality of the studies.

The overall quality rating based on weaknesses in seven critical domains (Appendix 2, see Table 7) of AMSTAR framework, which can significantly impact on the validity of a review and its conclusion of the reviewed articles. Given the focus of the review on identifying more effective primary prevention intervention/s focused on healthy lifestyle behaviour and the contextual factors influencing how they worked, the review drew most strongly on papers that had rich descriptions of interventions implementation, and that had been evaluated or described with sufficient detail that explanations could be identified for how the intervention lead to outcomes. Most of the papers were high to moderate quality, based on the scale we used for identifying high quality systematic reviews, including non-randomised studies of healthcare intervention of description.

Table 2 Overall characteristics of the reviewed studies

Outcome based distribution	Number of papers reviewed (not additive)
Nutrition or diet	11
Physical activity and sedentary behaviour	59
Weight reduction	11
Alcohol consumption	31
Combinations of healthy lifestyle	24
Diet and physical activity	6
Diet, physical activity and weight	8
Diet, physical activity and alcohol	4
Diet, physical activity, weight and alcohol	6
Diet and alcohol	1

Table 3 Rating overall confidence in the results of the reviewed paper

Rating categories	N
High No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest	52
Moderate More than one non-critical weakness: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review	28
Low One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest	17
Critically low More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies	2

Findings

Search process and yield

Titles were screened using inclusion and exclusion criteria. Abstracts of remaining papers were then screened. The full text of the remaining papers was then screened using the exclusion/inclusion criteria before the remaining texts were included for extraction. At each stage where reviewers were unsure, Professor Harris reviewed papers and following discussion these were included or excluded accordingly.

The search results are summarised and presented as a PRISMA flow diagram (Figure 3). The final search of the five chosen databases yielded 1065 references. This was reduced to a total of 99 articles by removing 170 duplicates and through the search stages of title review (228 removed), abstract review (507 removed) and final assessment (73 removed).

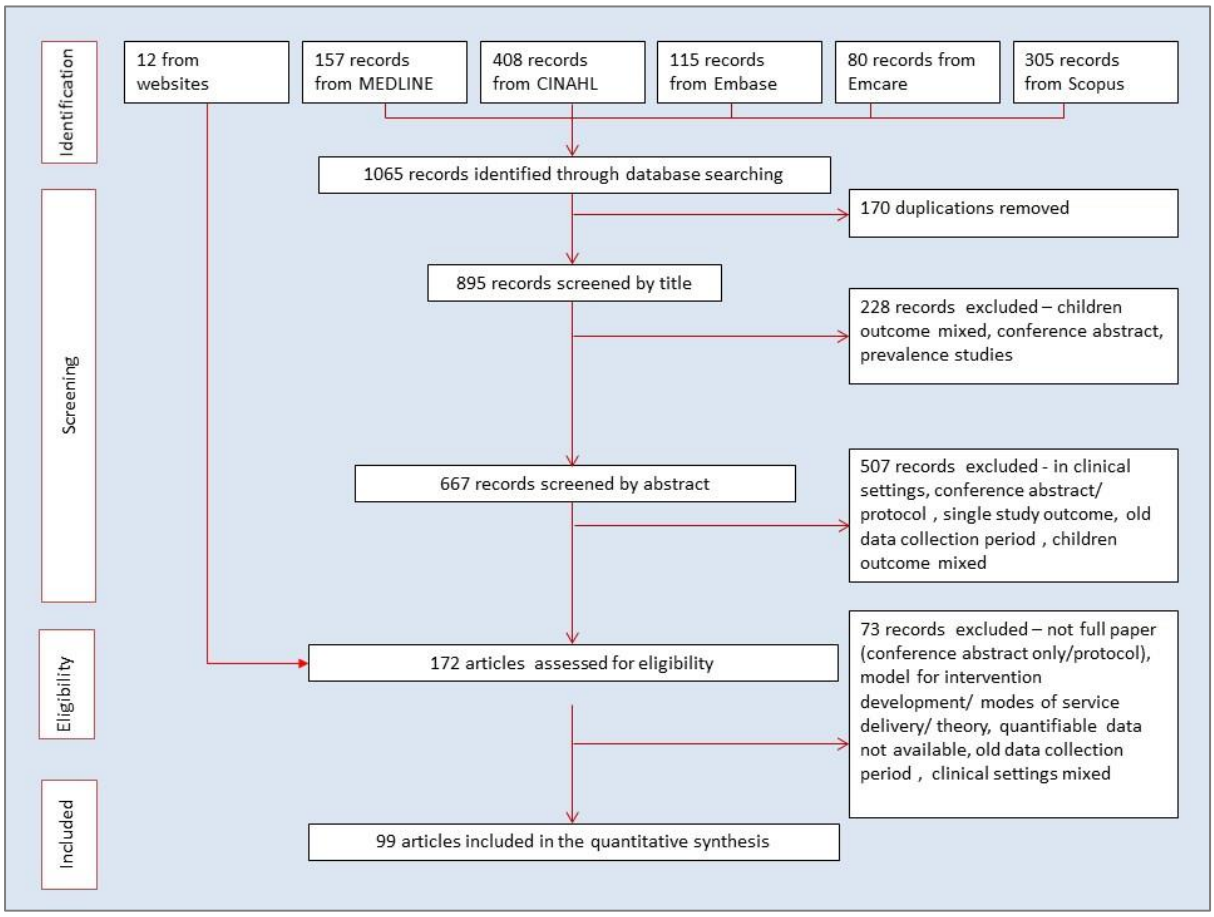

Figure 3: Flow chart showing study selection process

Analysis of evidence in relation to review Questions 1 and 2

Alcohol

We identified 31 systematic reviews of which 21 were focused on interventions that addressed alcohol only, and 10 were focused on alcohol with other risk factors (diet, physical activity or weight). Most of the systematic reviews were of moderate quality (based on AMSTAR2).

Brief interventions

Brief interventions delivered to individuals or groups who were not classified as alcohol dependent and which involved education, coaching and/or motivational interviewing were assessed in six reviews (five targeting alcohol alone and one in combination with other substances). Although these included recent and higher quality studies, they demonstrated only small reductions in the number of drinks per day or week. This evidence was strongest for studies with young people (to 25 years), with poorer quality evidence in older adults. Effect sizes were small.

The review by Samson et al [30] (to 2012) assessed 73 studies in heavy drinking college students (<25 years) observing a 7% reduction in daily alcohol consumption. Ickes et al [31] (to 2012) conducted a similar review of 49 studies (to 2012) in college students (<21 years) finding heterogenous effects including small reductions in average number of drinks and frequency of binge drinking and poor study quality. Foxcroft et al [32] reviewed 84 motivational interviewing intervention studies (to 2015) in young people aged 16–25, finding a small average reduction from 13.7 drinks/week to 12.5 drinks/week. Hennessy et al [33] (to 2014) assessed 18 variable quality studies of brief interventions for both alcohol and smoking in adolescents and young people, finding small changes in alcohol consumption but not smoking. Platt et al [34] reviewed 52 studies in young and middle-aged adults (to 2015) in a mixture of settings, finding a modest impact on the quantity but not frequency of alcohol consumption with a relatively low risk of bias. Effects of setting (university or primary care) and provider (nurses) were observed in the met-regression analysis. Beyer et al [35] reviewed 46 moderate quality studies (to 2017) of brief interventions (mostly in young adults, involving 1–5 sessions), finding an average reduction of 20 g per week after one year. Ashton et al [36] reviewed multiple smoking, nutrition, alcohol, physical activity and obesity (SNAPO) interventions. Two of three intervention studies examined the effect of a brief motivational intervention, showing a reduction in binge drinking at six months.

Mobile health (m-health), electronic health (e-health) or telephone interventions

Interventions using m-health, e-health and telephone models were evaluated in eight reviews – five of which were focused only on alcohol and three of which focused on alcohol with other risk factors. The quality of studies was variable (from low- to moderate-quality) demonstrating moderate reductions in amount and frequency of alcohol consumption. Studies were heterogenous involving a range of populations from young college students to middle-aged adults.

Kazemi et al [37] reviewed 12 poor and moderate studies (to 2015) of m-health interventions in a variety of formats including web-based, text messaging, SMS or smartphone apps. Only four studies showed impacts on drinking with insufficient evidence of impact on frequency or amount. Moreover this review was of low quality. Dedert et al[38] reviewed 28 low-moderate quality studies (to 2015) of interventions delivered online or via desktop computer or mobile device which delivered normative feedback, goal setting and/or psychoeducation. Half the studies were with college students. There was a small reduction in alcohol consumption (one drink per week) but no significant effect on the proportion of participants meeting consumption guidelines for amounts, frequency or on binge drinking episodes. Riper et al[39] reviewed 16 low- to moderate-quality studies (to 2013) of guided and unguided low intensity internet interventions finding a reduction of 22 g per week and better adherence to low risk drinking guidelines.

Bhochhibhoya et al [40] reviewed 14 low quality studies of internet-based interventions to prevent binge drinking, finding 13 studies that demonstrated reductions in quantity and frequency of alcohol consumptions. Tansil et al [41] reviewed 31 moderate-quality studies (to 2011) evaluating electronic screening for excessive alcohol consumption and brief interventions. This demonstrated a 23.9% reduction in binge drinking intensity and 16.5% reduction in binge drinking frequency.

Tsoli et al [42] reviewed 15 studies (to 2017) of interactive voice-response interventions (telephone call with interactive voice messages targeting behaviour change) – eight of which focused on diet, physical activity and alcohol but which reported no change in alcohol consumption. Afshin et al [43] reviewed 224 studies (to 2013), 49 specifically targeting alcohol, of interventions using information and communication technology, internet, mobile phone, personal sensors and stand-alone computer software in heavy alcohol drinkers. A total of 47 studies used internet interventions, with 34 reporting positive outcomes. However, there was heterogeneity in outcomes and low adherence with follow up of more than three months. Danielson et al [44] reviewed 74 low- to moderate-quality studies of technology-based support interventions for smoking, gambling and alcohol use (36 studies), finding insufficient evidence of impact on alcohol consumption. Oosterveen et al [ref 62] reviewed 17 intervention studies on alcohol using e-health. Of those, 12 interventions with web-based personalised feedback had the strongest effect. In the latter, nine out of 12 studies showed reductions in the intervention arm up to one-year post-baseline, compared to a control arm (mean number of drinks per week difference –2.43).

Policy interventions

There were three reviews of policy, legal interventions of low- to medium-quality, with limited and variable impacts on alcohol consumption. Nelson et al [45] reviewed five natural experiments changing alcohol taxes prices and availability (to 2016), finding selective impacts on subpopulations and drinking patterns. Siegfried et al [46] reviewed four poor-quality studies (to 2013) of restricting or banning alcohol advertising, finding no significant change in consumption. Muhunthan et al [47] reviewed 18 cross-sectional and time-series studies of Indigenous community-led legal interventions to control alcohol. One study reported a decline in alcohol consumption, but more than half reported other outcomes (reduced injury and crime). However this review was of critically low quality.

Settings

Yuvaraj et al [48] reviewed seven moderate-quality studies of workplace interventions (to 2018) finding reduced number of drinks (2.25) in those employees with high baseline consumption.

Stockings et al [49] reviewed 63 mostly low-quality studies (to 2017) of whole-of-community interventions (from 3–72 months duration) to reduce harms from alcohol use, finding small but significant decreases in risk drinking but not on alcohol use or binge drinking.

Specific population groups

Armstrong [50] reviewed seven variable-quality studies (to 2017) of interventions targeting alcohol use in adults 55+ years. The interventions were in primary care centres and in community-based groups and the participants were identified as at-risk, 'heavy' or 'problem' drinkers. Interventions included brief interventions, personalised reports on risks and problems, education, diaries and telephone counselling. The review found reduced frequency and/or amount of alcohol consumption in five studies.

Adams-Guppy [51] reviewed 17 low-quality studies of interventions for homeless alcohol-dependent adults, finding small reductions in quantity (1.2 drinks per week) or frequency (0.2 days) of alcohol consumption. However this review was of low quality.

Other

Carey et al [52] reviewed 21 studies of mandated alcohol programs for college students, finding short-term reductions in alcohol consumption but not long-term changes in frequency or quantity of alcohol consumed. Steinka-Fry et al[53] reviewed nine high-quality studies (to 2014) of interventions to reducing 21st birthday celebratory drinking in college students ,finding a small reduction in blood alcohol levels.

Prestwich [54] reviewed 41 studies using social-influence-based interventions to change alcohol consumption, finding minimal impact on alcohol intake and alcohol-related problems.

Scott et al [55] reviewed eight studies (to 2018) of non-pharmacological interventions to address unhealthy diet or risky drinking in young adults, finding no significant change in binge drinking or alcohol consumption.

James et al [56] reviewed six studies (to 2015) of simultaneous versus sequential targeting of multiple health behaviour changes in diet, physical activity, smoking and alcohol consumption, finding little difference between sequential or simultaneous interventions.

Hollands et al [57] reviewed 18 studies (to 2015) of providing genetic-based estimates of disease risk but did not find a significant impact on alcohol consumption.

Physical activity

There were 59 systematic reviews of which 37 were focused on interventions to address physical activity only, three focused on sedentary behaviour only and 19 focused on physical activity together with other risk factors. The duration of interventions varied between 3–12 months. Most of the reviews were of medium quality according the AMSTAR2 criteria.

Behavioural interventions

There were two reviews of behavioural interventions in non-clinical settings with largely positive findings. French et al [58] reviewed 24 studies (to 2013) of behavioural interventions in adults 60 years or older, finding improvements in physical activity. The greatest impacts were found in interventions providing normative information about others physical activity (PA), where and when to perform PA, and planning social support. McEwen et al [59] reviewed 45 studies (to 2015) evaluating multicomponent goal setting interventions, finding significant effects across all intervention setting except workplace locations (effect size 0.55).

Individual coaching

There were two reviews evaluating health coaching showing modest improvements. Oliveira et al [60] reviewed 27 studies (to 2016) evaluating health coaching aimed at improving physical activity, finding a small effect on physical activity levels (standardised mean difference 0.27). Castro et al [61] reviewed 15 studies (to 2016) evaluating educational interventions aimed at enhancing health literacy and adoption of healthy lifestyles delivered face-to-face or by telephone, individual or group. In eleven studies physical activity improved – one showing an increase in the proportion of participants meeting guidelines.

Digital: web, e-health, text messaging

There were five reviews evaluating e-health, web and text interventions with moderately positive findings. However, there were not clear effects of specific types or components. Oosterveen et al [62] reviewed 45 studies (to 2015) evaluating the impact of e-health behavioural interventions (including tablets, email, mobile (apps and text messages), digital games or monitoring devices on smoking, alcohol, physical activity and diet. Four studies demonstrated superior physical activity levels in an e-health intervention group compared to control at 6–26 weeks. Hakala et al [63] reviewed 23 studies (to 2015) evaluating technology-based distance interventions to promote physical activity. These interventions were 12% more effective in increasing physical activity. No differences were observed between the effectiveness of interactive, non-interactive or self-monitoring technologies.

Muellmann et al [64] reviewed 20 studies (to 2017) evaluating e-health interventions to promote physical activity. Four of six web-based interventions, two out of five telephone interventions and one out of two text messaging interventions increased physical activity levels at 1–6 months. Stockwell et al [65] reviewed 22 studies (to 2018) evaluating digital behaviour change interventions using mobile apps, websites to remotely deliver goal setting, problem solving, feedback, prompts, practice, rehearsal and adding objects to the environment. This showed an average increase in overall PA (std mean difference 0.28), moderate intensity

PA (st mean difference 0.47) and reduced sedentary time (0.44). Street et al [66] reviewed nine studies (to 2016) evaluating the impact of exergaming[2] programs on exercise behaviours, observing variable short-term impacts on physical activity time and intensity and weight.

Afshin et al [43] conducted a high-quality review of 224 studies (to 2011) evaluating internet and mobile interventions aiming to improve diet, physical activity, obesity, tobacco and alcohol use in a variety of populations and settings. Seventy-one studies targeted physical activity, with 33 demonstrating improvements including increasing minutes of physical activity (the average amount of increase varying between 1.5 to 153 minutes/week between studies) and meeting physical activity recommendations by an effect size between 1.3 and 1.5. However, adherence and impacts were only short term (up to one year).

Digital: m-health

There were two reviews specifically evaluating interventions using mobile phone apps, with mixed outcomes. Schoeppe et al [67] reviewed 23 studies (to 2015) evaluating apps to improve diet, physical activity and sedentary behaviour. Thirteen out of 21 studies showed impacts on physical activity. Apps that targeted single behaviours rather than multiple included multiple components such as goal setting, self-monitoring, motivational or tailored advice, reinforcement and gamification were slightly more effective. Song et al [68] reviewed eight studies (to 2017) evaluating mobile phones in promoting physical activity, finding an increase in frequency of physical activity in four of five studies, and step count in two of three studies up to three months following the intervention. However, these outcomes were not sustained beyond three months.

Digital: social networks

Three reviews evaluated the impact of digital social media, with limited evidence of effectiveness. Ferrer et al [69] reviewed eight studies (to 2014) evaluating physical activity interventions delivered by Facebook with most studies indicating increased physical activity. However, most follow up was short (less than three months) and studies were of variable quality. Maher et al [70] reviewed 10 studies (to 2012) evaluating social network health behaviour interventions on a variety of platforms aiming to improve diet, physical activity, or weight loss. One study reported improvement in physical activity. Williams et al [71] reviewed 22 studies (to 2013) evaluating social media interventions to change diet and physical activity behaviours including diaries, learning modules and social support using a variety of platforms. No effect on physical activity was demonstrated.

Phone counselling (interactive/non-interactive)

One review evaluated the use of telephone counselling, demonstrating impacts on physical activity. Tsoli et al [42] reviewed 15 studies (to 2017 of variable quality) evaluating interactive voice response interventions delivered via telephone and targeting alcohol (n=4), diet and physical activity (n=2), physical activity alone and medication adherence. There was a small effect on physical activity. Messages that were 'personalised', which offered 'social support (unspecified)' or provided 'information about health consequences' were associated with larger effects.

Activity trackers

Two studies reviewed the use of activity monitors, finding moderate to large effects on physical activity levels. De Vries et al [72] reviewed 14 studies (to 2015) evaluating the use of activity monitors in overweight or obese adults, finding an increase of 282 metabolic equivalent of task (MET) minutes or between 500–1000 steps per week. Braakhuis et al [7] reviewed 14 studies (to 2012) evaluating the use of activity trackers to provide objective feedback. They found a moderately positive effective size (0.34).

[2] Video games that require rigorous physical exercise (Collins English Dictionary 2019).

Cycling

Stewart et al [73] reviewed 12 studies (to 2014) evaluating interventions to increase commuter cycling (written information, workplace travel plans to encourage cycling to work, cycling training, environmental changes). This provided equivocal results. Environmental interventions were difficult to evaluate.

Policy, regulation

Tseng et al [74] reviewed 17 studies (to 2018) evaluating a broad range of policies and programs to reduce adult obesity (through changes to diet and physical activity). Interventions included some relating to the built environment (n=3), transport (n=4), financial subsidy (n=1) and school programs (n=1). Four of nine that focused on environment or physical activity showed small reductions in BMI (0.5–1 kg/m^2). Two of the eight studies measuring physical activity showed improvement.

Financial incentives

Tambor et al [75] evaluated 15 studies (to 2015) evaluating financial incentives for healthy lifestyle in adults aged 50 years and over. There were mixed findings on the impact on physical activity, with some evidence that in-kind incentives (eg gym vouchers) were viewed more positively.

Settings: workplaces / worksites

Seven reviews evaluated interventions in workplaces including a range of interventions to reduce sedentary behaviour or improve physical activity. Hutcheson et al [76] evaluated 15 studies (to 2015) evaluating the impact of environmental interventions in the workplace on sedentary behaviour. Fourteen out of 15 studies reported decreases in sedentary behaviour, with reductions in sitting time during the workday, ranging from 18 minutes to 233 minutes. Cao et al [77] reviewed 16 studies (to 2014) evaluating the impact of active workstations (treadmill or cycling) finding an increase of approximately 3900 steps per day or a mean weight loss of 2.7kg.

Lassen et al [78] evaluated nine studies (to 2017) evaluating the impact of worksite interventions to promote healthier food and/or physical activity. There was moderate change in the frequency/duration of physical activity in four studies where this was assessed. Wolfenden et al [79] reviewed six studies (to 2017) evaluating implementation of workplace-based policies targeting tobacco, alcohol, diet, physical activity and obesity finding no impact on physical activity. Gutermuth et al [80] reviewed 18 studies (to 2015) evaluating interventions in a diverse range of worksites using CDC's worksite health score card as a tool to assess the interventions. Eleven studies showed significant improvements in physical activity. Incentives, health risk assessments, health promotion committees, leadership support, marketing, subsides and discounts for use of exercise facilities were the most effective organisational support strategies

Flahr et al [81] reviewed seven studies (to 2016) evaluating physical activity interventions in shift workers (mostly night shift workers including casino staff, cleaners, nurses) finding some improvements in fitness and decreased weight. However, studies were heterogenous in terms of interventions and outcome measures. Malik et al [82] reviewed 58 studies (to 2011) evaluating workplace physical activity interventions. Two out six physical activity programs showed improved step count (by 699–978 steps per day), one study demonstrated an increase of 2–4 hours spent doing physical activity per week. A total of 29 out of 39 health promotion programs showed a small increase in PA time (average 30 min per week).

Settings: home environment

There were two reviews focused on sedentary activity at home. Martin et al [83] reviewed 51 studies (to 2013) evaluating diverse interventions with a potential to reduce sedentary time in adults. This showed a reduction of 22 minutes per day in sedentary time. Wu et al [84] reviewed 14 studies (to 2015) evaluating reducing screen time. The outcomes measured was weight (BMI reduction 0.15kg/m^2).

Settings: community

Three reviews evaluated intervention in local communities with equivocal findings. Bock et al [85] reviewed 55 studies (to 2012) evaluating community-based physical activity interventions based in churches or community centres. It was combined with dietary interventions in 17 studies. Half of the studies reported change in PA outcomes (16% average). Interventions using face-to-face or group sessions were most effective as were programs tailored to women or specific ethnic groups. Yun et al [86] reviewed 18 studies (to 2016) evaluating community-wide media campaigns to promote physical activity. Five studies reported change. However, studies were of poor quality. Onerup et al [87] reviewed nine studies (to 2017) evaluating physical activity prescription based on the Swedish model. Four of seven studies showed an increase in physical activity. However, the outcomes were heterogenous and restricted to Sweden and Finland.

Environmental: green space, trails, gyms

There were two reviews on recreational interventions in the local environment with some positive findings but variable quality studies. Hunter et al [88] reviewed 12 studies (to 2014) evaluating interventions to modify the urban green space to promote physical activity. Interventions included improved gyms, picnic areas, walking and cycling paths and trails, landscaping, etc. Four out of nine environmental interventions showed positive effect on PA, three out of three studies showed improved PA from a combination of PA programs combined with environmental changes. Laine et al [89] reviewed 16 studies (to 2013) evaluating the cost effectiveness of population-level physical activity interventions including community parks, road and rail trails, pedometers, school health programs, outdoor gyms, computer interventions and free leisure centres. Community rail trails were most cost effective, followed by use of pedometers, fitness zones in parks and school health programs. However, studies were of variable quality.

Providers: role of community health worker, peers

Two reviews evaluated the influence of providers promoting physical activity, demonstrating the potential role of community and peer workers in promotion and maintenance of physical activity. Burton et al [90] reviewed 18 studies (to 2016) of peer-led or peer support programs for older people to be more physically active. This showed that all reported improvements in adherence to physical activity with greater maintenance long term where the peer was trained. Costa et al [91] reviewed 26 studies (to 2014) of interventions to promote physical activity delivered by community health workers, finding positive impact on PA at six months.

Population groups: people with intellectual disability

Three reviews evaluated physical activity interventions with people with intellectual disabilities. Brooker et al [92] reviewed six studies (to 2012) of physical activity interventions with intellectually disabled adults, observing some improvements based on goal setting, education in individual and group formats, and individualized delivery. However, there was a high risk of bias given the quality of studies. Willems et al [93] reviewed eight studies (to 2016) of diet and physical activity in people with intellectual disabilities demonstrating a borderline increase in frequency of physical activity. Temple [94] reviewed six studies (to 2015) of interventions to promote physical activity in people with intellectual disabilities. Three studies reported improvements in duration and frequency of PA. The three with negative findings did not involve carers and involved only one session per week.

Population groups: CALD and ethnic populations

Two reviews evaluated interventions with ethnic groups in the US. Bender et al [95] evaluated seven studies (to 2013) evaluating interventions that aimed to improve diet, physical activity or weight in Asian American adults online or in a variety of settings. Four studies showed a significant increase in physical activity. Whitt-Glover et al [96] reviewed 16 studies (to 2013) of physical activity interventions among African American

adults in the US, finding some improvement in self-reported physical activity but equivocal findings in objective measures.

Population groups: older people

Three reviews evaluated the impact of interventions on older people demonstrating improvements in moderate intensity physical activity. Chase et al [97] reviewed 104 studies (to 2013) of physical activity interventions in adults 65 years and older, finding a mean effect size of 0.18 equivalent to 620 more steps or 73 more minutes of moderate intensity physical activity per day. Muller et al [98] reviewed 17 studies (to 2013) of non-face-to-face physical activity interventions (most print or phone) in adults aged 55 years or more, demonstrating positive effects on weekly moderate intensity physical activity. Zubala et al [99] reviewed 19 systematic reviews (to 2015) that evaluated physical activity interventions for older adults (40+ mean age from 59.8 to 79 years) using behaviour change techniques. They found that multimodal (e.g. face-to-face and online) and multicomponent interventions resulted in small to moderate increases in PA, but equivocal maintenance beyond 12 months. However, effectiveness was not influenced by mode of delivery, setting or type of health professional.

Population groups: low socioeconomic status (SES)

Two reviews evaluated the effect on interventions in groups with low socioeconomic status (SES), finding insufficient evidence of impact. Bull et al[100] conducted a review of 35 studies (to 2014) of healthy eating, physical activity and smoking interventions in low SES adults. This found small positive effects (SMD 0.21), which were not maintained over time. Interventions that focused on one behaviour were more effective. Lehne et al[101] evaluated 59 studies (to 2015) finding insufficient evidence of impact on interventions on socioeconomic inequalities in physical activity. However, most studies collected insufficient information on SES characteristics described by PROGRESS-Plus to permit differential intervention effects to be examined.

Population groups: Indigenous

Two reviews examined interventions with Indigenous people including in Australia, with equivocal findings. Sushames et al[102] reviewed 13 studies (to 2016) of physical activity interventions in Indigenous people in Australia and New Zealand. Of the six studies evaluating change in physical activity, only one showed significant improvements. Pressick et al[103] reviewed six studies (to 2015) evaluating group-based sport and exercise programs designed for Indigenous adults, and observed positive change in BMI at three months, but not sustained in the long term.

Maintenance of physical activity

Murray et al[104] reviewed 62 studies (to 2016) evaluating maintenance of physical activity, with 32 studies reporting maintenance to 6–9 months. Interventions that were delivered in primary care, prompted self-monitoring, or used follow up prompts had a greater intervention effect.

Combination with other interventions

Two reviews examined the effect of combining physical activity interventions with those targeting other behaviours. Bouaziz et al[105] conducted a review of 26 studies (to 2014) comparing endurance training alone versus when combined with diet, finding similar outcomes in terms of fitness (although other metabolic benefits from combination with diet) James et al[56] reviewed six studies (to 2015) of simultaneous versus sequential targeting of multiple health behaviour changes in diet, physical activity, smoking and alcohol consumption, finding little difference between sequential or simultaneous interventions.

Other

Biswas et al[106] reviewed 26 studies (to 2017) that reallocated sedentary time to light- or moderate-intensity physical activity, finding some energy benefits.

Hollands et al[57] reviewed 18 studies (to 2015) evaluating the impact of communication of personal risk of disease based on genetic profile on smoking, medication use, alcohol intake, diet and physical activity. This found that there was no effect on any of the risk behaviours studied.

Nutrition and weight

There were 36 systematic reviews on interventions targeting nutrition and/or weight. Most of the reviews were of moderate quality when graded according to AMSTAR2. Nine systematic reviews evaluated interventions aiming to improve nutrition only and 16 reviews on nutrition with other risk factors. There were nine reviews targeting weight only and 12 on weight together with other risk factors.

Community education programs

There were two reviews of community education and awareness programs, demonstrating changes in diet but not weight. Ashton et al[36] reviewed 10 studies (to 2013) targeting the SNAPO (smoking, nutrition, alcohol, physical activity and obesity) risk factors (to 2013). They found that both included studies targeting nutrition demonstrated improved diet at short-term follow-up (to six months). However, the review did not demonstrate weight change. Maderuelo-Fernandez et al[107] reviewed 15 studies (to 2013) evaluating interventions to promote Mediterranean diet or health eating adherence offered in individual or group sessions over 2–48 months. This demonstrated an increase in portion of fruit and vegetables (up to two serves of each per day) and increase in fibre from 1–4 g per day. Four studies also targeted physical activity. Trieu et al[108] reviewed 22 studies (to 2015) evaluating community education and awareness raising programs aiming to reduce salt intake or change salt behaviours. Nineteen studies reported improvements in salt intake (0.9 g to 3.3 g per day) or salt-related behaviours.

Behavioural interventions involving coaching or motivational interviewing

Kong et al[109] evaluated 28 studies (to 2012) of behavioural interventions with culturally-adapted strategies to improve diet and weight for African American women. It showed modest change in diet behaviour (5–20% increase in portions, 0.5 g increase in fibre) and weight (2–5 kg loss) at six months.

Web-based coaching, m-health (apps), e-health, text messaging, social media,

There were four studies specifically focused on the use of digital technology in weight management. Bennett et al[110] conducted a high-quality review of six studies (to 2012) evaluating e-health interventions for weight management among racial ethnic minority adults in the US. These produced an average 2.1 kg weight loss at six months. Schippers et al[111] reviewed 12 studies (to 2016) evaluating weight loss interventions delivered by mobile phones to overweight adults including goal setting and self-monitoring an average of once per day reporting an average 3.1 kg weight loss. Siopis et al[112] reviewed 14 studies (to 2013) evaluating text messages (from daily to fortnightly) used to support weight loss demonstrating a mean change of 2 kg weight. Wang et al[113] reviewed 24 studies (to 2016) of variable quality evaluating m-health interventions for obesity and diabetes management including text messages (13), wearable or portable monitoring devices (6) and apps (5). Nine of 14 reported weight loss (up to 7 kg) or reduced waist circumference. However, this was a low quality review according to AMSTAR2.

Two studies evaluated the use of social media to achieve diet change. Klassen et al[114] evaluated 21 studies (to 2017) evaluating social media use to achieve change in diet in young adults. Of these, 14 studies examined effectiveness, with none reporting changes in fruit and vegetable intake and only one in nine reporting weight loss. Williams et al[71] reviewed 22 studies (to 2013) evaluating social media interventions to change diet and physical activity behaviours including diaries, learning modules and social support using a variety of platforms. No effect on diet or weight was demonstrated, but this was a low-quality review based on AMSTAR2. Another review by Maher et al[70] included 10 studies (to 2012) evaluating social network health behaviour interventions on a variety of platforms aiming to improve diet, physical activity, or weight

loss, finding only modest evidence, with two studies reporting weight loss and one improved diet awareness.

Nour et al[115] reviewed 14 studies (to 2015) evaluating electronic and mobile phone-based interventions (text, email, mobile apps, phone calls or websites) promoting vegetable intake in young adults (mean age 21 yrs), reporting an increase of 0.2 portions of vegetables per day.

Four reviews considered digital interventions targeting the smoking, nutrition, alcohol and physical activity (SNAP) health behaviours, with variable impacts on diet and weight. Tsoli et al[42] reviewed 15 studies (to 2017 of variable quality) evaluating interactive voice response interventions delivered via telephone targeting alcohol (n=4), diet and physical activity (n=2), physical activity alone and medication adherence. This found no effect on diet. Schoeppe et al[67] reviewed 23 studies (to 2015) evaluating apps to improve diet, physical activity and sedentary behavior. Seven of the 13 studies showed improved diet and four of 10 studies showed improved weight. Apps that targeted single behaviours rather than multiple, included multiple components such as goal setting, self-monitoring, motivational or tailored advice, reinforcement and gamification were slightly more effective. Oosterveen et al[62] reviewed 45 studies (to 2015) evaluating e-health behavioural interventions (including tablets, email, mobile (apps and text messages), on alcohol, smoking, physical activity, obesity, nutrition (one study) and multiple behaviours. In the one study reviewed, no significant difference in fruit and vegetable intake was found after four weeks. In two out of four studies targeting weight there was a significant weight loss at 12 weeks. Afshin et al[43] conducted moderate-quality review of 224 studies (to 2013) evaluating internet and mobile interventions aiming to improve diet, physical activity, obesity, tobacco and alcohol use in a variety of populations and settings. Of these, 65 studies targeted diet or obesity, with 20 studies demonstrating improved diet and 35 demonstrating improvements in weight However, adherence and impacts were only short term (up to one year).

Policy, programs, regulation

Two studies evaluated changes to policies, programs and labelling, finding limited evidence of impacts on diet or weight. Tseng et al[74] reviewed 17 studies (to 2018) evaluating a broad range of policies and programs to reduce adult obesity (through changes to diet and physical activity). Interventions included some relating to the built environment (n=3), transport (n=4), food retailer regulation (n=3), food purchasing assistance (n=2), financial subsidy (n=1), school programs (n=1) and food labelling (n=1). Four of nine studies that focused on environment or physical activity showed small reductions in BMI (reducations of 0.5-1kg/m^2). None of the food or beverage interventions showed change in weight. Kelly et al[116] evaluated 12 studies (to 2017) on front-of-pack labelling of food products (endorsement labelling, summary indicators, warnings, nutrient specific interpretative systems) in Europe. Only three studies evaluated impact on diet, with only minimal impacts on energy and nutrient intakes but with some improvements in fat or fibre intake.

Settings: workplaces/worksites

Three studies evaluated interventions in workplaces, finding mixed impacts on diet and weight. Cairns et al[117] reviewed 18 studies (to 2012) evaluating workplace interventions to tackle socioeconomic disparities in obesity. These interventions included behavioural, environmental and organisational change in the workplace. Most of the studies were of low quality and showed no improvement. Hendren et al[118] reviewed 18 studies (to 2016) evaluating worksite cafeteria interventions on fruit and vegetable consumption in adults. Thirteen of the studies using techniques such as price-point subsidies, point of purchase materials and menu modification reported a statistically significant increase in consumption. Lassen et al[78] evaluated nine studies (to 2017) evaluating the impact of worksite interventions to promote healthier food and/or physical activity. These showed moderate effects on intake on fruit and vegetables (effect size between 0.2-0.6). Wolfenden et al[79] reviewed six studies (to 2017) evaluating implementation of workplace-based

policies targeting tobacco, alcohol, diet, physical activity and obesity. This showed mixed effects on diet and weight.

Settings: restaurants and community

Two studies evaluated changes modify the provision of food in restaurants and other community settings. Wright et al[119] reviewed 10 studies (to 2015) interventions in restaurants to promote healthy eating. Three studies evaluated manipulations of social norms finding an impact on food intake. Changes to size of portions, plates and/or cutlery in five studies demonstrated a small to moderate impact on food consumption. Three studies looked at the provision of health information, finding it had no effect on its own but that it reduced energy consumption when combined with interpretative information such as traffic lights or exercise equivalence. However, this review was of low quality when assessed against AMSTAR2 criteria. Hollands et al[120] reviewed 72 studies (to 2013) evaluating interventions to modify portion, package or tableware size to change selection and consumption of food, alcohol and tobacco. This found that exposure to larger-sized portions, packages, individual units, or tableware increased the quantities of food consumed.

Specific populations: Indigenous and minority population groups.

Gwynn et al[121] evaluated 35 studies (to 2017) attempting to improve the nutrition of Aboriginal and Torres Strait Islander adults. Of these, 14 studies reported improved markers of nutrition intake (including three reporting improvements in fruit and vegetable intake and weight). Store-based interventions including a food price strategy combined with community health promotion, fiscal strategies and nutrition education programs showed promise. However, improvements were only demonstrated for a short time period (3–12 months).

Bender et al[95] evaluated seven studies (to 2013) evaluating interventions delivered online or in a variety of settings that aimed to improve diet, physical activity or weight in Asian American adults. One of the four interventions measuring diet demonstrated improved diet and two of three targeting weight demonstrated improved BMI.

Samuel-Hodge et al[122] reviewed 17 studies (to 2012) evaluating diabetes prevention program implementation with overweight African American adults, finding an average of 3 kg was lost over six months, which is approximately half that achieved in diabetes prevention program trials in general populations.

Specific populations: women in post-partum period, low socioeconomic, people with disabilities, young people.

Dodd et al[123] reviewed 27 studies (to 2017) aiming to reduce weight in post-partum women. These used a variety of interventions. Combined diet and physical activity interventions produced greater postpartum weight loss (MD-2.5 kg) which was maintained at 12 months. However, this was a low-quality systematic review according to AMSTAR2.

Bull et al[100] reviewed 35 studies (to 2014) evaluating interventions aiming to improve the diet, physical activity and smoking by low-income groups. This demonstrated small improvements in diet. Hillier-Brown et al[124] reviewed 20 studies (to 2012) of individual, community and societal level interventions aimed at reducing socioeconomic inequalities in obesity. Interventions at individual and community level produced small changes in BMI and an increase in those attaining an ideal BMI, after six months. However, this was a low-quality systematic review according to AMSTAR2.

Willems et al[93] reviewed eight studies (to 2016) of diet and physical activity in people with intellectual disabilities demonstrating no impact on weight.

Other

Scott et al[55] reviewed eight studies (to 2018) evaluating non-pharmacological interventions to reduce unhealthy eating and risky drinking in young adults (18–25 years). Four studies reported changes in diet and weight (BMI reduction of 0.5kg/m^2).

Hollands et al[57] reviewed 18 studies (to 2015) evaluating the impact of communication of personal risk of disease based on genetic profile on smoking, medication use, alcohol intake, diet and physical activity. This found that there was no effect on any of the risk behaviours studied.

James et al[56] reviewed six studies (to 2015) of simultaneous versus sequential targeting of multiple health behaviour changes in diet, physical activity, smoking and alcohol consumption finding little difference between sequential or simultaneous interventions.

Clifford et al[125] reviewed 16 studies (to 2013) of "non-diet" approaches to eating on weight, diet, physical activity. One study reported weight loss. Others reported no significant change. One study reported improvement in diet quality and one reported increase frequency of physical activity. This study suffered from inconsistent definitions of "non-diet".

Question 3: Promising examples of interventions

The following community-level interventions were identified in response to Question 3, as having promise in reducing alcohol consumption, increasing physical activity, increasing healthy eating and/or reducing overweight and obesity.

Community health workers

A community health worker is defined as: "A frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served. This trusting relationship enables community health workers to serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery"[126]. There is some limited evidence for the effectiveness of same-culture community health workers promoting health eating and physical activity in achieving improvements in weight and waist circumference in Latina women in the US[127]. In Australian settings, the use of community health workers has been limited, but encompasses a range of roles such as peer workers, cultural support workers, bilingual community educators, navigators, and lived experience workers[128]. The most established form of community health workers in Australia are Aboriginal health workers, who have training programs, a system of registration, and are able to claim for Medicare Benefit Scheme (MBS) items.

Internationally, community health workers have been identified as a mechanism for meeting the needs of culturally diverse and marginalised groups, including the promotion of health screening participation, prevention and cancer control [129-131]. They have been effective at promoting lifestyle interventions, enhancing access to services, and reducing rates of rehospitalisation [127, 132-135].

Community health workers present a promising intervention to promote health lifestyles in the Australian context, in particular among CALD populations.

Improving access to food in remote communities

A project by Ngaanyatjarra Pitjantjatjara Yankunytjatjara (NPY) Women's Council, Nganampa Health Council, Mai Wiru Regional Stores Aboriginal Corporation and the Australian Prevention Partnership Centre targeted the availability, affordability, accessibility and promotion of healthy food in remote Aboriginal communities in the Northern Territory. The project was funded by the Medical Research Future Fund (MRFF) to address Aboriginal food security and dietary intake in two communities by improving the number, range, quality and relative price of fresh fruits and vegetables, lean meats and whole grain cereals,

as well as improved product placement and promotion and the provision of healthy takeaway foods. The project built on traditional food knowledge with a message to "eat store foods that are most like traditional bush foods".

Evaluation of the project showed improved availability, product placement and promotion in the intervention communities compared to other communities and more affordable healthy diet options. This resulted in a 50% increase in dietary intake of fruit and vegetables and 5% reduced intake of sugary drinks. The project demonstrated a direct relationship between product placement and promotion in food outlets and reported diets. It is still being followed up.

A key feature of this project was the collaborative approach to changing store policies with the local community and the stores and regular feedback of results to the community.

For more information see[136] (https://preventioncentre.org.au/news-and-events/prevention-centre-news/research-project-helps-remote-aboriginal-communities-improve-their-food-security-and-diet/)

The 'big' and 'little' local

The Big Local is a program funded by the UK National Lottery Community Fund providing funding to 150 disadvantaged communities in the UK. The funding can be spent over 10–15 years at the communities' chosen pace, and on their own plans and priorities. The projects involved are:

- Resident-led: building confidence and capacity among those wanting to make a difference to their community and their local area. They are run by locally trusted organisations (such as local community organisations) which are legally and financially responsible for the funding
- Non-prescriptive: enabling residents to spend on their own terms and in their own time, on the projects they judge to be most important to them.
- Patient and non-judgmental: giving communities the time and opportunity to learn, make mistakes, resolve disagreements and overcome challenges for themselves, on their way to achieving their ambitions.
- Accompanied by flexible and responsive support: to help communities to build the confidence and capability to make the most of the opportunities available to them, while not constraining their own ambition and initiative.

Evaluations have shown that this approach builds community skills and engagement, improves services and local employment.

More information is available at[137]: https://localtrust.org.uk/big-local/

In the Sydney suburb of Canterbury, the CAN-GET-HEALTH project is a collaboration between the Sydney Local Health District, Central and Eastern Sydney Primary Health Network and UNSW, Sydney. In 2018, they embarked on a scaled-down version of this approach which they called a 'Little Local'. The first community that the project was tried with was the Rohingya community (comprised mainly of refugees from North Burma). The community was allocated $10,000 towards a project that addressed health and wellbeing, together with training and ongoing support. The community chose to use the funding to help build community infrastructure and cohesion through activities involving promotion of traditional foods and physical activity, including a soccer tournament for young men. The project has led to improvements in access to health services and local health literacy (especially in oral and child health), although impacts on lifestyle behaviours have not yet been studied and or demonstrated.

More information is available at[138]: https://www.slhd.nsw.gov.au/sydneyconnect/story-Comfort-in-football.html

Park prescriptions

Park prescription programs (also called ParkRx) involve health or social service providers encouraging people to spend time in nature to improve their health and wellbeing. This idea began in 2011 in the San Francisco Bay area in the US, as a collaboration of park, health and community organisations. Park prescriptions involve healthcare and social service providers encouraging their patients to take advantage of programs to get people into the parks for their health and wellbeing.

Since its creation, the Healthy Parks Healthy People (HPHP): Bay Area has grown into a wide network of partners working across sectors to improve the health and wellbeing of all Bay Area residents through the use and enjoyment of parks and public lands. The collaborative has reached approximately 6000 community members through targeted park programming and is developing diverse approaches to implementing Park prescription programs that are created in partnership between park professionals and health care providers.

For more information see: https://instituteatgoldengate.org/resources/hphp-bay-area-roadmap-case-studies

This program has been adopted by many counties across the US and begun spreading to other cities including Singapore (see https://doi.org/10.1371/journal.pone.0218247) where the local partners have begun by assessing the barriers (e.g., being too busy, lack of social support, weather-related concerns and the fear of injury) and facilitators (e.g. park proximity and accessibility, physical activities of interest to the target group) to physical activity and park use. This approach is being used to develop interventions to address these barriers.

Health lenses and rapid health appraisals

Health lenses and rapid health appraisals consider the impact of a planned policy or program on population health before they are implemented. They consider the impact of an activity on the social, environmental, and economic determinants of health. They also examine how these impacts might affect different population groups and affect health equity[139]. Health lenses focus on a limited number of key questions, such as:

1. What is the initiative trying to achieve?
2. Is there evidence of existing health inequities?
3. Who may be dis/advantaged by the initiative?
4. Are there likely to be unanticipated impacts?
5. What are the key recommendations for implementation?

Health lenses were originally developed in New Zealand[140, 141] and have since been used in South Australia[142, 143] and Canada[144]. Related approached have also been used to at local government levels internationally[145]. Health lenses are relatively quick processes, require relatively limited resources, and can facilitate win-win planning across health and other sectors. Health lenses differ from Health Impact Assessments, which are more extensive, systematic, require participation of those involved and focus on minimising the negative and enhancing positive impacts.

Health lenses and rapid health appraisals may enable a greater focus on lifestyles, landscapes and livelihoods within a broad range of planning and policy development. There is limited evidence about the impact of health lenses and rapid health appraisals on lifestyles and health outcomes because they aim to influence decisions and implementation, rather than individuals' behaviours directly. They are promising because they have the potential to address the complex social and environmental determinants of lifestyle behaviours.

Community action for the prevention of unsafe alcohol consumption

The consumption of alcohol is widespread in Australian culture, with 80% of Australians reporting in 2016 that they had drunk at least one glass of alcohol in the previous 12 months[146]. Public concern and policy attention have focused most on social and health problems from alcohol misuse (e.g. binge drinking, drink driving, alcohol-related violence) and alcohol dependence. For cancer prevention, the NHMRC guideline for reducing the risk of alcohol-related harm over a lifetime is relevant. That is: "For healthy men and women, drinking no more than two standard drinks on any day reduces the lifetime risk of harm from alcohol-related disease or injury."[18](p. 39) This is not a 'safe' or 'no risk' level of drinking, but a low-risk pattern of drinking. In 2016, 17% of Australian adults reported that they consumed alcohol at levels placing them at lifetime risk of an alcohol-related disease or injury[146].

There is some evidence to support recommendations for population-wide measures to reduce alcohol consumption including[147-149]:

- Alcohol taxation (although the review presented in this report identifies that the impacts of taxation will vary with population subgroup, depending upon factors such as culture and ability to pay)
- The regulation of alcohol marketing by the Australian government
- Government controls on alcohol availability e.g. trading hours.

In addition to the policy options above, the WHO's global strategy to reduce harmful use of alcohol includes recommendations that communities can be supported and empowered by governments and other stakeholders to use their local knowledge and expertise to adopt effective approaches to prevent and reduce the harmful use of alcohol by changing collective, rather than individual, behaviours, while being sensitive to cultural norms, beliefs and value systems[150]. Policy options and interventions include:

1. Supporting rapid assessments in order to identify gaps and priority areas for interventions at the community level
2. Facilitating increased recognition of alcohol-related harm at the local level and promoting appropriate effective and cost-effective responses to the local determinants of harmful use of alcohol and related problems
3. Strengthening capacity of local authorities to encourage and coordinate concerted community action by supporting and promoting the development of municipal policies to reduce harmful use of alcohol, as well as their capacity to enhance partnerships and networks of community institutions and nongovernmental organisations
4. Providing information about effective community-based interventions, and building capacity at community level for their implementation
5. Mobilising communities to prevent the selling of alcohol to, and consumption of alcohol by, under-age drinkers, and to develop and support alcohol-free environments, especially for youth and other at-risk groups
6. Providing community care and support for affected individuals and their families; developing or supporting community programs and policies for subpopulations at particular risk, such as young people, unemployed persons and Indigenous populations
7. Population-specific issues, like the production and distribution of illicit or informal alcohol beverages at events at community level such as sporting events and town festivals.

Codesigned interventions

The benefits of consumer engagement in health have been well established[151]. Terms such as codesign, participatory design and coproduction have been used to describe various models of working collaboratively with consumers to develop, implement and/or evaluate a service or intervention. Such

methods aim to provide outputs that are relevant and usable. There has been a growing movement to use codesign methods for health and social service development[152, 153].

Codesign methods can be used in the development of health promotion interventions. For example, Verbiest and colleagues used codesign to develop a culturally tailored behaviour change m-health intervention for Māori and Pasifika communities in New Zealand[154]. Codesign may be particularly important for interventions that aim to change behaviours such as alcohol use that are highly affected by local cultural influences. When those cultural factors differ for population subgroups, such as young adults or people from specific cultural backgrounds, codesign can be especially important for ensuring the appropriateness and acceptability of an intervention.

There are multiple resources for guiding codesign [153, 155-159]. While most focus on service development, their principles are relevant for the development, implementation and evaluation of lifestyle interventions. Common features include:

1. Person-centred methods to understand the perspective of users/consumers
2. A focus on practical, real-world solutions to issues faced by the end users
3. Collaboration between organisations (such as service providers and/or research institutions) and consumers

Transforming a recreational trail into a loop for cyclists and pedestrians

The Lagoon Trail is a multi-use recreational walking and cycling loop trail in a densely populated area of Northern Sydney. It runs through bushland, parks and passes amenities such as parking areas, other recreational activities and cafes/restaurants. The local council redeveloped the trail between 2010 and 2015 linking the suburbs of Narrabeen and Cromer from both directions, providing a trail for pedestrian and cyclist use that is entirely off-road including new bridges, new boardwalk, reserve and car park upgrades, a boat ramp, toilet facility upgrades, park furniture, rest stops, vantage outlook points, heritage restoration, environmental protection and substantial planting of local vegetation.

This was evaluated using time series analyses of counts from infrared electronic counters of pedestrians and cyclists. The modification to the trail encouraged proportionate and real increases in usage and greater total physical activity especially for people not meeting physical activity recommendations. Pedestrian and cyclist counts on established trail sections increased by between 200% and 340% from pre- to post-completion. Those users not meeting physical activity recommendations were more likely to report increased total physical activity since the loop was created.

For more information see https://doi.org/10.1186/s12966-019-0815-4

Targeting the determinants of health through working with local government

The relationship between the built environment and health is well established. Strategic land use planning has been identified in recent years as having an important role in determining healthy built environments. Land use planning provides a way for local government to influence and shape the health of their communities through shaping and changing the built environment. A promising example of integrating health into local government land use planning process is the Wollondilly Shire Council Integrating Health Considerations into Planning Project..

This is a multiyear collaboration between South Western Sydney Local health District (SWSLHD), Wollondilly Shire Council (WSC) and Centre for Health Equity Training Research and Evaluation (CHETRE), UNSW Sydney. The multiphase project focused on identifying points of intervention and strategies for integrating health considerations into land use policy and planning processes.

The program of work has led to:

- An ongoing Health In Planning Working Group (HIPWG) with representatives from WSC, SWSLHD and CHETRE focused on continuing to develop, monitor and support the consideration of health in planning.
- A health vision for the Council incorporated into the Community Strategic Plan. This is the highest level of strategic planning undertaken by a local council: all other plans developed by the council as part of the Integrated Planning and Reporting Framework must reflect the Community Strategic Plan.
- The appointment of a co-funded (SWSLHD, WSC) Senior Strategic Health Planner.
- The development of a Health Assessment Protocol that provides a process for considering health impacts and strengthening to health benefits of:
    - Strategic and high-level planning and policy making,
    - Development Control Plans that provide planning standards and controls to guide new development in Wollondilly.
    - Development applications.

A key feature of this project is the use of a collaborative and context-specific approach that ensured that strategies were based on a clear, shared understanding of how health can 'fit' into the local government context and the context specific barriers and enablers.

Gaps in the evidence

There has been an increase in the evaluation of interventions using e-health. The effectiveness of these would need to be evaluated over a longer time period and would also need to be evaluated as relative to the effectiveness previous non-e-health interventions (e.g. as reviewed in the US Community Guide developed by the US Community Preventive Services Task Force). All the promising interventions (as outlined in findings on Question 3 above) need to be carefully evaluated regarding their feasibility and effectiveness. They have been included in the review largely based on their potential applicability in the Australian context, with some evidence of effectiveness at least in some contexts. We found relatively few promising interventions that related directly to weight and, as in our review of systematic reviews, there were few studies that evaluated the achievement of specific recommendations to reduce cancer risk (as opposed to increase general levels of healthy behaviour).

Several interventions identified in this review may be too short term to discern an effect. Further research is also needed to evaluate the longer-term impact of interventions involving changes to the environment, organisations or systems as they require longer periods to implement and to achieve change in the risk behaviours, as well as being more complex to evaluate and determine attribution.

Discussion

Synthesis

Ninety-nine reviews were identified of which 80 were assessed to be of moderate to high quality, suggesting a low risk of bias in their findings (whether positive, negative or equivocal).

Question 1: What primary prevention interventions have been effective at increasing adults' adoption of healthy lifestyle behaviours?

We identified a large number of systematic reviews of community-based interventions addressing modifiable lifestyle behaviours and overweight/obesity. These reviews were of variable quality with the majority being of moderate quality. Most of the literature reviewed was published within the past five years (2014 onwards). There was insufficient evidence that interventions targeting one behaviour were any more or less effective than those targeting multiple behaviours.

There was a large number of reviews evaluating digital and telephone health interventions targeting each of the modifiable lifestyle behaviours. These include:

- Web-based interventions providing information, goal setting, prompts and feedback
- Text messages and reminders
- Telephone sessions with intervention providers or automated voice messages and reminders
- Apps with goal setting, activity tracking, and reminder functions.

These were generally effective in modifying behaviour including in older (>50 years) and disadvantaged population groups, but their effectiveness and sustainability in the longer term (beyond 12 months) remains unclear. There was insufficient evidence for interventions specifically designed to engage social networks in changing behaviour.

The most frequently evaluated settings in which interventions were conducted were workplaces. These include a mix of interventions involving education, environmental changes, subsidies for health promoting activities and/or specific interventions to change risk behaviours. Interventions in other settings including those in the home, community, restaurants or local environment had smaller or more mixed outcomes.

Physical activity

The largest number of reviews (59) evaluated interventions targeting physical activity or sedentary behaviours. Effective interventions targeted young, middle aged and older (55+) adults, Indigenous people, and adults in low socioeconomic status populations. There was less evidence in relation to ethnicity with the only two reviews evaluating this confined to the US.

There were 14 reviews focused on digital (including physical activity trackers) and telephone interventions to promote physical activity, tailored to individual's activity level, age and physical fitness. These were associated with improvements in moderate activity of between 5–150 minutes or 500–1000 steps per week. Digital interventions that involved multiple components including motivational or tailored information, goal setting, prompts, feedback and reinforcement were more effective. There was insufficient evidence that interventions that were interactive, involved social networks, or used a particular type of platform (e.g. apps or social media) were more effective than other digital interventions. There was also uncertainty about their long-term impacts and adherence beyond 12 months.

Four reviews of non-digital behavioural or coaching interventions demonstrated modest improvements in moderate physical activity (up to 30–150 min or 500–1000 steps per week). Greater impacts were observed in interventions that provided goal setting and normative information about the physical activity of peers [58].

There were seven reviews focused on evaluating workplace interventions designed to decrease sedentary activity and/or promote physical activity among a wide variety of workers including shift workers. These included different types of interventions including: health risk assessment; health promotion and education; environmental changes; active workstations; promotion of active transport to and from work; competitions; and team-based activities. They showed a modest change in physical activity (30 minutes–4 hours of moderate activity or 500–1000 steps per week) or reductions in sedentary behaviour (20 minutes–4 hours per day). There were fewer reviews and more variable evidence regarding interventions in other settings including home or community, for a small reduction in sedentary time at home (two hours per week).

There were only two reviews evaluating interventions promoting recreation in the local environment. Interventions that provided access to indoor or outdoor gyms, parks, walking or cycle trails or tracks in combination with physical activity programs were most effective. Trails and fitness zones in parks were most cost effective.

Two reviews evaluated the impact of specific types of workers providing interventions: – peer workers for older people and community health workers. These demonstrated improvements in physical activity and adherence to physical activity regimens. These workers were commonly employed by non-government organisations or churches (see promising interventions).

Nutrition and weight

Half of the 36 reviews evaluated interventions targeting nutrition or physical activity alone, with the other half evaluating them in combination with each other or other risk factors. Effective interventions targeted young adults, post-partum women, or ethnic groups in the US. There was more equivocal evidence for the effectiveness of interventions with Indigenous people and groups with low socioeconomic status. Interventions aimed at the individual or community level were more readily able to demonstrate changes in disparities in behaviour or weight compared to societal-level interventions.

There were 11 reviews focused on digital interventions to promote healthy diet. Those involving goal setting, self-monitoring, reinforcement and/or text messages were associated with small but significant weight loss (2–7kg) and modest improvements in diet (0.2 portions of vegetables per day). Adherence and impact were evaluated over the short term (up to one year). Reviews of interventions using social media or interactive voice-response telephone calls demonstrated minimal or no change in diet or weight.

Non-digital behaviour or community education programs demonstrated moderate changes in diet (reduction of 0.1–0.4 portions per day; increase of 0.5–4 g of fibre per day; 0.9–3.3 g less of salt per day) and weight (reduction of 2–5 kg). These programs lasted between 2–48 months and there was insufficient evidence as to which strategies were most effective.

There were three studies evaluating workplace interventions involving behavioural, environmental and organisational change to the workplace to change diet and weight. Some of these showed mixed impact on fruit and vegetable intake (0–0.4 serves per day) and no impact on weight.

Two other reviews focused modifying food provision and consumption in restaurants and other community settings and found that size of portions, plates and/cutlery – but not education or information – changed food consumption. Other reviews of broader policy changes such as changes to food labelling had small impacts on fat or fibre consumption but were unable to demonstrate impacts of broad policy changes, incentives or promotion on weight.

Alcohol

There were 31 reviews that evaluated interventions targeting alcohol consumption. There were effective interventions targeting young, middle-aged and older adults. There was insufficient evidence to assess their effectiveness in particular ethnic or indigenous populations.

There were eight reviews evaluating digital and telephone interventions that aimed to reduce alcohol consumption. These interventions provided goal setting, normative feedback and/or education. They demonstrated small and variable impacts on the amount or frequency of alcohol consumption (including binge drinking) and low adherence beyond three months.

Non-digital coaching or behavioural interventions were evaluated in six reviews. These were generally of brief duration and produced modest reductions in the amount of alcohol consumed per week (20 g or two standard drinks). Although we did not include reviews of interventions addressing alcohol dependence, a number of brief interventions targeted binge drinking in young people. These showed small but significant changes, which if replicated at scale could potentially reduce population alcohol consumption.

There was only one review of workplace interventions targeting alcohol consumption which showed a small reduction by those with high baseline consumption. There was one whole-of-community intervention which demonstrated reductions in risk drinking (binge drinking of five or more drinks in a single session within the past six months or a score of > 8 on the Alcohol Use Disorders Identification Scale (AUDIT)), but no impact on overall alcohol consumption. Another study of Indigenous community-led legal interventions found equivocal evidence of impact on alcohol consumption. Reviews also found insufficient evidence of the effectiveness of policy changes influencing alcohol price or advertising. Affordability has been demonstrated to be more important than price[160].

Question 2: Of the interventions identified in Question 1, which interventions demonstrated effectiveness in achieving participant outcomes in terms of meeting the recommended guidelines (for both maintenance of health and prevention of cancer

Few of the reviews reported findings in terms of the proportion of the population meeting targets (and none specifically for cancer prevention), with most reporting increments of change in the behaviours over time rather than the attainment of target levels. Digital and workplace interventions changed dietary fruit and vegetables, fibre and salt consumption, alcohol intake and physical activity. Moreover, these were demonstrated in a range of population groups. However, in most studies the effect sizes were small. Their contribution to cancer prevention is thus likely to be small, although this may still be important at the population level.

Question 3: Are there community-level interventions that are promising, but may not be fully evaluated, in reducing alcohol consumption, increasing physical activity, increasing healthy eating and/or reducing overweight and obesity?

We included brief case studies of interventions that we identified either through the review process (including from the 'grey literature' web sites) or from the personal knowledge of the review team. We particularly sought to identify promising interventions with disadvantaged, CALD or Indigenous population groups.

Applicability

All the interventions included in this review are applicable in the Australian context and many have been implemented in Australia, although not necessarily at scale. The diet and physical activity interventions have been applied successfully across the age groups and with disadvantaged or vulnerable groups including Indigenous populations. There is a lack of strong evidence for interventions for migrant or CALD populations. There are also a range of promising emerging interventions which have not yet been fully evaluated.

Conclusion

1. There is strong evidence (IA) that digital health interventions that provide motivational information tailored to patients' current behaviour, age and ability; goal setting; text prompts; and individualised feedback and reinforcement improve physical activity, diet and weight reduction. These interventions can be used in different age groups (including older people) and disadvantaged groups (IIB). There is low- to moderate-quality evidence for their use in interventions aimed at reducing alcohol consumption. There is insufficient evidence for their use with CALD groups, to differentiate between modalities (e.g. m-health, e-health etc.), or to demonstrate whether they are more or less effective in addressing single or multiple risk behaviours.
2. There is moderate evidence that non-digital health coaching or behavioural interventions are effective in modifying physical activity, diet and weight (IB). These should include goal setting and normative feedback on peers (IIC).
3. There is moderate evidence that workplace interventions, including those designed to modify the environment, to promote healthy behaviours and to support specific activities, are effective in reducing sedentary behaviour and increasing physical activity (IB). There is insufficient evidence of their effectiveness in changing diet, weight or alcohol consumption.
4. There is emerging evidence for interventions that modify the environment and promote physical activity behaviours in the local environment (including outdoor gyms, parks, walking and cycling trials).
5. There is moderate evidence that interventions delivered by peer or community workers are effective in increasing physical activity and improving adherence to physical activity regimens (IIB).
6. There is emerging evidence for the effectiveness of using small portions, plate or cutlery size in restaurants and other settings to improve fruit and vegetable intake. There is insufficient evidence for the impact of education/information or labelling of food on diet or weight.
7. There is a need for more research on effective interventions to reduce alcohol consumption.
8. The majority of evaluations were short term, being of less than two years follow-up. This is an especially significant limitation for interventions that involve environmental or system level changes.

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Appendices

Appendix 1: Detailed search strategy

Search strategy

- Relevant databases that were searched for published literature included Medline, Embase, Emcare, CINAHL, Scopus. Journal articles, conference proceedings, theses, reports, government documents and white papers in English were searched.
- Relevant websites were searched for grey literature [(Advanced Google search (search by domain, file type); as well as technical reports, dissertations or government publications] (see main document, Table 1).
- Relevant literature was identified by tracking references and authors' names from the retrieved papers and from the papers obtained through personal contacts. The titles and abstracts of the studies and publications identified were screened, based on their relevance in relation to the inclusion and exclusion criteria. In cases of uncertainty on the relevance of specific references, resolution was obtained via discussion within the research team and if necessary, with the commissioning agency.
- At least two members of the review team screened and selected papers for inclusion based on titles and abstracts.

Search terms

Medical Subject Heading (MeSH) terms were used, starting with the broad search terms: 'primary prevention', 'healthy lifestyle' and 'systematic review'. The search was then narrowed to the OECD countries (Table 3). A research librarian was consulted to identify MESH terms and inform the search strategy.

Table 3: List of OECD countries

Australia	Iceland	Spain
Austria	Ireland	Sweden
Belgium	Italy	Switzerland
Canada	Japan	The Netherlands
Denmark	Luxembourg	The United Kingdom (UK)
Finland	New Zealand	The United States (US)
France	Norway	Turkey
Greece	Portugal	West Germany

The literature searches followed in three steps:

1. First, we searched (using the Boolean operator OR) all the keywords related respectively to:
- the terms 'Healthy behaviour' or 'lifestyle' or 'wellbeing' or
- the remit of the literature review, i.e. obesity (Table 4).
2. Second, we combined the keywords related to each thematic group in Table 1 with each other, using the Boolean operator AND, as in the following example: Healthy behaviour/ lifestyle/ wellbeing AND specific focus keywords.
- The searches covered from January 2014 to June 2019 (5.5 years) and English language only.
- Only studies in adults (18 and over) population were included.
- No keywords for outcomes were included to ensure the searches were inclusive as possible.
- Reviewers screened within the OECD countries to identify a subset of literature.

Table 4 Groups of keywords

Key concepts		Search terms
Healthy behaviour/lifestyle/wellbeing	1	Fruits, OR vegetables Or Dietary fibre OR red meat OR processed meat OR salt
	2	physical activity*, Exercise
	3	Alcohol consumption OR alcohol drinking OR alcohol intake
	4	Sedentary behaviour
	5	Obesity OR Overweight OR Body weight OR waist circumference
	6	1 or 2 or 3 or 4 or 5
Primary prevention	7	Primary prevention, Primordial prevention, Preventive health*, health promotion
Systematic review	8	Systematic review mp or "Systematic review"/
	9	6 and 7 and 8
Adults	10	Limit 9 to (*adult (19 and above))
	11	limit 11 to (English language and yr="2014 -Current")
Population/ Geographic Region (for identification of most relevant single case studies and gap analyses)	12	OECD

Note. * implies that different word ending variations were searched.

Appendix 2: Detail quality appraisal

The quality appraisal was done in two phases.

In the first phase, reviewers used NHMRC levels of evidence guidelines to determine the study quality of the included studies in the rapid systematic review. The guidelines were based on the FORM matrix[1], which consists of five components (Table 5):

Table 5: NHMRC 'FORM matrix'

- Evidence base (i.e. number, level and risk of bias in included studies*)
- Consistency (i.e. findings between studies)
- Clinical impact (suggested by the evidence base)
- Generalisability (the results to the population for whom the guideline is intended) and
- Applicability (the results to the Australian (and/or local) health care setting)).

* as determined by the NHMRC evidence hierarchy (Table 6)[2]

Table 6 NHMRC levels of evidence for intervention studies

Level of evidence	Study design
I	A systematic review of Level II studies
II	A randomised controlled trial
III-1	A pseudo-randomised controlled trial (i.e., alternate allocation or some other method)
III-2	A comparative study with concurrent controls (i.e. non-randomised experimental trials, cohort studies, case-control studies, interrupted time series studies with a control group)
III-3	A comparative study without concurrent controls (i.e. historical control study, two or more single arm studies, interrupted time series studies without a parallel control group)
IV	Case series with either post-test or pre-test/post-test outcomes

Source: NHMRC website: https://www.nhmrc.gov.au/about-us/publications/guide-development-evaluation-and-implementation-clinical-practice-guidelines#block-views-block-file-attachments-content-block-1

Each of the components in the FORM matrix were rated from A to D (see Table 7).

Table 7 Definition of NHMRC grades of recommendations

Grade of recommendation		Description
A	Excellent	Body of evidence can be trusted to guide practice
B	Good	Body of evidence can be trusted to guide practice in most situations
C	Satisfactory	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Poor	Body of evidence is weak and recommendation must be applied with caution

Source: NHMRC website: https://www.nhmrc.gov.au/about-us/publications/guide-development-evaluation-and-implementation-clinical-practice-guidelines#block-views-block-file-attachments-content-block-1

In the second phase, the overall methodological quality of included systematic reviews was assessed independently using the seven critical domains in the revised instrument *A MeaSurement Tool to Assess systematic Reviews* (AMSTAR 2)[3] (See Table 8). Critical domains can significantly impact on the validity of a

review and its conclusions. Five authors independently completed the methodological assessment tool and one author reviewed 20% of random samples for inter-observer agreement.

Table 8: AMSTAR 2 critical domains

• Protocol registered before commencement of the review (item 2)
• Adequacy of the literature search (item 4)
• Justification for excluding individual studies (item 7)
• Risk of bias from individual studies being included in the review (item 9)
• Appropriateness of meta-analytical methods (item 11)
• Consideration of risk of bias when interpreting the results of the review (item 13)
• Assessment of presence and likely impact of publication bias (item 15)

References for Appendix 2

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Appendix 3: Summary table of studies

No	Source	Study type	Level of evidence (NHMRC grade)	Intervention	Population groups	Settings (i.e., worksite, school, Aboriginal health service)	Risk factor targeted (alcohol, diet, physical activity, weight)	Country/ context	N (Number of studies, number of participants)	Intervention/ Comparator	Outcomes [behaviour change, risk factor change (e.g. weight)]	Direction/Magnitude of effect	Comment /Notes (interventions that achieve desired level for reducing cancer risk vs for general health and wellbeing)
1	Adams-Guppy JR, Guppy A. A systematic review of interventions for homeless alcohol-abusing adults. J Drugs: Education, Prevention Policy. 2016;23(1):15–30.	Systematic review (inception to March 2015), meta-analysis	IB	Alcohol specific treatment program (including housing projects)	Adults homeless chronic alcohol abusers (aged 18 years or over)	Homeless, having no stable housing (e.g. sleeping in shelters, places not intended for sleeping, at friends'/relatives' houses)	Alcohol	USA=15, Canada = 1, Germany =1	17 (baseline participants= 4683, final follow-up participants= 3741)	Standard case management (SCM) and intensive case management (ICM); pre-post intervention	All self-report. Alcohol use per 30 days (n=7); over periods of one week, three months and six months (n=3); Alcohol Problems Composite score (n=4); daily alcohol consumption in grams (g) or standard units/ day (n=2); problem drinkers status (n=1).	Participants receiving some form of treatment improved in their alcohol use over time (pre-post intervention effect) in most of the studies (n=17). This finding held both for the meta-analysis utilising a range of alcohol use measures (p<0.001, n=17), and for the subset meta-analysis utilising only alcohol use days per months (p<0.001, n=10).	Short-term (3–6 months follow up) effects are more apparent than longer term ones (9 month or 12 months)
2	Afshin A, Babalola D, Mclean M, Yu Z, Ma W, Chen CY, et al. Information technology and lifestyle: a systematic evaluation of internet and mobile interventions for improving diet, physical activity, obesity, tobacco, and alcohol use.	Systematic review (January 1990 - November 2013)	IB	Reducing noncommunicable disease risk using information and communication technology - internet, mobile phone, personal sensors, stand-	Alcohol - Adults with unhealthy patterns of drinking; diet and obesity - men and women (with more women than men in majority of	Alcohol- Universities, colleges, schools (N=27); other- primary care, workplace, community settings; diet and obesity - community, worksite, university/college,	Diet, physical inactivity, obesity, tobacco and alcohol use	Majority in the US, other: The Netherlands, UK, Canada, New Zealand, Sweden, Germany, Australia, Switzerland, Finland, Denmark	224 studies in total; 47 studies specifically targeting alcohol; 65 - diet and obesity; 71 - physical activity	Usual care or minimal interventions (e.g. printed leaflets); intensive non-technology based behavioural interventions; no controls	Lifestyle behaviour - change in diet, improved physical activity, change in body mass index, weight, waist circumference, hip circumference, waist-hip ration, skinfold thickness and body fat, smoking cessation, reduction in alcohol intake	Internet interventions improved diet (N=20 studies) (Class IIa A as per the AHA grading criteria), physical activity (N=33), adiposity (N=35), tobacco (N=22), and excess alcohol (N=47)(Class IA as per the AHA grading criteria). Mobile interventions improved physical activity (N=6) and adiposity (N=3) (Class IA as per the AHA grading criteria)	Impacts on lifestyle behaviour change only short-term (up to one year). Findings may be generalisable to Australia but only for particular population subgroups (adults, those who are more literate). Low adherence rate for interventions with longer duration of follow-up (>3 months).

	J Am Heart Assoc. 2016;5(9):e003058.			alone computer software. Alcohol related interventions lasting between-1 week to 2 years; diet and adiposity-1 week to 37 months; physical activity - 6 weeks to 6 months	studies), mean age between-30 and 60 years; physical activity - predominantly female populations, mean age 30–60 years	hospital/clinic, church, health club, online populations; physical activity - worksites, colleges, hospitals, churches, online communities							
3	Armstrong-Moore R, Haighton C, Davinson N, Ling J. Interventions to reduce the negative effects of alcohol consumption in older adults: a systematic review. BMC Public Health. 2018 Dec;18(1):302.	Systematic review (to Oct 2017)	IC	Interventions targeting alcohol use in older adults	Adults 55+ years	Primary care centres and community based groups	Alcohol	US 6, Denmark 1.	7 studies	RCTs. Controls received standard care	Reduction in self-reported frequency and amount alcohol consumption, or hazardous drinking at 3, 6 and/or 12 months	2 studies did not show significant difference in comparison to controls. 3 studies showered reduced frequency and amount of alcohol and 2 found reduced 7-day alcohol use. 3 studies reported lower frequency of binge or hazardous drinking. Review did not quantify the amount of reduction	Studies used heterogeneous measures. Two studies were small and underpowered.
4	Ashton LM, Morgan PJ, Hutchesson MJ, Rollo ME, Young	Systematic review (Only	IC	Promote healthy behavior by	Young adult men	Universities, military, workplace,	Improving, reducing or preventing	Young adult men from	10	Obesity can be seen as a state or result of other SNAPO	Six of 10 studies (two nutrition, 3 alcohol use and 1 multiple SNAPO		There is some evidence of short-term (≤6 months) effectiveness of

	MD, Collins CE. A systematic review of SNAPO (Smoking, Nutrition, Alcohol, Physical activity and Obesity) randomized controlled trials in young adult men. Prev Med. 2015;81:221-31.	RCTs)[inception date to 2013]		improving, reducing or preventing any of the SNAPO (Smoking, Nutrition, Alcohol, Physical activity and Obesity) risk factors		face-to-face etc.	any of the SNAPO (Smoking, Nutrition, Alcohol, PA and Obesity) risk factors	upper-middle and high-income countries according to World Bank Group website		risk factors. Some publications targeting PA or nutrition as obesity interventions. Any comparators were considered [i.e., comparison with no-intervention (e.g. waitlist control) and/or compared to active treatments]	intervention) demonstrated a significant positive effect for at least one intervention group on a particular SNAPO outcome.; had a short-term follow-up (≤6 months) or not sustained beyond six months. No interventions exclusively targeting PA, obesity or smoking.		SNAPO interventions in young adult men, but this is limited by a scarcity of programs implemented in this population group and the poor quality of included studies. Moreover half of the reported studies published since 2007.
5	Attwood S, van Sluijs E, Sutton S. Exploring equity in primary-care-based physical activity interventions using PROGRESS-Plus: A systematic review and evidence synthesis. International Journal of Behavioral Nutrition and Physical Activity. 2016;13(1).	Systematic review [RCTs only] [Aug 2014-March 2016]	IC	Potential differences in the effect of individual-level physical activity interventions across levels or groups of all eleven PROGRESS-Plus factors	Adult population	Adult populations in the context of primary care, defined as a patient's first point of contact with the medical system, with care provided by a generalist rather than specialist member of health care staff.	PROGRESS-Plus factors (place of residence, race/ethnicity, occupation, gender, religion, education, social capital, socioeconomic status, plus age, disability and sexual orientation)	Primary care system defined as a patient's first point of contact with the medical system, with care provided by a generalist rather than specialist member of healthcare staff	173	Individual-level PA interventions across levels or groups of all eleven PROGRESS-Plus factors (place of residence, race/ethnicity, occupation, gender, religion, education, social capital, socioeconomic status, plus age, disability and sexual orientation). 24 RCTs to be at low risk of	Self-report measures of PA (N = 22 RCTs), objective measures were employed (N = 8 RCTs), maximum oxygen uptake (VO2 max), a proxy measure of physical fitness, was used in five RCTs, PA measured using accelerometers in 2 and submaximal METs reported in 1 RCT.	12 trials observed a significant group difference favouring the intervention arm (one RCT reported only effect estimates disaggregated by gender). The length of study follow-up varied from 3–24 months.	Too little evidence to draw firm conclusions regarding the impact of PA interventions on the health equity of recipients.

										bias, 19 to be at medium risk of bias and none to be at high risk of bias.			
6	Bender MS, Choi J, Won GY, Fukuoka Y. Randomized controlled trial lifestyle interventions for Asian Americans: a systematic review. Prev Med. 2014;67:171-81.	Systematic review of RCT (1995-2013)	ID	Lifestyle intervention promoting changes in physical activity (PA), diet, and/or weight management	Asian Americans, Adults ≥ 18 years	Those who are enlisted through the US Census Bureau	Promoting PA, diet, and/or weight-loss/ management	US only	7 (Hmong-1, Japanese-1, Chinese-2, Korean-2, or Filipino-1)	Specific racial/ethnic population, cultural appropriateness.	Change in PA, diet, and/or weight loss/management.	Five of seven RCTs showed significant between group differences for PA, diet, and weight. Compared to their controls, 4 interventions significantly increased PA ($p < .05$), while 2 showed no change; 1 significantly improved diet ($p < .05$), while three did not; two significantly reduced weight and/or BMI compared to control ($p < .05$), and 1 did not .	Asian Americans promoting PA, diet, and/or weight loss was mixed, influenced by multiple design factors.
7	Bennett GG, Steinberg DM, Stoute C, Lanpher M, Lane I, Askew S, et al. Electronic health (eHealth) interventions for weight management among racial/ethnic minority adults: a systematic review. Obes Rev. 2014;15 Suppl 4:146-58.	Systematic review (2005–2012)	IIC	Weight management interventions [web-based].	Overweight and obese racial/ethnic minority adults. ≥18 years old, who were overweight or obese (BMI ≥ 25 kg m^2) at baseline or who were overweight at the start of a weight	Online, from integrated healthcare delivery system, primary care-based, academic medical settings and another in a military medical research centre.	Weight loss	US	6 [n=4899, 75% of whom were women. African Americans were the largest proportion of racial/ethnic minority participants]	Two studies compared an eHealth intervention arm to a no-treatment control group, 2 studies comparison arms included in-person nutrition education or self-directed, 2 studies information-based approaches via	Weight change over time, with weight assessed at baseline and at least once following exposure to intervention	The largest net weight change at 6 months was 2.08 kg; no study reported weight loss outcomes greater than 2.8 kg. One study, reporting longer-term outcomes, significantly greater performance of the e-health intervention, with 24-month net weight change of 1.03 kg. In general, weight loss outcomes were of low to moderate magnitude.	Compared with traditional individual and group-based intervention strategies, e-health approaches produce relatively modest weight loss outcomes with undetermined clinical significance.

					maintenance trial.					the web or print.			
8	Beyer F, Campbell F, Bertholet N, Daeppen J, Saunders J, Pienaar E, et al. The Cochrane 2018 Review on brief interventions in primary care for hazardous and harmful alcohol consumption: A distillation for clinicians and policy makers. J Alcohol Alcoholism 2019; 54(4);417–27.	Systematic review (inception to march 2017), meta analysis	IC	Brief intervention (single session and up to a maximum of five sessions of verbally delivered information, advice or counselling)	Adolescents, young adults or both (n=8), older adults (n=4)		Alcohol in grams per week (g of ethanol/week, abbreviated to g/wk); number of heavy drinking episodes per week, drinking days per week, drinks per drinking day, proportion of heavy drinkers, and proportion of heavy episodic drinkers. Laboratory markers of alcohol consumption, alcohol-related harm, patient satisfaction measures, health-	46 studies from high-income countries (US, UK, Australia, Canada, Sweden, Finland, France, Scotland, Spain, Switzerland, Germany, Denmark. Poland , 4 from middle-income countries (Brazil, Kenya, South Africa and Thailand).	42 (33,642 participants)	Brief intervention with 'minimal' or no intervention (n=61)	34 studies and provided moderate-quality evidence that brief intervention reduced alcohol consumption compared to control after one year (mean difference −20 g/wk, 95% confidence interval −28 to −12). Subgroup analysis showed a similar effect for men and women.		82% of studies in the primary meta-analysis reported a reduction in consumption for brief intervention compared to minimal or no intervention participants

							related quality of life						
9	Bhochhibhoya A, Hayes L, Branscum P, Taylor L. The use of the internet for prevention of binge drinking among the college population: a systematic review of evidence. J Alcohol alcoholism 2015;50(5):526-35.	Systematic review of RCTs (2000 - 2014)	IB	Internet-based interventions for binge drinking prevention.- 11 studies used pre-existing web-based programs ; 3 used unique web-based interventions. Overall 3 studies integrated a theory-based intervention. Online surveys, emails and	College students; range 19–22 years	College	Alcohol	Mostly US, New Zealand, The Netherlands	14 studies; 77–7815 participants	10 studies-control groups (assessment only, fact-based messages only, screening only, generic non-alcoholic normative feedback only, no intervention); 4 studies (randomised experimental groups, no controls).	RAPI (Rutgers Alcohol Problem ndex) scores, perceived drinking norms, drinking behaviour (number of typical drinks, frequency of alcohol use).	13 studies - significant reductions in overall drinking quantity and frequency; and predicted changes in RAPI score, peak BAC (blood alcohol concentration) and perceived norms	Does not quantify magnitude of effect of internet-based interventions on prevention of binge drinking. Quality appraisal of the included studies not done.

				websites used for intervention delivery. Web-based interventions evaluated program through online assessment & computer generated feedback. Other interventions included an educational component.									

10	Biswas A, Oh PI, Faulkner GE, Bonsignore A, Pakosh MT, Alter DA. The energy expenditure benefits of reallocating sedentary time with physical activity: a systematic review and meta-analysis. Journal of Public Health. 2017 Jun 7;40(2):295–303.	Systematic review with RCT or Non-RCT (Inception - 2017	II-C	RCT or non-RCT interventions with reallocating sedentary time to physical activity and energy expenditure (EE) or metabolic health	Adult population	_	PA interventions on sedentary behaviour	US, Australia, New Zealand, United Kingdom, Canada, Spain and The Netherlands	26 (24 reviewed for meta analysis; n=896)	The majority of studies (n = 15) utilised objective measurement methods to assess sedentary time and physical activity (by accelerometer and/or inclinometer devices) and objective methods to assess EE via indirect calorimetric and accelerometer estimates (n = 25). A total of 20 studies featured conditions where the focus was on limiting and/or replacing bouts of sedentary time with light-intensity physical activity (LIPA) (LIPA interventions); 10 studies featured conditions where	Assess sedentary time and physical activity (by accelerometer and/or inclinometer devices, n = 15); EE via indirect calorimetric and accelerometer (n = 25)	Reallocating 6–9 hours of sedentary time LIPA (standardised mean difference [SMD], 2.501 [CI: 1.204–5.363]) had lower cumulative EE than 6–9 hours of combined LIPA and MVPA (SMD, 5.218 [CI: 3.822–6.613]). Reallocating 1 hour of MVPA resulted in greater cumulative EE than 3–5 hours of LIPA and MVPA, but <6–9 hours of LIPA and MVPA	Combination of LIPA and MVPA are expected to produce the greatest cumulative EE benefits in adults, similar EE can be achieved by reallocating sedentary time to MVPA over a shorter duration of time.

										sedentary time was replaced with moderate to vigorous physical activity (MVPA) (MVPA interventions); and four studies featured a combination of both (LIPA and MVPA interventions)			
11	Bock C, Jarczok MN, Litaker D. Community-based efforts to promote physical activity: a systematic review of interventions considering mode of delivery, study quality and population subgroups. J Sci Med Sport. 2014;17(3):276–82.	Systematic review (with all kind of study; 2001–2012)	III-2C	Community-based physical activity interventions (including mail, the Internet and telephone presenting data)	Adult population	Churches, community centres	Increase PA	31 studies from US, 12 in Australia/ New Zealand, 10 in Europe and 2 in Asia	55 (n=20,532)	Increase physical activity and a measure of post-intervention PA behaviour reported with sufficient detail to calculate effect estimates	PA only (n=34); PA and dietary intervention (n=17), length of study (> 6 months, ≤6 months, < 12 months and ≥12 months	Half of the studies reported positive PA outcomes (total net percent change: 16.4%; p = 0.159; net percent change for high-quality studies, i.e. studies meeting more than 5/7 quality criteria: 16.2%; p = 0.010). Interventions using face-to-face counselling or group sessions were most effective (net percent change: 35.0%; p = 0.014). Net per cent change was also higher in studies exclusively tailored to women (27.7%; p = 0.005) or specific ethnic groups (38.9%; p = 0.034).	Community-based interventions appear generally effective in promoting PA.

12	Bouaziz W, Schmitt E, Kaltenbach G, Geny B, Vogel T. Health benefits of endurance training alone or combined with diet for obese patients over 60: A review. International Journal of Clinical Practice. 2015;69(10):1032–49.	Systematic review (with all kind of study; 1995–2014)	ID	Endurance training alone (ET) or combined with diet (ETD) for obese people	Older obese patients over 60 years of age	_	Chronic conditions or geriatric syndromes such as cardio-respiratory risk factors, metabolic disorder and alteration in body composition.	_	26 [10 studies on endurance training (ET) and 16 studies on endurance training combined with diet (ETD)]	_	Alone or combined with energy restriction, cardio-respiratory fitness,	Positive effect of endurance training alone or combined with diet on health outcomes and metabolic benefits in older adults.	_
13	Braakhuis HEM, Berger MAM, Bussmann JBJ. Effectiveness of healthcare interventions using objective feedback on physical activity: A systematic review and meta-analysis. J Rehabil Med. 2019;51(3):151-9.	Systematic review (RCT, 2007-2017)	IB	Interventions promoting PA in healthcare that use objective feedback about PA via wearable activity monitors	Populations were patients (≥ 21 years of age) with chronic obstructive pulmonary disease (COPD), stroke, various cardiovascular diseases, Parkinson's disease, and geriatric patients.	_	PA	_	14 (n=1902)	Five studies used a pedometer for feedback and the others studies used accelerometers.	PA were steps per day, walking time per day, energy expenditure (in kJ or kcal per day or per week), accelerometer counts per day, and time in moderate intensity PA per week	Study characteristics and intervention strategies varied widely. The overall effect size was in favour of the intervention groups (0.34, 95% CI 0.23–0.44, p < 0.01). Five interventions were in an inpatient setting and the others were outpatient- or home-based.	Healthcare interventions using feedback on objectively monitored PA have a moderately positive effect on levels of PA.

14	Brooker K, van Dooren K, McPherson L, Lennox N, Ware R. A systematic review of interventions aiming to improve involvement in physical activity among adults with intellectual disability. J Phys Act Health. 2015;12(3):434-44.	Systematic review (1910-2012	ID	Physical activity interventions for people with intellectual disability.	18–71 years, adult with physical disability	Participants recruited through disability services	Health education or health promotion programs with PA, nutrition, and weight loss components	_	6 (n=856)	Pre and post-assessment	PA was measured using objective (pedometers and accelerometers) and subjective (IPAQ-S) measures. Half the studies used accelerometers to measure minutes per day spent in PA and sedentary time.	Interventions have had some success in using goal-setting strategies, health education focusing on the benefits of PA in a group and individualised format, incorporating PA into the intervention and using group and individual delivery modalities	Study results are based upon a small number of studies mostly of a pre-post design with small sample sizes
15	Bull ER, Dombrowski SU, McCleary N, Johnston M. Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? A systematic review and meta-analysis. BMJ Open. 2014;4(11):e006046.	Systematic review (RCT, 1995–2014)	IC	Behavioural interventions targeting diet, physical activity or smoking in low-income adults	Adults aged 18 years and over, of low income and from the general population	Community (n=22); Healthcare (n=12); or workplace (n=1).	Change in smoking, eating and/or PA behaviours	US (K=30); UK (k=3); Australia (k=1) and Chile (k=1).	35 (28 RCTs; 7 cRCTs) containing 45 interventions. Total participants n=17,000.	7 dietary, 7 PA, 15 smoking, and 6 for multiple behaviours (5 diet and PA, 1 diet and smoking). 3 studies had multiple intervention arms for 1 behaviour. 16 for the dietary meta-analysis, 12 for PA meta-analysis and 17 for smoking meta-analysis.	Dietary interventions (fruit and vegetables consumed, grams of fat, dietary risk assessment score (which estimates saturated fat and cholesterol intake) or calories from fat consumed per day). PA studies reported mean number of minutes or hours of moderate PA/week, metres walked in 6 min, or MET/week.	Meta-analysis estimated at post-intervention effects were positive but small for diet (standardised mean difference (SMD) 0.22, 95% CI 0.14 to 0.29), physical activity (SMD 0.21, 95% CI 0.06 to 0.36) and smoking (relative risk (RR) of 1.59, 95% CI 1.34 to 1.89). Studies reporting follow-up results suggested that effects were maintained over time for diet (SMD 0.16, 95% CI 0.08 to 0.25) but not physical activity (SMD 0.17, 95% CI − 0.02 to 0.37) or smoking (RR 1.11, 95% CI 0.93 to 1.34). Physical activity interventions suggested that studies that focused	Small positive effects of interventions on behaviour compared with controls, which persisted over time only for diet.

												on a single behaviour were more effective.	
16	Burton E, Farrier K, Hill KD, Codde J, Airey P, Hill AM. Effectiveness of peers in delivering programs or motivating older people to increase their participation in physical activity: Systematic review and meta-analysis. J Sports Sci. 2018;36(6):666-78.	Systematic review (RCT & mixed, 1976-2016)	IB	Peer-led or peer support programs or encouraging older people to be physically active and improve physical outcomes.	Older adult	Community	PA	US (K=11); UK (k=2); Australia, New Zealand, Malaysia, China & Canada (k=1) each.	18 (6 RCTs, 4 quasi, 3 pre- & post-test, 2 longitudinal, 2 descriptive, 1 is 2*2 factorial)	Study periods ranged between 12–52 weeks. 15 offered exercise interventions (predominantly a mix of aerobic and resistance training exercises), one included aquatic classes. 3 other offered advice and support. Exercise dosage ranged from 30–75 min sessions and from 1–5 times per week. 12/18 described the method of training provided to peers, 6/18 providing no details.	Adherence to exercise program and/or measures of physical function.	16 studies - all reported improvements in either levels of PA or physical function. Trained peers may enhance long-term maintenance. 6 suggested peer-led interventions may be as effective as run by health professionals.	Different methodologies and measures, made it difficult to conduct meaningful meta-analyses to determine effectiveness across the studies

17	Cairns JM, Bambra C, Hillier-Brown FC, Moore HJ, Summerbell CD. Weighing up the evidence: a systematic review of the effectiveness of workplace interventions to tackle socio-economic inequalities in obesity. J Public Health (Oxf). 2015;37(4):659–70.	Systematic review (RCT & mixed, start date-Oct 2012)	III-2C	Any behavioural (e.g. health education or exercise), environmental (such as removal of unhealthy foods, replacement of lifts with stairs) or organisational (e.g. changes to working hours) workplace interventions in reducing socio-economic inequalities in obesity. Also intervention duration at least 12 weeks (combination of	Adults aged over 18	Workplaces [including school, electronic company	Obesity [obesity was measured in terms of proxies for body fat (weight and height; BMI; waist measurement/ waist-to-hip ratio; percentage of fat content; skin fold thickness)]	13 studies were from the US; with one each from Chile, Brazil, Australia, Korea and Germany.	18	14/18 behavioural interventions (including exercise, counselling and education), 3 behavioural and environmental interventions (e.g. behaviour interventions plus access to healthy food, stairwell enhancements) and 1 workplace food voucher scheme. 9 studies targeted at lower grade workers, 10 were universal and on the social gradient in obesity.	Obesity was measured in terms of proxies for body fat (weight and height; BMI; waist measurement/ waist-to-hip ratio; percentage of fat content; skin fold thickness). Objective and self-reported measured	Workplace counselling or advice-based interventions—whether targeted or universally delivered—are ineffective in reducing inequalities in obesity, 11 studies reported no effects on BMI or weight.	2 RCTs- PA interventions targeted at low-income workers could be effective in reducing inequalities in obesity with small weight reductions (2 kg) , Observational - universally delivered PA increased educational inequalities in waist circumference.

				interventi on and follow-up)									
18	Cao C, Liu Y, Zhu W, Ma J. Effect of active workstation on energy expenditure and job performance: A systematic review and meta-analysis. J Phys Act Health. 2016;13(5):562–71.	System atic review (start date: Feb 2014)	IC	Active workstati on on energy expenditu re (EE) and job performa nce [intervent ion (cycling or treadmill walking, frequency , intensity, time, and type]	Adults	Workstation	Measure or estimate EE, such as calories, steps, gas exchange, and time of PA	US (k=14); Australia (k=2)	16		A significant increase in EE by users of active workstation	Obese individuals spend about 120 min/day more time sitting down than lean individuals, and they spend about 150 min/day less in the upright position. Weight-loss studied ranging from 4 to 12 months, showed structured exercise alone produces a modest weight loss of approximately 2.4 kg. 1 study- increased PA by approximately 3900 steps per day, resulting in a mean weight loss of 2.7 kg and a loss of around 2% body fat.	Active workstation could significantly increase daily PA and be potentially useful in reducing workplace sedentariness, and as a result lead to improvement in overall health, such as weight loss, systolic blood pressure.

19	Carey KB, Scott-Sheldon LA, Garey L, Elliott JC, Carey MP. Alcohol interventions for mandated college students: A meta-analytic review. J Journal of consulting clinical psychology. 2016;84(7):619.	Meta analysis of systematic review (inception to December 2012)	IC	"Mandated interventions" (alcohol programs) to prevent future alcohol misuse. Content included normative comparisons (90%), alcohol education (85%), personalised feedback on alcohol consumption, alcohol-related problems, or alcohol-related risks (82%), strategies to modify alcohol consumption (79%), goal setting (62%), or expectancy challenge exercises (60%). Interventions	College students; 35% women; 85% White; mean age 19 years (range = 18.6 to 20.4 years). First year students (57%)	Large public universities	Alcohol	US	31 studies; 8621 participants	Assessment-only control groups; waitlist controls or no intervention (5 studies)	Alcohol consumption [quantity consumed (a) over a period of time (e.g., week or month) (b) during specific drinking periods (e.g., weekends, spring break); (c) frequency of drinking days over a period of time (e.g., week or month); (d) frequency of heavy drinking, usually defined as 5 or more drinks for men and 4 or more drinks for women; (e) maximum amount of alcohol consumed on a single occasion; and (f) peak (maximum) and (g) typical (average) estimated blood alcohol concentration] and alcohol-related problems (e.g., hangover, blackouts, missed work or classes)	Significant effects observed for all outcomes in the short term (i.e., ≤ 3 months post-intervention), with d+ ranging from 0.14-0.27. No differences between the intervention and wait-list controls on quantity of drinking during specific intervals/drinking days, peak consumption, frequency of drinking days or heavy drinking, and alcohol-related problems. Only a single outcome (i.e., typical BAC) was significant at the long-term assessment (d+ = 0.12, 95% CI = 0.01, 0.25, k = 10).	Significant effects (may be applicable to Australia) but only a short-term risk reduction strategy. Intervention. Components often delivered in combination hence difficult to ascertain which components or combination might explain outcomes. The small number of no-treatment or waitlist control groups in studies of mandated students constrained between-groups analyses.

				delivered during a single one-hour session - mostly face-to-face (74%), via computer (19%) or included a computer-based component and/or session (4%). Most interventions delivered to individuals (59%) but some delivered in small groups (39%; *Mdn* = 10 participants, range = 2 to 19);									
20	Chase JA. Interventions to increase physical activity among older adults: A meta-analysis. Gerontologist.	Meta analysis of systematic review	IC	Physical activity intervention effectiveness on measures	Community-dwelling adults aged 65 and older	_	PA	_	104 [53 two-group treatment vs control compari	Participants tended to be overweight with a median mean BMI of 27 kg/m^2. Interventions	PA interventions had a significant impact on PA behaviors among community-dwelling older adults.	Mean effect size (ES) for two-group post-test comparisons was 0.18 ($p < .001$) single group pre-post-test comparisons was 0.23 ($p < .001$) and control was 0.01 ($p = .78$).	Theory-based interventions were more effective than those interventions without a reported theoretical basis.

	2015;55(4):706–18.	(1960-2013)		of PA behavior among older adults					sons and 48 single group pre-post-test comparisons]	had a median of 15 sessions, with each session lasting a median of 60 min.		This ES is equivalent of 620 more steps/day or 73 more minutes of PA/week for the treatment group over the control group.	
21	Costa EF, Guerra PH, Santos TI, Florindo AA. Systematic review of physical activity promotion by community health workers. Prev Med. 2015;81:114-–.	Systematic review (until May 2014) with RCT	IB	Interventions conducted by community health workers (CHWs) for promoting PA among adults in the primary healthcare settings. Intervention used talking circles, flipcharts, TV soaps, magazine and videos, home visit program, group meeting,	Healthy adults (≥18 years old), or adults with/or at risk of chronic NCDs (i.e. specific samples comprising individuals with/or at risk of CVD, obesity and/or T2DM	Primary healthcare settings	PA		26 [most in USA (n=24), 1 in Brazil and 1 in UK]	Majority of trials had no control group	16/26 reported positive results for different parameters of PA	5 used PA promotion and 25 used self-report methods; average: 6.5 months and targeted mainly for individuals older than 30 years of age in specific ethnic groups, including Hispanics, Blacks and Bangladeshis, findings were related to syndromic or at-risk individuals, particularly for T2DM or CVDs.	Successful interventions were over about 6 months and targeted at risk people for diabetes or CVD)
22	Danielsson A-K, Eriksson A-K, Allebeck P. Technology-based support via telephone or web: a systematic	Systematic review of RCTs (January 1966 - May 2013)	IC	Technology-based support interventions for smoking, alcohol use and	College students	Higher educational institutions, universities, military installations,	Alcohol, smoking, gambling	Alcohol-related studies: majority in the US; others- The Netherla	74 studies; internet interventions - alcohol consumption (36	Various intervention groups: individual vs group interventions; Internet-based therapy	Alcohol intake, smoking cessation, gambling	Telephone helplines can have an effect on tobacco smoking, but that no conclusions can be drawn on whether telephone support, without an already established personal contact, has an	Limited evidence on the impact of technology-based interventions on alcohol reduction. Majority of the studies lacked reliable control

	review of the effects on smoking, alcohol use and gambling. J Addictive Behaviors. 2014;39(12):1846–68.			gambling - telephone or web-based; utilising motivational enhancement therapy (MET), psychoeducational therapy (PET), personalised feedback techniques				nds, Canada, UK, Denmark, New Zealand, Australia, Sweden	studies), smoking (21 studies) and gambling (1 study); helplines - smoking (12 studies), alcohol consumption (2 studies) and gambling (2 studies). For alcohol-related studies; participants ranged between 44 and 5074.	(therapy alcohol online; TAO) vs. Internet-based self-help (self-help alcohol online;) vs. waiting list, for problematic alcohol use;		effect on alcohol use or gambling. Evidence on the effectiveness of internet-based support for smoking, alcohol use or gambling is inconsistent.	groups (no intervention). Included studies have not reported demographic characteristics hence may be difficult to generalise to population groups in Australia
23	de Varies HJ, Kooiman TJ, van Ittersum MW, van Brussel M, de Groot M. Do activity monitors increase physical activity in adults with overweight	Systematic review and meta analysis (to 2015)		Physical intervention with activity monitor 3–12 months	Adults BMI ≥27 for Caucasians, BMI≥25 for Asians. Primarily ≥60 years or	Community	PA, weight	Scotland–1, US – 8, Australia –4, Canada – 1.	14 studies (1157 participants) (11 in meta-analysis)	1. Physical activity without activity monitor. 2. Wait list/usual care	Minutes of moderate or vigorous PA; steps, weight change in kg	Increase in physical activity compared without activity monitor or usual care but high heterogeneity. Magnitude: 282 MET Minutes, 500 11000 steps per week, -0.86 kg weight	Activity monitor increases PA in adults with overweight or obesity.

	or obesity? A systematic review and meta-analysis. Obesity. 2016 Oct;24(10):2078–91.				pregnant women								
24	Dedert EA, McDuffie JR, Stein R, McNiel JM, Kosinski AS, Freiermuth CE, et al. Electronic interventions for alcohol misuse and alcohol use disorders: a systematic review. J Annals of internal medicine. 2015;163(3):205 114.	Systematic review (Jan 2000 – March 2015)	IB	Electronic interventions (e-interventions) delivered by online or at a desktop computer (n = 24), mobile device (n=1). Supplemented support by 1.5 to 6.5 hours. Personalised normative feedback (n=8), goal setting (n=7), psychoeducation (n=9).	Adults and college students. Miss	Home, clinic classroom	Alcohol consumption (g/wk); met limits, binge drinking		28 [college students (n = 14) and non-college adults (n=14)]	E-interventions versus inactive controls	Low-intensity e-interventions produce small reduction in consumption (approximately 1 drink per week) in adults and college students at 6 months but not at 12 months.	There was no statistically significant effect on meeting drinking limit guidelines in adults or on binge-drinking episodes or social consequences of alcohol in college students.	This study heavily influenced by inclusion of more intensive treatments that involved more interaction with e-interventions, interactive voice-response, human support, or some combination of these treatment components.
25	Dodd JM, Deussen AR, O'Brien CM, Schoenaker	Systematic Review & Meta	IIB	Postpartum dietary and/or PA	Women in the post-partum period		Mean change in weight (in	Mostly in US (k=19), 2 each in	27 (n=3485)	Diet/ PA alone or combined vs standard postnatal care	Promote weight loss.	A combined dietary and PA intervention provided postpartum produced greater postpartum	The longer-term effects on sustained behavioral change and on subsequent

	DAJM, Poprzeczny A, Gordon A, et al. Targeting the postpartum period to promote weight loss: A systematic review and meta-analysis. Nutrition Reviews. 2018;76(8):639-54.	(until Nov 2017)		interventions to promote weight loss and improve health.			kg)/ BMI, PA	Australia & Sweden; 1 each in Scotland, Taiwan, Iran & Japan.		or no intervention. Trial use text message, phone call, a closed Facebook support group		weight loss (MD, 2.49 kg; 95%CI, 3.34 to 1.63 kg [random effects model]; 12 studies, 1156 women), which was maintained at 12 months postpartum (MD, 2.41 kg; 95%CI, 3.89 to 0.93 kg [random-effects model]; 4 studies, 405 women), compared with no intervention.	pregnancy and birth outcomes are not clear/unknown.
26	Hollands, G. J., French, D. P., Griffin, S. J., Prevost, A. T., Sutton, S., King, S., & Marteau, T. M. (2016). The impact of communicating genetic risks of disease on risk-reducing health behaviour: systematic review with meta-analysis. BMJ, 352, i1102. doi:10.1136/bmj.i1102	Systematic review and meta analysis of RCTs (inception to Feb 2015)	IC	Communication of personalised risk estimates for disease based on DNA alone or DNA plus non-DNA risk factors (e.g., family history, markers of disease, patient characteristics). Genetic risk	Mean age 30 to 56 years, 0% to 73% women	Mixed, including health care settings andworkplace	Smoking, alcohol, sun protection, diet, PA	Multiple countries	18 studies; 73–2663 participants	Communication of non–DNA based risk estimates or no risk estimates	Behaviour change: smoking cessation, medication use, alcohol intake, sun-protection behaviors, diet, PA, or attendance at screening or behavioral support programs	No effect on any of the behaviours targeted	Number of trials in the meta-analysis was small. Few trials (4) had low risk for bias due to the use of self-reported outcomes. High-quality trials on changing health behaviour are needed before firm conclusions can be made on the benefits or risks of communicating genetic-based risk estimates to patients.

				communicate for lung or oesophageal cancer to smokers (5 RCTs); Crohn disease to smokers (1 RCT); oesophageal and other cancers based on alcohol consumption (2 RCTs); melanoma (1 RCT); colorectal cancer (1 RCT); type 2 diabetes (3 RCTs); heart disease, cardiovascular disease, or hypertension (3 RCTs); Alzheimer's disease (1 RCT); and								

				obesity (1 RCT).									
27	Ferrer DA, Ellis R. A review of physical activity interventions delivered via Facebook. Journal of Physical Activity and Health. 2017;14(10):823–33.	Systematic review (2010-2014)	IIC	Facebook-delivered interventions for promoting physical activity behaviour change.	Varied across studies: Undergraduate students; adolescents, cancer survivors, registered nurses, and women with young children. 93% female	Online media	PA		8 (n=458); 93.4% participants were female	2/ 3-group designs: Facebook, Facebook plus text messaging and personalised feedback, and waitlist control; some are within-subjects crossover design; Duration: 3–12 weeks, 4 used indirect measures (self report Q - PAQ/ GLTEQ), 2 used direct measures (pedometers), 2 combined GLTEQ and accelerometers	Promoting PA	87.5% study (K=7) indicated increased PA; 7/8 RCTs reported significant PA behaviour change (ie, interactions, main effects for time, differences between conditions), 2 reported significantly better for the treatment group.	All 8 studies assessed change in PA from pre-intervention to post-intervention, but no studies included follow-up assessments of behaviour change.

28	Flahr H, Brown WJ, Kolbe-Alexander TL. A systematic review of physical activity-based interventions in shift workers. Preventive Medicine Reports. 2018;10:323–31.	Systematic review (2014-2016)	IIB	Physical activity-based interventions (4 weeks–6 months)	Occupational group (shift workers - mostly night shift workers, and casino staff including dealers, ushers, cleaners and nurses)	Educational and government settings	PA, body composition, fitness, sleep, total Cholesterol, LDL, HDL,	Australia, Finland, North Korea	7 (sample size 30-75 participants; age range: 20-58)	6/7 studies 'prescribed' aerobic activity (i.e., walking, jogging, or rowing); 2 incorporated both aerobic and resistance training. Only one included scheduled follow up assessments, which were at 6, 12 and 24 months.	PA reduced BMI, body weight, fat mass,	3/7: decrease of body weight, 4: reduced BMI, 2 showed improvement of Oxygen consumption, 3: improve fat mass	Due to the heterogeneous explanatory and outcome measures and the tools used - meta analysis was not possible.
29	Foxcroft DR, Coombes L, Wood S, Allen D, Santimano NM, Moreira MT. Motivational interviewing for the prevention of alcohol misuse in young adults. Cochrane Database of Systematic Reviews. 2016(7).	Systematic review and meta-analysis (to 2015)	IA	Motivational interviewing (MI) for prevention of alcohol misuse and alcohol-related problems. 65 consisted only of an individual MI session. In one both individual session and a group	15–24year olds	51 in higher education settings, 4 trials at other post-secondary educational institutions, 14 trials in healthcare, 1youth centre, local companies, a vocational training centre, army recruitment setting, drug agencies, a youth court and juvenile detention centres	Alcohol	US–66, Canada/ US–1, UK–4, Australia –1, Switzerland–6, Spain–1, France–1, Brazil–2, Thailand–1, The Netherlands–1,	84 trials	49 compared MI versus an assessment-only control group. 25 compared MI to alcohol counselling, education or information only, 7 with feedback only, with relaxation or six-session Alcoholics Anonymous (AA) abstinence program	At 4+ months, self-reported quantity of alcohol consumed, frequency of alcohol consumption, frequency of alcohol consumption (days per week), and peak blood alcohol concentration.	Reduced quantity of alcohol consumed (standardised mean difference (SMD) or a reduction from 13.7 drinks/week to 12.5 drinks/week; reduced frequency of alcohol consumption (SMD −0.14) or a reduction in the number of days/ week alcohol was consumed from 2.74 days to 2.52 days). Not significant change in peak blood alcohol concentration.	The effect sizes were too small, given the measurement scales used in the included studies, to be of relevance to policy or practice. No substantive, meaningful benefit of MI for alcohol misuse by young adults.

				session; in another 4 group sessions and one individual session;6 studies- two individual sessions; 4 involved four sessions, 3 used single group, one used four group sessions and another used six group sessions									

30	French DP, Olander EK, Chisholm A, Mc Sharry J. Which behaviour change techniques are most effective at increasing older adults' self-efficacy and physical activity behaviour? A systematic review. Ann Behav Med. 2014;48(2):225–34.	Systematic review (RCTs, non-RCTs or studies with a pre-post design). Till Nov 2013)	III-3C	Behaviour change techniques (BCTs) (as defined by CALO-RE taxonomy) that increase self-efficacy and physical activity behaviour	Non-clinical community dwelling adults 60 years or over		Increase self-efficacy and PA behaviour		24 [RCTs = 20, non RCTs= 1 and pre-post=4]; self-efficacy n=247; PA n=349; age range: 60–84 years	An explicit theoretical basis with the most frequent being social cognitive theory (k=18). Interventions were most commonly delivered face-to-face by a nurse or general practitioner or a health and fitness professional to groups in a community centre.	6/24 studies associated with lower self-efficacy and 10/24 studies with lower PA.	Interventions increased self-efficacy (d=0.37) and physical activity (d=0.14). Self-regulatory techniques such as setting behavioural goals, prompting self-monitoring of behaviour, planning for relapses, providing normative information and providing feedback on performance were associated with lower levels of both self-efficacy and physical activity.	The greatest differences in PA according to the presence or absence of BCTs were: "provide normative information about others' behaviour", "provide information on where and when to perform behaviour" and "plan social support/social change".
31	Goryakin Y, Suhlrie L, Cecchini M. Impact of primary care-initiated interventions promoting physical activity on body mass index: systematic review and meta-analysis. Obes Rev. 2018;19(4):518–28.	Systematic review and meta analysis (1990-2016, RCTs)	IC	PA-related interventions	People at an increased risk of having potentially disabling non-communicable diseases (but healthy enough to exercise)		PA, BMI		22 (BMI addressed = 16, n=229; EE= 10, n= 542-1005)	The interventions commonly took the form of exercise on prescription; behaviour change sessions/counselling; ERS; interactive phone and mail-based PA support programmes; and development of PA plans.	12/16 found reduced BMI, 11/17 increased EE	Interventions reduce body mass index by about 0.21 kg m2 (95% CI: 0.41 to 0.01) and increase PA-related EE (based mostly on self-recall) by about 1.77 MET of task-hours a week (95% CI: 0.58 to 2.95).	

32	Gutermuth LK, Hager ER, Pollack Porter K. Using the CDC's Worksite Health ScoreCard as a framework to Examine worksite health promotion and Physical Activity. Prev Chronic Dis. 2018;15:E84.	Scoping review (Jan 2000–July 2015)	IIC	Physical activity component (eg, promoted increased physical or reduced sitting time) of a worksite health promotion intervention	Employees at various worksite	Diverse group of worksites, including desk-based, manufacturing, and healthcare worksites. Two studies conducted programs in multiple settings (eg, a university and a bus company), 1 study evaluated a public school setting, and 1 study evaluated a university setting	PA	7/18 studies at USA	18 (participants ranges from 50-750)	10 RCTs: including wait-list control groups, random allocation, and a crossover design. 5 used a single-group pre–post design, 1 non-RCT, 1 used interrupted-time-series approach, and 1 used a quasi-experimental design. For PA program: onsite exercise classes (k=6); 5 used walking groups; used structured physical activity breaks, and 2 used stretching classes.	11/18 studies produced significant improvements in PA.	Incentives, health risk assessments, health promotion committees, leadership support, marketing, and subsidies or discounts for use of exercise facilities were the most effective organisational supports strategies cited, and PA seminars, classes, and workshops were the most effective PA strategies cited.	Worksite Health ScoreCard is a tool for employers to assess the implementation of evidence-based worksite health promotion interventions
33	Gwynn, J., K. Sim, T. Searle, A. Senior, A. Lee and J. Brimblecombe (2019). Effect of nutrition interventions on diet-related and health outcomes of Aboriginal	Systematic review (Dec 2017)	III 2C	Nutrition interventions	Australian Aboriginal and Torres Strait Islander people	Remote/very remote communities (n=18); 'inner' and/or' outer regional' (n=4); major city (n=4)	Improve diet-related and health outcomes [BMI, blood glucose and triglycerides (TGs),	Australia	35 [12 cohort designs; 1 cohort with a 'nested' repeat cross-sectional study; 2 repeat	Six intervention types were identified [nutrition education and promotion programs primarily aiming to improve	Statistically significant improvements were reported in 14 studies of which eight reported improvements in biochemical/ haematological markers and either anthropometric	Most of the studies that included a nutrition education and promotion component also included a PA component assessed as not being the primary focus of the study. Store-based intervention including a food price strategy, combined with	

	and Torres Strait Islander Australians: a systematic review. BMJ Open 9(4): e025291.						total cholesterol (TC) and ratio of total to high-density lipoprotein cholesterol (TC:HDL-C)]		cross-sectional; 2 interrupted time series; 4 case series and 1 each of retrospective pre–post study, multisite case study, non-randomised controlled study, stepped-wedge randomised controlled trial and an interrupted time series with a control group and a 'nested' cohort.]	nutrition and including a 'healthy lifestyle' program component (n=8 studies); store-based intervention with community health promotion (n=5 studies); return to traditional diet (n=3 studies); fruit and vegetable subsidy (n=2 studies); store environment and/or policy (n=7 studies) that included store/ organisation/ government policy, food price discounts and the effect of store manager on diet; and preschool meal program (n=1 study).]	and/or diet-related outcomes. Nutrition and health included the following categories: biochemical and/or haematological markers of dietary intake and/or health status (n=12 studies); food, diet and/or nutrient intake measures (24 hours recall, survey and store-turnover/point-of-sale methods) (n=14 studies); anthropometric measures (n=14 studies) and other outcomes (n=12 studies).	community health promotion in very remote communities, fiscal strategies and nutrition education and promotion programmes show promise.	

34	Hakala S, Rintala A, Immonen J, Karvanen J, Heinonen A, Sjogren T. Effectiveness of physical activity promoting technology based distance interventions compared to usual care. Systematic review, meta-analysis and meta-regression. European Journal of Physical and Rehabilitation Medicine. 2017;53 (6):953–-967.,	Systematic review with meta analysis (Jan 2000 – Dec 2015)	IIC	Physical activity promoting technology-based distance interventions compared to usual care	Healthy or under a health risk-adults (aged: 18–65 years)		PA either subjectively (questionnaire, interview) or objectively (accelerometer, pedometer);		23 (n=4645) [13 were healthy/ obese or inactive participants, 9 comprised participants with a diagnosed medical condition and 1 study comprised pregnant women].	Type of the intervention: technologies that enabled one-way interaction, interactive technologies, and noninteractive, self-monitoring technologies. Mean (SD) duration: 5.8 (5.6) months, ranging from 1 week to 24 months.	16/23 studies investigated PA with self-report (IPAQ, 7-day PAR, CHAMPS, AAS, AQuAA, SWET, SQUASH); 7/23 studies with an activity monitor or accelerometer.	Technology-based interventions (n=23) were 12% more effective than similar or minimal control interventions in increasing physical activity (RR: 1.12; 95% CI: 1.01 to 1.25, P=0.03); compared to minimal control interventions were 19% more effective (RR: 1.19; 95% CI 1.05 to 1.35, P=0.0096) and in targeting patients 25% more effective than non-use (P=0.027).	No differences were observed in physical activity between the effectiveness of interactive, non-interactive and self-monitoring technologies

35	Hallgren M, Vancampfort D, Giesen ES, Lundin A, Stubbs B. Exercise as treatment for alcohol use disorders: systematic review and meta-analysis. Br J Sports Med 2017;51(14):1058–64.	Systematic review and meta analysis of RCTs (inception to 11 April 2016)	IB	Exercise interventions; acute exercises and long-term exercise interventions (≥2 weeks). Mean exercise duration 43 min (SD=19 min). Exercises included aerobics (13 studies); combination of aerobics,, strength training and/or calisthenics (5 studies) and yoga/stretching (3 studies).	Adults (mean and women) with alcohol use disorders; mean age 47.8 years; mean illness duration - 4.4 years. Inpatient Hospital settings (12 studies); outpatients (3 studies); students (2 studies).		Alcohol		21 studies; 1202 participants	17 studies - active control (CBT, group counselling and/or pharmacotherapy); 1 study (non-treated control group); 3 studies no information on controls.	Alcohol consumption	Exercise did not reduce daily alcohol consumption (after adjustment for publication bias) (SMD= -0.886, p=0.24); or AUDIT total scores (SMD = -0.378, p=0.18). Direction of change favoured exercise participants compared to controls during follow-up.	No impact (analyses limited to three studies, one with small sample size hence potential for imprecise estimates of effect). Pooled dropout rate high - 40.3% (similar to controls) and significantly higher among men. No adverse events reported, exercises safe for people with alcohol use disorders.

36	Hendren S, Logomarsino J. Impact of worksite cafeteria interventions on fruit and vegetable consumption in adults. A systematic review. International Journal of Workplace Health Management. 2017;10(2):134–52.	Systematic review (1980-2016)	ID	Worksite cafeteria interventions on fruit and vegetable (F/V) consumption.	Adults greater than 18 years of age working in public, private, government, or voluntary organizations (e.g. cafeteria, hospital cafeteria for employees, university employee dining, and Army canteens).	Worksites included private, public, government, university, and military settings encompassing both white and blue-collar employees. Industry sectors included industrial, health services, education, finance, construction, transportation, manufacturing, real estate, wholesale trade, life insurance, retail, bank, waste-handling, and a military base	Fruits and vegetable (F/V)	7 in the US, 5 in Denmark, 2 in Brazil, 1 in New Zealand, 2 in Japan and 1 in The Netherlands	18 (sample size 35 to 28000)	Intervention duration: 3 weeks–2 years. 13 studies used marketing and POP materials; 10 studies implemented menu modification; 5 studies implemented nutrition labelling; 3 studies used food demonstrations, and 1 study subsidised prices. 2 studies implemented a nutrition awareness game with incentives to entice participation and purchase of healthier menu selections.	16 studies reported both F/V and 2 only V. Most data self-reported. 14/18 reported Increase of F/V consumption, 1/3 reported decrease and 2/3 reported no change	4 studies used quantifiable data and 10 studies used self-reported FFQs, food diaries, and other surveys.	Most of the data were self-reported and is subject to error. Price-point subsidies, point-of-purchase materials, and menu modification has positive impact on F/V consumption.

37	Hennessy EA, Tanner-Smith EE, Steinka-Fry KT. Do brief alcohol interventions reduce tobacco use among adolescents and young adults? A systematic review and meta-analysis. J Journal of behavioral medicine. 2015;38(6):899-911.	Systematic review of RCTs (1980–2012)	IC	Using brief interventions (BIs) to reduce alcohol and tobacco use for adolescents and young adults. Majority utilised motivational enhancement therapy or motivational interviewing techniques, 3 used psychoeducational therapy, and 1 delivered personalised feedback via computer. Almost all interventions	Adolescents (11 studies) and young adults (7 studies); 61% male; 43% white,	High school, University, health clinic, military recruitment center	Tobacco, alcohol use	Mostly US, Switzerland, England, Brazil	18 studies; 5949 participants	No treatment, wait-list control, or treatment as usual	Alcohol consumption; smoking cessation	BIs associated with a significant reduction in alcohol consumption relative to control groups [g^{-} = 0.11, 95 % CI (0.04, 0.17)] but not with tobacco use [g^{-} = 0.07, 95 % CI (−0.01, 0.16)].	Potential for study bias due to inclusion of non-peer reviewed studies. Implications of potential variability in effects across age groups or intervention types are exploratory and should be interpreted with caution.

				delivered one-on-one with a practitioner; other-mixed-delivery format with self-administration and one-on-one delivery, self-administration via computer.									
38	Hillier-Brown F, Bambra C, Cairns J, Kasim A, Moore H, Summerbell C. A systematic review of the effectiveness of individual, community and societal-level interventions at reducing socio-economic inequalities in obesity among adults and children. Obesity Facts. 2017;10	Systematic review (till October 2012)	III3C	Individual, community and societal interventions in reducing socio-economic inequalities in obesity	Adults (aged 18 years or over)		Proxy for body fatness (weight and height; body mass index; waist measurement/waist to hip proportion; percentage body fat; skin fold thickness) and socio-economic status		20	RCTs and non-RCTs; non-treatment control or standard treatment groups, prospective and retrospective cohort studies, with or without control/ standard treatment groups, and prospective repeat cross-sectional studies with or	Weight gain/reduction	5 individual level, 12 community, 1 societal-environmental and 2 societal macro- policy interventions shows some level of positive outcome.	

	(Supplement 1):10-1.									without control/standard treatment groups. Studies duration of at least 12 weeks (combination of intervention and follow up).			
39	Hollands GJ, Shemilt I, Marteau TM, Jebb SA, Lewis HB, Wei Y, Higgins JP, Ogilvie D. Portion, package or tableware size for changing selection and consumption of food, alcohol and tobacco. Cochrane database of systematic reviews. 2015(9).	Systematic review (1978 and July 2013)	IIB	interventions involving exposure to different sizes or sets of physical dimensions of a portion, package, individual unit or item of tableware	Adults and children directly engaged with the manipulated products	Community	Diet	USA 58, Canada 5, Netherlands 3, Belgium 2, UK 2, Australia 1, South Korea 1	72 studies (70 in metaanalysis)	RCTs	We assessed the amount of energy (e.g. calories), food or drink measured in kilojoules.	Exposure to larger-sized portions, packages, individual units, or tableware increased the quantities of food consumed (SMD of 0.40). Effect sizes were larger in studies of less healthy food products and in participants who were older. The effect of being provided with shorter, wider empty glasses or plastic bottles on participants' unregulated selection (without purchase) of fruit juices or water in a single, self serve setting increased the quantities of fruit juices or water people selected for consumption (SMD of 1.39)	People exposed to larger-sized portions, packages, individual units or tableware consistently consumed larger quantities of food compared with those exposed to smaller sizes.
40	Hunter RF, Christian H, Veitch J, Astell-	Systematic review	III-2C	Interventions to encourag	The populatio n were of	Urban green space	PA in urban green space	US (n = 9), particular	12	Quasi-experiment, controlled pre-	PA programs combined with a physical change to	4/9 studies showed positive effect to support built environment for	

	Burt T, Hipp JA, Schipperijn J. The impact of interventions to promote physical activity in urban green space: A systematic review and recommendations for future research. Social Science and Medicine. 2015;124:246–56.	(Up to July 2014)		e PA in urban green space	low socio-economic position and of ethnic minority groups.			ly in California (n =6), and Australia (n =3).		post design (n = 8), difference-in-difference design (n=1); employed a RCT design (n=1)	the built environment are likely to have a positive effect on PA.	encouraging use and increasing PA in urban green space. 3/3 studies showed positive effect to support PA programs or PA programs combined with a physical change to the built environment, for increasing urban green space use and PA of users.	
41	Hutcheson AK, Piazza AJ, Knowlden AP. Work site-based environmental interventions to reduce sedentary behavior: A systematic review. Am J Health Promot. 2018;32(1):32–47.	Systematic review (Jan 2005–Dec 2015)	III-3C	Work site-based, environmental interventions	58% to 98% of participants identified as female	Participants from private and public office settings (i.e., call centre, physical activity research centre, health promotion office, university employees, health agency employees, and government agency employees)	Sedentary behaviour (sitting time); anthropometric outcomes, including height, weight, body composition, and waist/hip circumference; metabolic profiles	Australia (n=7), US (n=6), 1 each in Canada and the UK.	15	7 RCTs, 5 quasi experimental and 3 single group pre-test–post-test design. Intervention dosage ranged from 5 days to 9 months.	14/15 reported statistically significant decreases in sedentary behavior.	Used inclinometers to measure sedentary behavior (n = 9), recruited predominantly female samples (n =15), and utilized sit-to-stand desks as the primary intervention modality (n =10).	Environmental worksite interventions to reduce sedentary behavior show promise because worksites often have more control over environmental factors.

42	Ickes MJ, Haider T, Sharma M. Alcohol abuse prevention programs in college students. J Journal of Substance Use. 2015;20(3):208–27.	Systematic review (Jan 2007–Dec 2012)	ID	Alcohol abuse interventions [Motivational interviewing (n=12) and brief motivational interventions (n=10); BASICS (n=5), eCHUG (n=5), Alcohol 101 (n=4),]	College students (under 21 years of age)	College student	Alcohol consumption, either measured by self-report prevalence of binge drinking, number of drinks, or blood alcohol content (BAC).	US	49 (RCTs: n=40, Quasi-experimental: n=2, Non-experimental: n=7)	Mostly RCTs (n=40), non-experimental (control and/or comparison groups were not delineated, n=7); each session/ contact ranged from 10 to 90 min; Long-term follow-up (n=6)	Positive outcomes included: decreased drinking or number of drinks (n=17), decreased binge drinking (n=8), decreased alcohol problems or consequences (n=5), decreased perception of peer alcohol use (n=4), decreased BAC (n=3)		Over 70% of the interventions included college students under 21 years old and these students are under the legal drinking age, underage drinking plagues most college campuses. Poor study quality.
43	James E, Freund M, Booth A, Duncan MJ, Johnson N, Short CE, et al. Comparative efficacy of simultaneous versus sequential multiple health behavior change interventions among adults: A systematic review of randomised trials. J Preventive –23.	Systematic review of RCTs (up to October 2015)	IB	Delivery of simultaneous and sequential multiple health behaviour change (MHBC) interventions	Adults, aged >18 years	Community, primary care, substance abuse settings	Smoking, diet, PA, alcohol	US (3 studies), Belgium (1 study), The Netherlands (1 study);	6 studies; 36–5390 participants	Simultaneous delivery and sequential delivery of MHBC interventions; usual or minimal intervention	Health behaviour changes: smoking cessation, change in diet, improved physical activity, alcohol consumption	Sequential and simultaneous MHBC approaches more efficacious that usual care/controls in at least each behavioural outcome. Of the trials favouring a sequential approach, both included intervention spacing of six months or more, and found a differential effect for addictive cessation behaviours (smoking and alcohol use).	Validity of results questionable due to small number of trials and varying heterogeneity

44	Kazemi DM, Borsari B, Levine MJ, Li S, Lamberson KA, Matta LA. A systematic review of the mHealth interventions to prevent alcohol and substance abuse. Journal of health communication. 2017 May 4;22(5):413–32.	Systematic review (2005-2015)	IIC	m-health interventions delivered in a variety of formats: web-based, text messaging, SMS or smartphone apps. Some were delivered in combination with in person treatment. Duration 2 weeks to 3 months.	Adults with a drinking disorder, college students with problem drinking, youth transitioning from substance abuse treatment programs and individuals with psychotic disorders. Most aged 18–25 years (range 12–45 years).,	College, community, outpatient facility	Alcohol	US–7, Ireland–1, Switzerland–2, Sweden–1, Germany – 1,	12	No control–4. Comparison groups in controlled trials: Nil–3, Usual care–2, 12 months of treatment as usual, Texts every 1 to 2 weeks, Frequent message prompts.	Drinks per day, days drinking per week	4/12 showed reductions in drinking. Other studies reported no difference or increased frequency	Limited clear evidence of impact on drinking frequency or amount. Heterogeneous population groups. Studies of poor to moderate quality.
45	Kelly B, Jewell J. What is the evidence on the policy specifications, development processes and effectiveness of existing front-of-pack food labelling policies in the WHO European	Systematic review (to 2017)	IVC	Front of pack food labelling policies including endorsement logos, summary indicator systems, nutrient-specific warning	Global	Community, Food stores	Diet	Denmark, Iceland, Lithuania, Norway, Sweden, The Netherlands, Poland, Slovenia, France, UK, Sweden.	12 (9 using data simulation modelling of food choices and 3 usually actual	Cohort studies	Limited evidence and variable impacts. Three studies found some improvements in fibre intake.	Not reported	

	Region? Copenhagen: WHO Regional Office for Europe; 2018 (Health Evidence Network (HEN) synthesis report 61)			labels and nutrient-specific interpretive systems					dietary intake)				
46	Klassen KM, Douglass CH, Brennan L, Truby H, Lim MS. Social media use for nutrition outcomes in young adults: a mixed-methods systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2018 Dec;15(1):70.	Systematic Review - mixed studies 1987–2017	IB	Most used private or closed social networking groups with the purpose of providing information, and/or social support. Social media was only one component of a complex intervention which also included websites with a resource library, behavior tracking	The majority of studies took place in the United States, within the past 5 years, with the majority of participants being female with a mean age of < 25 years and 17/23 (74%) recruited university or college students.	Media: Social Media	BMI, weight, fruit and vegetable intake	Mostly USA	14 Measured impact on diet and/or weight.	Randomised controls who received usual care	1 study found difference in BMI at 3 months. No difference in Fr or Veg in any studies.	Overweight patients lost 6.1Kg (95% CI -3.3 to -2.3)	The majority of interventions included in this review were not effective in improving weight, BMI, or dietary intake compared with control groups. Outcomes were not reported as proportion of weight goals for primary prevention of cancer.

				devices, personalized food and nutrition reports, SMS) reminders, group sessions, coaching and smartphone applications									
47	Kong A, Tussing-Humphreys LM, Odoms-Young AM, Stolley MR, Fitzgibbon ML. Systematic review of behavioural interventions with culturally adapted strategies to improve diet and weight outcomes in African American women. Obesity Reviews. 2014;15:62–92.	Systematic review 1990-2012	IB	Behavioural lifestyle (diet, weight loss) interventions that specified at least one culturally adapted strategy for African Americans	Afro-American women (overweight)	Community based: churches, community centres, health care clinics, beauty salon, health club and one worksite	Diet and or weight loss.	US	28 Studies	Usual care. Some involved non Afro-American women.	7 studies reported significant between group differences in both weight and diet. 2 studies found between-group differences in diet only; and one study found significant between-group differences in weight only. 2 studies reported increases in fibre, 5 studies reported increases in fruit and 2 in vegetables.	Most studies reported weight loss ranging from 2 to 5 kg (to 6 months). 5–20% increase in portion of participants achieving targets for consumption of fruit and vegetable portions and 0.5 g increase in dietary fibre.	Modest change in diet behaviour and weight at 6 months.

48	Laine J, Kuvaja-Köllner V, Pietilä E, Koivuneva M, Valtonen H, Kankaanpää E. Cost-effectiveness of population-level physical activity interventions: a systematic review. American journal of health promotion. 2014;29(2):71–80.	System atic review (to June 2013)	IC	Populatio n level physical activity interventi ons: communi ty park, roadside and rail-trails, pedomet ers, school health education programs , outdoor gyms, computer - generate d interventi ons, physical and health interventi ons, Access to free leisure centres	All age groups	Community, leisure centres, schools.	PA	6/10 US, 2 UK, 4 Belgium, 1 Australia, 1 Greece	16 studies	Comparison group or situation (not necessarily randomised)	Physical activity: normal to equivalent metabolic equivalent intensity (MET-hours gained per person per day. Moderate intensity equates to 3.0 METs, moderate to vigorous PA 4.5 METs, and vigorous 6.0 METs.	Building community rail trail was cost effective ($0.006 per MET-h. Use of pedometers $0.014/MET-h. Fitness zones in parks achieved cost effective ratio of $0.087/MET-h. School health education programs $$0.056/MET-h. Enhanced access to leisure centres and some of the more costly trails were the least cost effective	Variety of interventions. Strength in comparing cost effectiveness. Variable quality studies. Did not quantify physical activity according to Cancer guidelines.
49	Lassen AD, Fagt S, Lennernäs M, Nyberg M, Haapalar I, Thorsen AV, Møbjerg AC, Beck AM. The impact of	System atic review (to 2017)	IB	Interventi ons to improve diet habits and/or physical activity:	Adults working irregular hours (shift workers, night work) or	Workplaces	Diet, PA, overweight .	US, Europe, East Asia and Australia	9 studies: 30 to 1369 participa nts	Mostly RCTs or cluster RCTs but Includes retrospective comparison	Weight, dietary habits (3), VO2max, physical activity measured at 3–12 months (one study assessed at 7 years.	Change in fruit and vegetables (3 studies): no effect in one study, effect size in two studies 0.2 for individual and 0.4 for team based groups. Change in physical activity in 4/4 studies but	Small to moderate effects on diet and physical activity.

	worksite interventions promoting healthier food and/or physical activity habits among employees working 'around the clock'hours: a systematic review. Food & Nutrition Research. 2018;62.			Including broad lifestyle interventions (2), exercise (3), healthier food/meals (2). Lasted 2–12 months	expended working hours.							not in VO2 max. Variable effects on weight (2 improved, 3 no change and one showed weight gain)	
50	Lehne G, Bolte G. Impact of universal interventions on social inequalities in physical activity among older adults: an equity-focused systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2017 14(1):20.	Systematic review (2005-2015)	IC	Interventions to improve physical activity.	Adults, 50 years and over	Community	PA	Netherlands (2) UK (1) US (3), Italy (1), Germany (1) Sweden (2)	59 studies. 11 which used PROGRES-Plus factors in analysis	Before after or comparison group.	Self-reported or objectively measured physical activity	Difference between groups	Variable design including before after studies. Insufficient evidence to draw conclusions about the impact of interventions on social inequalities

51	Maderuelo-Fernandez JA, Recio-Rodríguez JI, Patino-Alonso MC, Perez-Arechaederra D, Rodriguez-Sanchez E, Gomez-Marcos MA, García-Ortiz L. Effectiveness of interventions applicable to primary health care settings to promote Mediterranean diet or healthy eating adherence in adults: A systematic review. Preventive medicine. 2015 Jul 1;76:S39–55.	Systematic review (1990–2013)	IA	Interventions to promote Mediterranean diet or healthy eating: motivational counselling, assistance or education offered individual or group sessions over 2–48 months	Adults with good health or chronic disease	Primary healthcare	Diet	Published in English or Spanish. 4 UK, 7 US, 1 Netherlands 1, Italy, 1 Spain.	15 studies 18–78 year old (69–3088)	Randomised controlled trials	Fruit and vegetables or fibre in diet or physical activity at 6–48 months. Physical activity	Portions of fruit by 0.03 to 2 serves. Portions of vegetables from 0.3 to 2.55 daily servings. Fibre increased by between 0.86 g to 4.26 g per day. Increased physical activity (MET/min or minutes of moderate activity.	Intervention caused moderate increases in fruit, veg and fibre intake. Threeof the 4 studies that evaluated physical activity showed improved PA. Interventions in a range of settings
52	Maher CA, Lewis LK, Ferrar K, Marshall S, De Bourdeaudhuij I, Vandelanotte C. Are health behavior change interventions that use online social networks effective? A systematic review. Journal of medical Internet	Systematic review (2000–2012	III3C	Online social network health behaviour interventions. Interventions included commercial online health social network websites	Adults	Community/ online	The targeted health behaviours were diet/weight loss (n=2), PA (n=3), or a combination of diet/weight loss and PA (n=5).		10 studies (113,988 participants)	5 RCTs, 1 randomised cross-over study 4 single group pre-post studies. Any comparator was acceptable (ie, a traditional control group, an alternative intervention, or a within subject pre-post design).	Weight loss, PA,	4 studies (three pre-post studies and one cross-over study) reported significant improvement in an outcome measure, namely weight loss (n=2) [25,26], physical activity (n=1) [23], and dietary awareness (n=1) [30]. 4 Studies (all RCTs) no change. 2 studies mixed results	Modest evidence that online social network interventions may be effective

	research. 2014;16(2):e40.			(n=2), research health social network websites (n=3), and multi-component interventions delivered in part via pre-existing popular online social network websites (Facebook n=4 and Twitter n=1). Interventions ranged in duration from 5 days to 6 months.									

53	Malik SH, Blake H, Suggs LS. A systematic review of workplace health promotion interventions for increasing physical activity. British Journal of Health Psychology. 2014;19(1):149–80.	Systematic review (to 2011)	IB	Workplace physical activity interventions (six physical activity/exercise interventions, 13 counselling/support interventions, and 39 health promotion messages/information interventions)	Adults at work	Workplaces (Universities, public health care, oil refineries)	PA		58 studies	RCT, prospective RCT, or Quasi experimental group	Physical activity (Step count or hours of PA per week)	PA programs: 2/6 studies showed improvement in step count (699–978 steps per day), one study showed increase in weekly PA time of 2–4 hours. Counselling support: 10/13 showed increased PA. Telephone was more effective than internet. Health promotion: 29/39 showed increased PA time (30 min per week).	Variable impact of PA programs on PA.
54	Martin A, Fitzsimons C, Jepson R, Saunders DH, van der Ploeg HP, Teixeira PJ, Gray CM, Mutrie N. Interventions with potential to reduce sedentary time in adults: systematic review and meta-analysis. Br J Sports Med. 2015;49(16):1056–63.	Systematic review and meta-analysis (to 2013)	IB	Interventions including sedentary behaviour as an outcome measure in free-living adults. Only three specifically targeted sedentary behaviour - others	Adults aged 18 years or over who have left school.	Community. Clinical settings such as hospitals were excluded	Sedentary behaviour (self-reported sitting/screen/transport time, accelerometers/inclinometer.	Multiple	51 studies (34 meta-analysis) (18,480 participants)	Waiting list, attention control (eg, general health information), usual care and alternative treatment conditions`	Sedentary behaviour	Meta-analysis showed overall reduction in sedentary time by mean difference of −22 min/day	Possible to reduce sedentary behaviour by 22 min per day.

				targeted physical activity.									
55	McEwan D, Harden SM, Zumbo BD, Sylvester BD, Kaulius M, Ruissen GR, Dowd AJ, Beauchamp MR. The effectiveness of multi-component goal setting interventions for changing physical activity behaviour: a systematic review and meta-analysis. Health psychology review. 2016 Jan 2;10(1):67–88.	Systematic review and meta-analysis (to 2015)	IA	Multicomponent individual goal setting interventions for changing physical activity behaviour	Middle-aged and older adults	Workplaces, outpatient clinics, community	PA	Finland (3), Netherlands (1), Italy 1, UK 6, US 19, Australia 5, Canada 2, Other	45 studies	Control group	Daily step count, self-reported days per week, minutes of moderate exercise per week	0.55 effective size	Significant effects were seen across all intervention settings, except in workplace locations; They were not influenced by being delivered in person or by technology and duration did not influence the effects.

56	Muellmann S, Forberger S, Möllers T, Bröring E, Zeeb H, Pischke CR. Effectiveness of eHealth interventions for the promotion of physical activity in older adults: A systematic review. Preventive medicine. 2018 Mar 1;108:93–110.	Systematic review (To 2017)	IB	E-health interventions promoting PA in older adults were included. E-health interventions encompass interventions accessible via computer or other handheld devices, such as Personal Digital Assistants, telephones or smartphones, or tablets.	Older adults, aged 55 years and above without pre-existing chronic medical conditions	Community (patients in clinical settings eg rehab after stroke or heart attack, diabetic patients) were excluded)	PA	11 in US, 3 Netherlands, 2 Belgium, 1 Spain, 1 Australia, 1 New Zealnd, 1 Malaysia	20 included studies, 18 were RCTs (6671 participants)	Randomised controlled trial [RCT] or quasi-experimental study designs that compare with either a non-e-health PA intervention or a group that is not exposed to any intervention	PA was assessed using objective (e.g., pedometer, accelerometer), subjective (e.g., PA diary, questionnaires),	Web based: 4/6 studies; Telephone: 2/5 , Text messaging 1/2 increased their PA levels at 1–6 months.	Engagement of participants was moderately high but few participants reached the intended dose (in terms of time and frequency of interaction)
57	Muhunthan, J., B. Angell, M. L. Hackett, A. Wilson, J. Latimer, A. M. Eades and S. Jan..Global systematic review of Indigenous	Systematic review (1975 - Dec 2015)	IC	Indigenous community-led legal interventions to control alcohol	Indigenous community	Nationwide, populations studied were rural or remote communities.	Alcohol-related health and social factors	High-income nations, the US (n=10), Australia (n=6), Canada (n=1) and	18 [cross-sectional or time-series analyses]	Controls were implemented in rural and remote populations of high income nations	11/18 studies reported the Indigenous-led alcohol controls employed were effective in achieving improvements in one or more health outcomes [less		The findings of this review indicate that community-led alcohol controls characterised by their development and/or implementation by Indigenous communities globally have been shown to

	community-led legal interventions to control alcohol. BMJ Open. 2017; 7(3): e013932.							Greenland (n=1).			crime(n=5), fewer injury deaths (n=3), fewer injury (n=4), alcohol consumption declined (n=1)]		be effective in improving health and social outcomes.
58	Müller AM, Khoo S. Non-face-to-face physical activity interventions in older adults: a systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2014 Dec;11(1):35.	Systematic review (2000-2013)	1C	Non-face-to-face physical activity interventions (11 print or telephone, 3 internet).	Healthy community dwelling older adults (≥ 50 years).	Community	PA	US 11, Australia 3, New Zealand 1, Netherlands 1.	17 studies (11 RCTS) (31–2503 participants)	12 RCT or cRCT, 5 quasi-experimental comparison with site or longitudinal data	Self-reported PA, 1 used accelerometer.	14 reported improvements: in weekly moderate activity time, (60 min +); meeting PA guidelines	Positive short- and long-term outcomes of non-face-to face PA interventions in older adults. Few studies used the internet.
59	Murray JM, Brennan SF, French DP, Patterson CC, Kee F, Hunter RF. Effectiveness of physical activity interventions in achieving behaviour change maintenance in young and	Systematic review and meta-analysis (to Jan 2016)	1A	Physical activity interventions (Interventions targeting multiple health behaviours were excluded (e.g., studies	Adults (mean age 18–64 years) non-clinical population	Community (39), primary care (13) and work/university (10).	PA	US 32, Europe 10, UK 9, Japan 2, Canada 2, New Zealand 2, Thailand 1	62 studies (61,690 adults)	52 RCTs or cRCTs	Self-report estimates of time spent in PA, MVPA time, leisure-time PA, energy expenditure from PA, and percentage of participants meeting recommendations for MVPA	Thirty-two studies reported PA behaviour maintenance between 6 and 9 months: 136 extra minutes of physical activity per week.	Modest impact on PA. 'Primary care (versus community)', 'Prompt self-monitoring of behavioural outcome' (i.e., recording specific measures expected to be influenced by behaviour change) and 'Use of follow-up prompts' (i.e.,

	middle aged adults: a systematic review and meta-analysis. Social Science & Medicine. 2017 Nov 1;192:125 133.			targeting PA and diet). Mean interventi on duration (during which the interventi on was active) was 8 months (median 6 months; range 24 months).									gradual reduction in intervention intensity or frequency of contact over time) all increased the effect.
60	Nelson JP, McNall AD. What happens to drinking when alcohol policy changes? A review of five natural experiments for alcohol taxes, prices, and availability. J The European Journal of Health Economics. 2017;18(4):417–34.	System atic review from empiric al studies (2003 to 2014)		Alcohol policy interventi ons- excise tax reduction; raising of minimum age limit for buying alcohol (Denmark); retail limits and advertisin g restriction s (Finland); reducing wholesale import duties,	Legal-age individuals (>16 years) and under-age youth (<16 or 18 years)		Alcohol	Denmark, Finland, Hong Kong, Sweden, Switzerla nd	29 studies; 1–5000 to 40–100,000 participa nts		Alcohol consumption (youth and young adults), binge drinking, heavy consumption by older adults	Lack of consistent results to provide a sound evidence-base for alcohol tax policy development. Limited robust results for major segments of the population following interventions that reduced prices and relaxed import quotas.	May not be generalisable to Australia. Alcohol tax and price changes likely to have selective effects on drinking and drinking patterns, rather than broad population-level effects.

				institution of anti-drunk driving campaigns (Hong Kong); enacting laws to raise legal age, tax alcopops and lowering of BAC for drink driving, eliminating discriminatory taxes on foreign spirits (Switzerland); tax cuts in Denmark & Finland; increased retail prices (Sweden)									

61	Nour M, Chen J, Allman-Farinelli M. Efficacy and external validity of electronic and mobile phone-based interventions promoting vegetable intake in young adults: systematic review and meta-analysis. Journal of Medical Internet Research. 2016;18(4):e58.	Systematic review and meta-analysis (1990–2015)	IB	Electronic (e-health)- and mobile phone (m-health -based interventions that promote vegetable intake (using texting, email, mobile phone apps, phone calls, or websites to deliver the intervention). Variable contact: one-off to daily	Young adults (mean age 20.8 years	University or college settings (12/14).	Diet	US 7, Australia 4, NZ 1, Malaysia 1.	14 studies (12 in meta-analysis) 7984 people	RCTs. 6 studies no treatment, 7 studies gave information, 1 gave intervention on completion of follow up assessments.	Portions of fruit and vegetables - self reported.	Standardised mean difference of 0.22 . 2 studies reported clinically significant improvements of ≥1 serving/day	Small change (<1 serv pe day) in intake of fruit and vegetables.

62	Oliveira JS, Sherrington C, Amorim AB, Dario AB, Tiedemann A. What is the effect of health coaching on physical activity participation in people aged 60 years and over? A systematic review of randomised controlled trials. Br J Sports Med. 2017 Oct 1;51(19):1425–32.	Systematic review of RCT (to May 2016)	IB	Health coaching aimed at increasing physical activity participation with a clear focus on changing behaviour (ie, physical activity) and attaining health promotion goals. 3 to 24 sessions with each session ranging from 10 to 60 min. By telephone (10), face-to-face (7), face-to-face and telephone (10).	60 years and older.	Primary care (8), community (9), hospital (5), outpatient clinic or program (5).	PA	Canada 1, Italy 2, Belgium 2 New Zealand 2, UK 2, Australia 4, The Netherlands 5, US 10.	27 studies (5803 participants)	RTs and quasi-RCTs. Control group received usual care or wait-list control	Objectively measured (such as with accelerometers or pedometers) and self-reported (with validated questionnaires) physical activity measures	Small. SMD=0.27. Equally effective for those with or without chronic clinical conditions. No influenced by mode of delivery - telephone just as good.	Small impact.
63	Onerup A, Arvidsson D, Blomqvist Å, Daxberg EL,	Systematic review	IC	Swedish model of physical activity	Adults (mean age 47–79)	Community	PA	9 studies - 8 in Sweden	9 studies (34–481) - only 7 reported	7 RCT, 1 cohort, 1 case series. control: usual care,	Reported frequency of PA or MVPA, steps at 3 to 36 months	4/7 studies showed increased PA. One study showed an Increase in 0.9 sessions of moderate to	Increase in PA demonstrated in most studies where it was measured.

	Jivegård L, Jonsdottir IH, Lundqvist S, Mellén A, Persson J, Sjögren P, Svanberg T. Physical activity on prescription in accordance with the Swedish model increases physical activity: a systematic review. Br J Sports Med. 2019 Mar 1;53(6):383–8.	(1999–2017)		prescription, which consists of: patient-centred dialogue, individually tailored PA recommendation and written prescription and follow up.				and 1 in Finland	change in PA	written information or rehab with physiotherapist		vigorous PA sessions per week. One study showed increase of >150min per week.	However heterogeneity of outcomes and restricted to Sweden and Finland.
64	Oosterveen E, Tzelepis F, Ashton L, Hutchesson MJ. A systematic review of eHealth behavioral interventions targeting smoking, nutrition, alcohol, physical activity and/or obesity for young adults. J Preventive medicine. 2017;99:197–206.	Systematic review (Only RCTs) [2000–2015]	IIC	E-health behavioural interventions [websites, computers, including tablets, e-mail, mobile/smartphones (apps or text messages), digital games or monitoring devices (i.e., pedometers]. 17/45	Young adult (18–35 years)	Most studies (n=39) recruited participants within a university setting	Improving: smoking, nutrition, alcohol intake, PA and/or treating or preventing obesity	Mostly US (39/45)	45 (15,243 participants, Mean 338.7)	Mostly RCTs, any comparator/controls. Compared e-health interventions to a control group [(e.g. waiting list control, minimal intervention) (n=32)], in-person (n=9) and other (n=16)	Improving alcohol intake (n=26), smoking (n=7), PA (n = 4), obesity (n = 4), nutrition (n = 1) and multiple lifestyle behaviours (n=3). E-health interventions delivered via websites (79.5%). Majority (n = 23) showing a positive effect on a SNAPO outcome at follow-up.	Meta-analysis demonstrated a significantly lower mean number of drinks consumed/week in brief web or computer-based interventions compared to controls (Mean Difference −2.43 [−3.54, −1.32], P b 0.0001, n = 10). 16 studies compared e-health delivery modes, with inconsistent results across target behaviours and technology types. 9 studies compared e-health to other modes of delivery (e.g. in person) with all finding no difference in SNAPO outcomes between groups at follow-up.	E-health interventions are typically more effective than control groups in asserting behaviour change in the short term.

				included single session, 28/45 ranging from 2 days to 1 year (Mean 9.9 weeks) interventi on.									
65	Platt L, Melendez-Torres G, O'Donnell A, Bradley J, Newbury-Birch D, Kaner E, et al. How effective are brief interventions in reducing alcohol consumption: do the setting, practitioner group and content matter? Findings from a systematic review and	System atic review (1966-Jan 2015), Meta analysis	IIC	Brief interventi ons for alcohol (ABI) [Brief advice, motivatio nal interviewi ng, motivatio nal interviewi ng 'plus']	16 years and older adults (average: 18–44)	A&E services; community-based - non-clinical settings; primary or ambulatory care in clinics; hospital inpatient, university services	Alcohol	US (45%), UK (22%), Australia, Taiwan and Thailand - 1 in each	52 (29891 individu als	Mostly RCTs or intention-to-treat,	A beneficial effect at reducing the quantity of alcohol consumed by 0.15 standrd drinks (SD)s.	Interventions delivered by nurses reducing quantity (d=−0.23, 95% CI (−0.33 to −0.13)) but not frequency of alcohol consumption, brief advice was the most effective in reducing quantity consumed (d=−0.20, 95% CI (−0.30 to −0.09)).	The stratified analysis of quantity of alcohol consumed per unit time suggested stronger effects of setting, provider and content of intervention at the first time point of assessment than indicated in the multilevel models but with comparable effect estimates within each category.

	metaregression analysis. BMJ open. 2016;6(8):e011473.												
66	Pressick EL, Gray MA, Cole RL, Burkett BJ. A systematic review on research into the effectiveness of group-based sport and exercise programs designed for Indigenous adults. Journal of science and medicine in sport. 2016 Sep 1;19(9):726–32.	Systematic review (2014–2015)	IIC	Group based sport and exercise programs targeting indigenous adults 3–24 months	Adults age 18–64	Community	Weight/BMI	Australia 3, Canada-1, New Zealand 2	6 studies	1 PRCT, others before after comparisons	BMI, waist circumference	Positive change in BMI (2.3 to 14.2) at 3 months but not sustained long term	Poor study design (most before after studies without control). PA not directly measured. Some change observed but not maintained in weight.

67	Prestwich A, Kellar I, Conner M, Lawton R, Gardner P, Turgut L. Does changing social influence engender changes in alcohol intake? A meta-analysis. Journal of consulting clinical psychology. 2016;84(10):845.	Systematic review and meta analysis of RCTs (1996–2012)	IC	Social influence-based interventions on adults' drinking: behaviour change techniques (BCTs); most using printed materials and delivered face-to-face.	University-based populations	Educational settings	Alcohol	Majority in the US	41 studies; 17,445 participants		Social influence and alcohol intake	Provision of normative information about others' behaviour and experiences effective in changing social influences (Effect size g = 0.29; 95% CI 0.22-0.37). Even moderate-to-large changes in social influences corresponded with only a small change in drinking behaviour. While changes in social influences (descriptive norms) engendered reductions in total alcohol intake and binge drinking, it was not associated with reductions in alcohol-related problems.	Minimal impact of social influence on alcohol intake and alcohol-related problems. Variation in BCT techniques used across studies.
68	Ramôa Castro A, Oliveira NL, Ribeiro F, Oliveira J. Impact of educational interventions on primary prevention of cardiovascular disease: A systematic review with a focus on physical activity. European Journal of General Practice.	Systematic review (2000–2016)	IB	Health education aiming to enhance health literacy and the adoption of healthy lifestyles delivered face-to-face or telephone, individual or group.	Adults	Community and general practice	PA		15 studies (6727 participants)	All controlled studies	Physical activity (3–6 months) - variably assessed by questionnaires' (IPAQ, CHAMPS, etc.) one accelerometer,	PA improved in 11/15 studies. One study showed improvement in proportion meeting guidelines.	Some evidence of health education on PA. Difficult to quantify effect because of variability of measures

	2017 Oct 2;23(1):59–68.												
69	Riper H, Blankers M, Hadiwijaya H, Cunningham J, Clarke S, Wiers R, et al. Effectiveness of guided and unguided low-intensity internet interventions for adult alcohol misuse: a meta-analysis. J PLoS One. 2014;9(6):e99912	Systematic review (September 2013), Meta analysis	IIC	Guided and unguided low-intensity internet interventions	Adult, alcohol misuse (age 18 and over)	Workplace, community, military and general practice.,	Alcohol [How consumed, quantities of alcohol, intention-to-treat (ITT) versus completers-only (CO) analyses, post-treatment assessments in months, dropout rate]	US (n=5), Netherland (n=5) and n=1 for Canada, Denmark, Germany, Japan, Norway, UK	16 (5612 participants)	RCTs [web-based intervention with a control group (in an assessment only, waitlisted or alcohol information brochure); a low-intensity self-help (perform on a computer or mobile phone)	Participants in Internet interventions drank on average 22 grams of ethanol less than controls and were significantly more likely to be adhering to low-risk drinking guidelines at post-treatment (RD 0.13, 95% CI: 0.09–0.17, p,.001).	Subgroup analyses revealed no significant differences in potential moderators for the outcome of alcohol consumption, although there was a near-significant difference between comparisons with waitlist control and those with assessment-only or alcohol information control conditions (p = .056).	
70	Samson JE, Tanner-Smith EE. Single-session alcohol interventions for heavy drinking college students: A systematic review and meta-analysis. Journal of Studies on Alcohol and Drugs. 2015 Jun	Systematic review (to Dec 2012)	IB	Brief single session interventions to reduce alcohol use (psychoeducational therapy, CBT, motivational	Heavy drinking college students (≤25 years)	College	Alcohol	US (79%), UK, Scandinavia, Australia/ New Zealand 7%	73 Studies (662)	1/3 active conditions, 2/3 no treatment or wait list.	Evaluation between 1 and 206 weeks. Quantity of alcohol consumed, frequency of heavy use, blood alcohol consumption.	Positive average effect size (0.18). 0.37 fewer drinks per week at 1 month.	Modest effect translating into a 7 percentile improvement in daily drinking

	24;76(4):530–-43.`			interviewing.									
71	Samuel-Hodge CD, Johnson CM, Braxton DF, Lackey M. Effectiveness of Diabetes Prevention Program translations among African Americans. Obesity Reviews. 2014 Oct;15:107–24.	Systematic review (2003 to 2012)	IIC	Diabetes prevention implementation programs of at least 3 months	African American adults aged means of 34.7–60.3 years. Mean BMI 36.	Churches 4, university 2, primary care 4, community 4, other 6.	Overweight /obesity	US	17 studies	12 RCTs, 5 no control	Measured weight loss	Average weight loss over 6 months was 3 kg	Implementation studies achieved weight loss of approx. half that achieved in the Diabetes Prevention Program (DPP) trials.
72	Schippers M, Adam PC, Smolenski DJ, Wong HT, de Wit JB. A meta-analysis of overall effects of weight loss interventions delivered via mobile phones and effect size differences according to delivery mode, personal contact, and intervention	Systematic review and meta-analysis (1996–2016)	IB	Weight loss interventions delivered via mobile phones. Social media 1, pedometer 1, app 3, text/SMS 5). Mean duration 152 days (1–12	Adults (Mean age 39.1 years, mean BMI 30.6); all studies had a mix of overweight or obese patients)		Overweight /obesity		12 studies (1170 participants)	All RCTs	Measured weight loss	Average across 10 studies -3.1 kg	

	intensity and duration. Obesity reviews. 2017 Apr;18(4):450–9.			months) with mean of 1.1 interventions per day. Goal setting (10 studies), self monitoring (9), feedback (7).									
73	Schoeppe S, Alley S, Van Lippevelde W, Bray NA, Williams SL, Duncan MJ, Vandelanotte C. Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: a systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2016 Dec;13(1):127.	Systematic review 2016 to 2015)	IB	Apps to improve diet, physical activity and sedentary behaviour either as stand alone or with other interventions.	Adults with mean age 41.5 years		Diet, PA, sedentary behaviour	US 12, Aust/NZ 7, Europe 7, Middle East 1	23 studies, targeted 2189 adults	Most RCTs	Dietary intake (n = 13), physical activity (n = 21) and sedentary behaviour (n = 5). Other reported lifestyle-related health outcomes were: weight status (n = 11); Follow-up assessments 4 weeks (n = 5), 8 weeks (n = 8), 12 weeks (n = 9), 20 weeks (n = 2), 6 months (n = 2), 9 months (n = 1) and 18 months (n = 1).	6/11 studies showed improved diet, 13/21 showed improved PA, 1/1 showed improved sedentary behaviour, 4/10 showed improved weight.	Variable quality. Half of the interventions showed improvements. Single health behaviour interventions had larger improvements than those targeting multiple behaviours. Multicomponent interventions that combine apps with other interventions are more effective than app alone.

74	Scott S, Beyer F, Parkinson K, Muir C, Graye A, Kaner E, Stead M, Power C, Fitzgerald N, Bradley J, Wrieden W. Non-pharmacological interventions to reduce unhealthy eating and risky drinking in young adults aged 18–25 years: a systematic review and meta-analysis. Nutrients. 2018 Oct;10(10):1538.	Systematic review (Inception to June 2018), Meta-analysis	IC	Non-pharmacological interventions. Targeted interventions aiming to reduce unhealthy eating and linked alcohol use in 18–25 year olds. 3 interventions were delivered in a single session but with post engagement activities. 3 required a number of modules. One involved multiple interventions using social	Young adults aged 18–25-years	Community-wide, students' health services, 7 university	Dietary, nutritional or energy intake; alcohol consumption related to body composition (i.e., BMI, waist circumference, waist-hip ratio, % body fat, biochemical measures, purchasing behavior, and hospital admissions).	US (n=3), n=1 for Australia, UK, New-Zealand, Chile	8 studies (7 with student populations)(5 in meta-analysis)	5 RCT, 1 pre/post, 1 pseudo-experimental. 5 assessment only control group. One waitlist control. One provided health information in the form of leaflets. 2 studies did not contain control groups (one had three active arms and one pre-post).	Self-reported changes in fruit and vegetable consumption (mean change/daily servings: 0.33; 95% CI - 0.22 to 0.87) and alcohol consumption (mean reduction of 0.6 units/week; CI -1.35 to 0.19). Self-reported episodes on binge drinking. There was also little difference in the number of binge drinking episodes per week between intervention and control groups (-0.01 sessions; CI -0.07 to 0.04).	4 studies reported positive changes in diet and weight status [reductions in body weight (pre: 67.7 kg±10.8; post: 65.6 kg±9.3; p≤0.0001), and BMI (pre: 24.8±3.9; post: 23.9±3.3; p≤ 0.0001)]. 2 studies providing linked feedback on alcohol and diet consumption had inconclusive results (One influenced F/V consumption and one had small reduction in alcohol days. The other studies targeted alcohol and diet separately. Meta-analsyis found no significant effect on volume of alcohol or binge episodes. Similarly metanalsyis of three studies found no difference in servings of fruit and vegetables	Inconclusive evidence of changes in fruit and vegetable or alcohol consumption.

				media, website, guides, physical activity tracker.									
75	Siegfried N, Pienaar DC, Ataguba JE, Volmink J, Kredo T, Jere M, Parry CD. Restricting or banning alcohol advertising to reduce alcohol consumption in adults and adolescents. Cochrane Database of Systematic Reviews. 2014(11).	Systematic review (to Oct 2013)	III3D	1. RCT: participants watched movie clips containing either a high degree of alcohol content or a low amount of alcohol content interrupted with commercials containing advertising for alcohol products. 2. ITS: Alcohol advertising ban (partial or full) - 2 applying and 1	1. RCT: 18 and 29 years old males. 2. Three interruped time series (ITS) consumption or sales at provincial level	Community	Alcohol	Netherlands 1, Canada 3	One small RCT (80 male students in the Netherlands in 2009) and 3 ITS studies (general population studies in Canada in the 1970s and 80s)	1 RCT (The control group watched a movie clip containing a low amount of alcohol content and a commercial for neutral products). Two of the ITS studies evaluated the implementation of an advertising ban and one study evaluated the lifting of such a ban	RCT: observed number of alcohol drinks consumed during the viewing session and self-reported frequency of drinking	1 RCT found that young men exposed to movies with a low-alcohol content drank less (MD -0.65) than men exposed to movies with a high alcohol content. Young men exposed to commercials with a neutral content compared with those exposed to commercials for alcohol drank less (MD -0.73 drinks). A meta-analysis of the two studies that evaluated the implementation of a ban showed no significant change in beer consumption.	Poor quality old studies.

				lifting ban.									
76	Siopis G, Chey T, Allman-Farinelli M. A systematic review and meta-analysis of interventions for weight management using text messaging. Journal of Human Nutrition and Dietetics. 2015 28:1–5.	Systematic review and meta-analysis (1993 to October 2013)	IB	Interventions for weight management using text messaging (1 to 24 months; Frequency of text messaging was from daily to fortnightly.)	Adults and children, 84% female	Community	Weight	Europe 4, Australia 3, US 3, Korea 3	14 studies-9 for adults	RCTs	Change in body weight (kg), BMI [weight (kg)/height (m)2], waist circumference (cm)	2.2 kg weighted mean change in body weight in intervention participants compared to controls 0.37 kg	Some evidence for text messaging in the context of weight management interventions for women
77	Song Y, Qu J, Zhang D, Zhang J. Feasibility and Effectiveness of Mobile Phones in Physical Activity Promotion for Adults 50 Years and Older: A Systematic Review. Topics in Geriatric Rehabilitation. 2018 Jul 1;34(3):213-22.	Systematic review (April 1, 2017)	IIC	Mobile phone (all types of mobile phone including basic mobile phone and smartphone, excluding telephone) interventions on PA promotion	Older adults 50 years and older (2 of studies were patients with chronic disease)	Community -6, OPD clinic 1, Primary care 1	PA	Canada, China, South Korea, Malaysia, and the US (3)	8 Studies (5 RCTs, 1 with a non-equivalent control group design, 1 crossover design. 2 qualitative methodology)	Control group	PA frequency and step count	The frequency of PA was achieved in 4/5 studies and step count increased in 2/3 studies but was not sustained after the intervention ceased.	Variable quality studies and outcomes not sustained.

78	Steinka-Fry KT, Tanner-Smith EE, Grant S. Effects of 21st birthday brief interventions on college student celebratory drinking: A systematic review and meta-analysis. J Addictive behaviours. 2015;50:13–21.	System atic review and meta-analysis of RCTs (Decem ber, 2012)	ID	Reducing college students' 21st birthday celebrato ry drinking using birthday-focused, individual ly-targeted, no-contact (email or letter-based) brief alcohol interventi ons (BAIs) - content included alcohol education , alcohol consumpt ion alternativ es, social norms message, moderati on strategies , normativ e feedback. Delivery	College students; 41% male, 75% white, 17% were part of a Greek organisati on	University institutions	Alcohol	US	9 studies; 1513 participa nts	No treatment	Quantity of alcohol consumed and estimated blood alcohol concentration (BAC)	No evidence on birthday-focused brief alcohol interventions reducing quantities of alcohol consumed during birthday celebrations (g=0.05,95% CI[−0.03 to 0.13]). Interventions associated with significant reductions in estimated BAC levels (g= 0.20, 95% CI [0.07 to 0.33]), but this effect was small in absolute terms.	Included studies of very low quality; high risk of bias.

				modes - electronic, mailed cards, web-based feedback									
79	Stewart G, Anokye NK, Pokhrel S. What interventions increase commuter cycling? A systematic review. BMJ open. 2015 Aug 1;5(8):e007945.	Systematic review (to 2014)	IVC	1.Written information or advice to encourage cycling. 2. Workplace travel plans/programs encouraging cycling to work. 3.Cycling Training 4. Environmental changes including opening of a bridge, cycleways, traffic calming, cycle lanes)	Adults	Community-based	PA	UK 6, Australia 2, Sweden 1, Ireland -1, New Zealand 1 and US1	12 studies	2 RCTs, 10 before-after studies.	Proportion of population cycling to work.	One of the two individual RCTs. Group- or individual-based studies showed equivocal results. Environmental studies had broader potential impacts but were difficult to evaluate.	Limited clear evidence

80	Stockings E, Bartlem K, Hall A, Hodder R, Gilligan C, Wiggers J, et al. Whole-of-community interventions to reduce population-level harms arising from alcohol and other drug use: a systematic review and meta-analysis. J Addiction. 2018;113(11):1984–2018.	Systematic review (Inception to August 2017), Meta-analysis	IID	Whole-of-community interventions; Mean intervention length was 28.8 months (range = 3–72 months); self reported	Young people	Schools, sporting clubs, police and law enforcement agencies, community centres, local media and retail premises.	Alcohol and other drug (AOD) use	US (n = 13); Netherlands (n = 2); Australia (n = 2); and one each in Sweden, Italy, Canada, Iceland, Sri Lanka, South Africa and China.	63 (249,125 participants)	Cluster-randomised controlled trials (n = 13)	Significant reductions in risky drinking [Alcohol Use Disorders Identification Scale (AUDIT) > 8; three trials (7 data points), RR = 0.78, 95%CI = 0.62–0.99)], but found no impact on past-month alcohol use (5 trials, RR = 0.95, 95% CI = 0.89–1.02), binge drinking (5 trials, RR = 0.97, 95% CI = 0.89–1.06)	Narrative synthesis indicated 24 whole-of-community intervention trials showed some reductions in AOD-related assault rates and arrests, but were equivocal for quantity of alcohol consumed.	Risk of bias was mostly high, due to lack of random allocation, selective reporting and significant attrition
81	Stockwell S, Schofield P, Fisher A, Firth J, Jackson SE, Stubbs B, et al. Digital behavior change interventions to promote physical activity and/or reduce sedentary behavior in older adults: A systematic review and meta-analysis. J Experimental Gerontology. 2019;120:68–87.	Systematic review (to 2018)	IIB	Digital behaviour change interventions use technologies such as mobile applications and websites to remotely deliver behaviour change interventions: goal setting, problem solving, feedback, prompts,	Older adults (aged 50+ years)	Community	PA	US 16, Australia 1; New Zealand-1, Malaysia 1 and Europe 3.	22 studies (17 to 278)	14 randomised controlled trials (RCTs); , 5 pre and post-test studies; 1 randomised crossover study; 1 mixed methods quasi-experimental two group pre-post study design..	Physical activity and sedentary behaviour captured via objective measure (e.g. pedometers, accelerometers) or self-report validated tools (e.g. IPAQ).	The current meta-analyses suggest that among RCT (EI) studies, digital behaviour change interventions increased total PA (SMD=0.28, p=0.04), increased MVPA (SMD=0.47, p < 0.001; MD=52,) p < 0.001) and reduced sedentary time (SMD=−0.44, p < 0.001; MD=−58, p < 0.001) when compared with control conditions	Digital behaviour change interventiosn have the potential to increase total PA in older adults, but may face similar problems to traditional methods regarding maintenance, although this is still unknown.

				practice, rehearsal, adding objects to the environment									
82	Street TD, Lacey SJ, Langdon RR. Gaming your way to health: A systematic review of exergaming programs to increase health and exercise behaviors in adults. Games for health journal. 2017 Jun 1;6(3):136–46.	Systematic review (to Nov 2016)	IIC	Health interventions involving exergaming or active videogames to promote physical activity behaviours and health (most from 6 to 12 weeks in duration)	Older adults	Community	PA	US 4, Canada 3, Australia 1, Japan 1	9 studies (4 RCTs, before after or cohort)	4 RCTS	Most used accelerometer or digital step measures. BMI and weight was measured in 8 studies.	Some studies reported increase in physical activity time or intensity. Variable impact on weight: changes in weight were observed where there was high exergaming participation (eg 3 times a week).	Exergaming can engage adults in physical activity who are not participating in traditional exercise activities.
83	Sushames, A., J. G. van Uffelen and K. Gebel (2016). Do physical activity interventions in Indigenous people in Australia and New Zealand improve activity levels and health outcomes? A	Systematic review (Inception to March 2016)	III - 2D	Physical activity interventions	Indigenous people [aged 18 years or over; Aboriginal people and Torres Strait Islanders in Australia and the	Metropolitan, urban and regional areas. Also remote/rural	PA (measured by pedometer and self-report measure), weight and / or BMI, and health outcomes [metabolic markers,	Australia and New Zealand	13 [Australia 9; New Zealand 4] 3 RCTs	3 RCTs, 9 cohort, 1 interrupted time series. To promote PA, multicomponent interventions either through exercise programs or health education.	6 studies assessed PA via subjective (n = 4) or objective (n = 2) measures with only one showing significant improvements. 7/12 studies reported significant reduction of weight and BMI, 5 studies reported		Due to the lack of validated measures of PA in most studies it is unclear how successful interventions are at increasing activity levels in Indigenous adults in Australia and New Zealand. Comparisons between studies was difficult as there was

	systematic review. Int J Behav Nutr Phys Act 13(1): 129.				Māori people in New Zealand]		including fasting glucose, insulin, cholesterol and oral glucose tolerance tests)]			Intervention duration: 4 weeks to 2 years	improvements in fitness test.			a lack of homogeneity in study designs and outcome measures, which may be due to communities instigating intervention adaptations to be tailored towards their individual needs.
84	Tambor M, Pavlova M, Golinowska S, Arsenijevic J, Groot W. Financial incentives for a healthy life style and disease prevention among older people: a systematic literature review. BMC Health Services Research. 2016 Aug;16(5):426.	System atic review (to Nov 2015)	IVC	Financial incentives for health promotin g behaviour of older people including implicit incentives such as removal of financial barriers or increase barriers (eg tax on alcohol)	Adults 50+ years	Community	PA	US 7, Europe 3, Australia 1, Mexico 1, South Africa 1, Canada 1, Israel 1	15 studies	11 quantitative and 4 qualitive studies	Frequency of reported physical activity or meeting PA goals	Mixed findings of direct financial incentives for physical activity	Qualitative findings suggest that older adults viewed direct financial incentives as unfair or bribery. However in-kind incentives (eg gym vouchers) were viewed more positively
85	Tansil KA, Esser MB, Sandhu P, Reynolds JA, Elder RW, Williamson RS, et al. Alcohol electronic screening and brief intervention: a	System atic review of RCTs (1967 to Octobe r 2011)	IB	Electronic alcohol screening and brief interventi on (e-SBI) for preventio n of excessive	Adolescen ts and adults	Healthcare settings, universities, community-based	Alcohol	Half in the US, other half outside the US	31 studies;	Traditional ASBI (3 studies); different forms of e-SBI feedback (3 studies)	Binge drinking measures - prevalence, frequency and intensity; consumption measures - frequency of alcohol consumption and	Among excessive drinkers, a median 23.9% reduction in binge-drinking intensity (maximum drinks/binge episode) (9 study arms) and a median 16.5% reduction in binge-drinking frequency (9 study arms). Reductions	Significant impact of e-SBI on reducing alcohol consumption. However, its main focus is on individual risk reduction. Alcohol consumption self-reported prone to biases. Differences in intervention

	Community Guide systematic review. J American journal of Preventive Medicine. 2016;51(5):801–11.			drinking. Uses electronic devices to facilitate delivery of traditional alcohol screening and brief intervention (ASBI). Involves screening individuals for excessive drinking & delivery of brief intervention incorporating personalised feedback on risks and consequences of excessive drinking.							total alcohol consumption	in drinking measures sustained for up to 12 months.	effectiveness may be due to differences in the prevalence of various drinking patterns & their sensitivity in evaluating changes in alcohol consumption in different populations.

86	Temple VA, Frey GC, Stanish HI. Interventions to promote physical activity for adults with intellectual disabilities. Salud Pública de México. 2017;59:446–53.	Systematic review (to 2015)	IIB	Interventions to promote physical activity in adults with intellectual disabilities	Adults 18+	Community service agencies	PA	USA 5, Sweden 1	6 studies	3 RCT, 3 other.	Accelerometer 3, pedometer 1, observation 1, survey 1 at end of program or 12 weeks	3/6 studies reported improvement in duration and frequency PA post intervention. The three with negative findings did not involve carers and were only one session a week for 8 weeks	Equivocal impacts in short term.
87	Trieu K, McMahon E, Santos JA, Bauman A, Jolly KA, Bolam B, Webster J. Review of behaviour change interventions to reduce population salt intake. International Journal of Behavioral Nutrition and Physical Activity. 2017 Dec;14(1):17.	Systematic review (2005-2015)	IIB	Population level activities aimed at reducing salt intake or salt-related behaviours including education and awareness raising.	Adults	Community/ national	Dietary salt	China 4, UK 4, US 3, Australia 2, Japan 2, Portugal 2, Canada 1, Ghana 1, Iran 1, Ireland 1, Italy 1.	22 studies (41,448 participants)	7 controlled trials	Estimated dietary intake (eg from urinary sodium) or self reported dietary intake	19/22 studies found decrease in salt consumption or improvements in salt lowering behaviours. Estimated 0.9 to 3.3 g per day salt reduction in 10 studies. Three studies demonstrating no change were all health education-only programs.	When considering the better quality studies - 5/10 studies demonstrated objective change in sodium intake.
88	Tseng E, Zhang A, Shogbesan O, Gudzune KA, Wilson RF, Kharrazi H, Cheskin LJ, Bass EB, Bennett WL. Effectiveness of policies and programs to combat adult	Systematic review (2000–2018)	III3C	Programs, policies and built-environment changes targeting obesity prevention and control	Mean age 38–80+ with mean baseline BMI 17-30.	Community	BMI and weight	Australia 2, China 1, UK 3, 11 US	17 studies	Studies defined as "natural experiments"	BMI weight. Self-reported diet. Self-report moderate or vigorous physical activity	4/9 studies focused on physical activity/built environment showed small BMI reductions (0.5 to 1). None of the food and beverage environment interventions showed reduced weight or BMI. One Australian study on healthy eating and	Natural experiments. Few studies showed impact diet, PA, or weight.

	obesity: a systematic review. Journal of general internal medicine. 2018 Nov 1;33(11):1990–2001.			(duration from 1 to 20 years). Built environment/housing 3, transport 4, financial subsidies 1, School programs: 1, food retailer regulation 3, food purchasing assistance 2, food labelling 1, health workplace, tax/financial support/education								physical activity in the workplace showed no change in BMI. Another focused on family support and tax reduction found equivocal change. 1/5 programs focused on diet changes (SSB, fruit and veg etc) showed improved diet. 2 /8 studies focused on physical activity showed improved physical activity.	

89	Tsoli S, Sutton S, Kassavou A. Interactive voice response interventions targeting behaviour change: a systematic literature review with meta-analysis and meta-regression. BMJ open. 2018 Feb 1;8(2):e018974.	Systematic review and meta-analysis (1990-2017)	IC	Interactive voice-response delivered through a telephone call with interactive or non-interactive voice messages. 4 targeted alcohol, 1 targeted PA, 2 diet and physical activity, 8 medication adherence	Adults	Community	PA, diet, alcohol	Sweden 1, USA 6, Canada 1	15 studies - 8 on diet/PA/ alcohol	Comparator - usual care	Self report alcohol, physical activity, diet	Small significant effect on PA. No effect on diet or alcohol consumption	Systematic review also looked at medication adherence. Variable quality of studies
90	Wang Y, Xue H, Huang Y, Huang L, Zhang D. A systematic review of application and effectiveness of mHealth interventions for obesity and diabetes treatment and self-management. Advances in Nutrition. 2017 May 5;8(3):449–62.	Systematic review (2000-2016)	IB	M-health Interventions for obesity (13 mobile text messages, 6 wearable or portable monitoring devices, 5 apps)	Adults with obesity or diabetes	Clinical services and community	Obesity	US 15, Iran 2, Germany 1, South Korea 2, Italy 1, Finland 1 Spain 1 and Australia 1.	24 studies (14 for obesity)	16 RCT 8 Quasi-experimental. Usual care or pre intervention	Change in weight or waist circumference: -1–12 months	9/14 reported weight loss or waist circumference (up to 7 kg).	Study included both people with obesity and diabetes. Short period of follow up in most studies. Variable quality.

91	Whitt-Glover MC, Keith NR, Ceaser TG, Virgil K, Ledford L, Hasson RE. A systematic review of physical activity interventions among African American adults: evidence from 2009 to 2013. obesity reviews. 2014 Oct;15:125–45.	Systematic review (2009–2013)	IC	physical activity interventions among African American adults	African American adults aged 18 years and older. 3 interventions lasted <3 months ,2 3–<6 months 11 >6 months	Clinical and community	PA	US	16 studies (18 to 33 participants)	6 RCTs, 1 non-RCT, 5 quasi experimental, 4 pre-post	4 used pedometers, one accelerometer one heart rate monitor. 10 used self-report measures to assess PA	Most showed change in self report measures. Only 2 showed within group change in objective measures and only 1 showed between group change.	May not be relevant to other population groups.
92	Willems, M, Waninge, A, Hilgenkamp, TIM, et al. Effects of lifestyle change interventions for people with intellectual disabilities: Systematic review and meta-analysis of randomized controlled trials. J Appl Res Intellect Disabil. 2018; 31: 949–961. https://doi.org/10.1111/jar.12463	Systematic review and meta-analysis (2000 - 2016)	IB	Lifestyle change interventions delivered face to face individually or groups. Weekly for 3–4 months	People with intellectual disabilities	Clinical and community	Diet and PA		8 Studies	RCT	Diet, Physical activity, weight/BMI/waist 6-12 months	Borderline increase in physical activity. Significant decrease in waist circumference. No impact on BMI or weight.	

93	Williams G, Hamm MP, Shulhan J, Vandermeer B, Hartling L. Social media interventions for diet and exercise behaviours: a systematic review and meta-analysis of randomised controlled trials. BMJ open. 2014 Feb 1;4(2):e003926.	System atic review and meta-analysis (2000-2013)	IB	Social media to promote healthy diet and exercise behaviour s. Included online learning modules ad self report diaries of weight, physical activity or diet behaviour s along with social support. 19 studies used discussio n boards, one used Facebook and Twitter, and one use a social networkin g platform within the study website in	16 studies of adults. 6 studies in children	Community	Diet, PA	USA 15, Australia 4, other countries 3.	22 studies (16 of effective ness	All RCTs. 4 no-intervention comparison group, 12 had alternative intervention not using social media (eg information on a website).	Weight, BMI, physical activity levels, diet measures such total energy or dietary fat.	No significant difference in outcomes.	

				addition to discussion boards. Duration from 3 to 24 months.									
94	Wolfenden L, Goldman S, Stacey FG, Grady A, Kingsland M, Williams CM, Wiggers J, Milat A, Rissel C, Bauman A, Farrell MM. Strategies to improve the implementation of workplace-based policies or practices targeting tobacco, alcohol, diet, physical activity and obesity. Cochrane Database of Systematic Reviews. 2018(11).	Systematic review (2012 to 2017	IB	Workplace-based policies or practices targeting diet, PA, obesity, tobacco use and alcohol use. Workplace policies and practices targeted included: healthy catering policies; point-of-purchase nutrition labelling; environmental supports for healthy eating	Adults	Workplaces	Diet, PA, alcohol, weight.	USA 4, England 1, Brazil 1	6 studies	4 RCTs.	Three trials examined the impact of implementation strategies on employee health behaviours	Mixed effects for diet and weight status and no effect for physical activity or tobacco	Low evidence for the implementation of health-promoting policies and practices in the workplace setting

				and physical activity; tobacco control policies; weight management programmes; and adherence to guidelines for staff health promotion.									
95	Wright B, Bragge P. Interventions to promote healthy eating choices when dining out: A systematic review of reviews. British Journal of Health Psychology. 2018 May;23(2):278–95.	Systematic review of reviews (2010-2015)	N.A.	Interventions in dining-out settings to reduce food/calorie consumption: in 3 behavioural intervention areas: social models/norms, manipulation of size, and provision of health information	Adults and children	Community	Diet	Multi-country	10 included systematic reviews identified 183 primary studies		1.Social modelling was defined as the provision of information about eating norms (eg linking poor diet to particular social groups, or being led to believe that other participants ate healthy/unhealthy foods). 2. Portion, package, individual unit, or tableware size on consumption of food in both children and adults. 3. Provision of calorie information alone or combining this with contextual or	Three systematic reviews evaluating the use of social models/norms found this was an effective intervention for influencing food intake. Five systematic reviews that assessed manipulation of portion/dishware/cutlery size found a small-to-moderate effect on food consumption. Three systematic reviews looked at the provision of health information, which was not effective alone; however, in combination with contextual or interpretive material such as traffic lights or exercise equivalence, this was shown to reduce calorie consumption.	Previous review of systematic reviews with behavioural focus. Most studies were experimental rather than in restaurant settings.

											interpretive material such as traffic light or exercise equivalence statements		
96	Wu L, Sun S, He Y, Jiang B. The effect of interventions targeting screen time reduction: a systematic review and meta-analysis. Medicine. 2016 Jul;95(27).	Systematic review and meta-analysis (to 2015)	IC	Interventions targeting screen time reduction (3 weeks to 24 months duration)	Adults and children (3 to 54 years)	Community	Weight	US 10,	14 studies - all RCTs (2238 participants)	7 studies used monitoring devices to assist with allocating screen time or television viewing time. In 11 studies, the control group did not receive any intervention. In the other 3 trials received counseling or advice.	Measured BMI change or screen time	Mean BMI difference between the 2 groups was 0.15kg/m^2	Very small change.

97	Yun L, Ori EM, Lee Y, Sivak A, Berry TR. A systematic review of community-wide media physical activity campaigns: An update from 2010. Journal of physical activity and health. 2017 Jul;14(7):552–70.	Systematic review (2010–2016)	IVC	mass media campaigns promoting physical activity	Adults	National, provincial, regional, local	PA	US 6, Canada 3, England, Netherlands, Belgium, Australia 4, Japan 2 and Korea.	18 campaigns with 22 publications	3 studies compared with previous measures. Most had quasi-experimental designs.7 did not have experimental design.	21 self-report questionnaires to measure physical activity behavior. One used pedometers.	5/21 articles reported changes in behaviour. 4 reported no impact.	Poor quality studies.
98	Yuvaraj K, Eliyas SK, Gokul S, Manikandanesan S. Effectiveness of workplace intervention for reducing alcohol consumption: a systematic review and meta-analysis. J Alcohol alcoholism. 2019;54(3):264–71.	Systematic review (Inception to May 2018), Meta analysis	IID	Workplace Intervention (face-to-face counseling or web-based intervention); duration average <6 months; frequency: low (less than once or once a month), and high (twice or more a month).	Employees	_	Alcohol	Higher income countries like Australia, Japan, Norway and Germany.	7 (1291 participants)	RCTs, [workplace versus standard care or controls with other interventions not linked with workplace; individuals or groups of alcohol consumers]	Positive effect on reduction of weekly consumption of standard units of alcohol with pooled MD of −2.25 [95% CI: −4.20 to −0.30].	Positive effect was only seen where subjects had a baseline alcohol consumption of over 15 standard drinks per week. There was no heterogeneity across the trials (I2=0%). Funnel plot was symmetrical shaped and Egger's test confirmed that there was no publication bias. 2 studies found no advantages to intervention on differences on the AUDIT test	Weak evidence for workplace interventions (varying modes) as a way of facilitating reduction in the consumption of alcohol among employees but only among the heavier consumers.
99	Zubala A, MacGillivray S, Frost H, Kroll T, Skelton DA, Gavine A, Gray	Systematic review of reviews	IB	PA promotion interventions	40 to 91 years, with mean age ranging	Participants' homes, general practice and occupationa	PA	US, UK, Canada, Australia, Japan, China,	19 reviews (8 with meta-analyses)	All systematic reviews	Physical activity frequency and intensity	Multimodal and multicomponent interventions resulted in small to moderately increased physical activity	The evidence suggests that interventions to promote PA among older adults are

	NM, Toma M, Morris J. Promotion of physical activity interventions for community dwelling older adults: a systematic review of reviews. PloS one. 2017 Jul 10;12(7):e0180902.	(1990 to 2015)		aimed at community dwelling people typically incorporating behaviour change techniques (BCTs) and were delivered as face-to-face, remote, group, individual or as combined interventions. Durations of between three months and 12 months being most common	from 59.8 to 79 years	l therapy service		New Zealand, Taiwan, The Netherlands, Belgium, Italy and Finland				of older adults living in the community but it is unclear if this was sustained >12 months. However effectiveness does not appear to be influenced by mode of delivery, setting or type of health professional delivering it.	generally effective but there is uncertainty around the most beneficial intervention components.

Abbreviations: AOD – alcohol and other drug; ASBI – alcohol screening and brief intervention; BAC - blood alcohol content; BCT – behaviour change techniques; BMI – body mass index; CHW – community health worker; CVD – cardiovascular; EE – energy expenditure; e-SBI – electronic screening and brief intervention; EDT – endurance training with diet; ES – effect size; ET – endurance training; ITS – interrupted time series; LIPA – low-intensitvy physical activity; MET – metabolic equivalents; MHBC – mulpitle health behaviour change; MVPA – moderate to vigorous physical activity; MI – motivational interviewing; NCD – non-communicable disease; PA – physical activity; SNAPO – smoking, nrition, alcohol, physical activity and obesity; RAPI – Rutger's Alcohol Problem Index; RCT – randomised controlled trial.