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Targeted mass media interventions promoting healthy behaviours to reduce risk of non-communicable diseases in adult, ethnic minorities (Review)

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[Intervention Review]

Targeted mass media interventions promoting healthy behaviours to reduce risk of non-communicable diseases in adult, ethnic minorities

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ABSTRACT

Background

Physical activity, a balanced diet, avoidance of tobacco exposure, and limited alcohol consumption may reduce morbidity and mortality from non-communicable diseases (NCDs). Mass media interventions are commonly used to encourage healthier behaviours in population groups. It is unclear whether targeted mass media interventions for ethnic minority groups are more or less effective in changing behaviours than those developed for the general population.

Objectives

To determine the effects of mass media interventions targeting adult ethnic minorities with messages about physical activity, dietary patterns, tobacco use or alcohol consumption to reduce the risk of NCDs.

Search methods

We searched CENTRAL, MEDLINE, Embase, PsycINFO, CINAHL, ERIC, SweMed+, and ISI Web of Science until August 2016. We also searched for grey literature in OpenGrey, Grey Literature Report, Eldis, and two relevant websites until October 2016. The searches were not restricted by language.

Selection criteria

We searched for individual and cluster-randomised controlled trials, controlled before-and-after studies (CBA) and interrupted time series studies (ITS). Relevant interventions promoted healthier behaviours related to physical activity, dietary patterns, tobacco use or alcohol consumption; were disseminated via mass media channels; and targeted ethnic minority groups. The population of interest comprised adults (≥ 18 years) from ethnic minority groups in the focal countries. Primary outcomes included indicators of behavioural change, self-reported behavioural change and knowledge and attitudes towards change. Secondary outcomes were the use of health promotion services and costs related to the project.

Data collection and analysis

Two authors independently reviewed the references to identify studies for inclusion. We extracted data and assessed the risk of bias in all included studies. We did not pool the results due to heterogeneity in comparisons made, outcomes, and study designs. We describe the results narratively and present them in 'Summary of findings' tables. We judged the quality of the evidence using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) methodology.

Main results

Six studies met the inclusion criteria, including three RCTs, two cluster-RCTs and one ITS. All were conducted in the USA and comprised targeted mass media interventions for people of African descent (four studies), Spanish-language dominant Latino immigrants (one study), and Chinese immigrants (one study). The two latter studies offered the intervention in the participants' first language (Spanish, Cantonese, or Mandarin). Three interventions targeted towards women only, one pregnant women specifically. We judged all studies as being at unclear risk of bias in at least one domain and three studies as being at high risk of bias in at least one domain.

We categorised the findings into three comparisons. The first comparison examined mass media interventions targeted at ethnic minorities versus an equivalent mass media intervention intended for the general population. The one study in this category (255 participants of African decent) found little or no difference in effect on self-reported behavioural change for smoking and only small differences in attitudes to change between participants who were given a culturally specific smoking cessation booklet versus a booklet intended for the general population. We are uncertain about the effect estimates, as assessed by the GRADE methodology (very low quality evidence of effect). No study provided data for indicators of behavioural change or adverse effects.

The second comparison assessed targeted mass media interventions versus no intervention. One study (154 participants of African decent) reported effects for our primary outcomes. Participants in the intervention group had access to 12 one-hour live programmes on cable TV and received print material over three months regarding nutrition and physical activity to improve health and weight control. Change in body mass index (BMI) was comparable between groups 12 months after the baseline (low quality evidence). Scores on a food habits (fat behaviours) and total leisure activity scores changed favourably for the intervention group (very low quality evidence). Two other studies exposed entire populations in geographical areas to radio advertisements targeted towards African American communities. Authors presented effects on two of our secondary outcomes, use of health promotion services and project costs. The campaign message was to call smoking quit lines. The outcome was the number of calls received. After one year, one study reported 18 calls per estimated 10,000 targeted smokers from the intervention communities (estimated target population 310,500 persons), compared to 0.2 calls per estimated 10,000 targeted smokers from the control communities (estimated target population 331,400 persons) (moderate quality evidence). The ITS study also reported an increase in the number of calls from the target population during campaigns (low quality evidence). The proportion of African American callers increased in both studies (low to very low quality evidence). No study provided data on knowledge and attitudes for change and adverse effects. Information on costs were sparse.

The third comparison assessed targeted mass media interventions versus a mass media intervention plus personalised content. Findings are based on three studies (1361 participants). Participants in these comparison groups received personal feedback. Two of the studies recorded weight changes over time. Neither found significant differences between the groups (low quality evidence). Evidence on behavioural changes, and knowledge and attitudes typically found some effects in favour of receiving personalised content or no significant differences between groups (very low quality evidence). No study provided data on adverse effects. Information on costs were sparse.

Authors' conclusions

The available evidence is inadequate for understanding whether mass media interventions targeted toward ethnic minority populations are more effective in changing health behaviours than mass media interventions intended for the population at large. When compared to no intervention, a targeted mass media intervention may increase the number of calls to smoking quit line, but the effect on health behaviours is unclear. These studies could not distinguish the impact of different components, for instance the effect of hearing a message regarding behavioural change, the cultural adaptation to the ethnic minority group, or increase reach to the target group through more appropriate mass media channels. New studies should explore targeted interventions for ethnic minorities with a first language other than the dominant language in their resident country, as well as directly compare targeted versus general population mass media interventions.

PLAIN LANGUAGE SUMMARY

Targeted mass media interventions to encourage healthier behaviours in adult, ethnic minorities

Background and review question

Health authorities and non-governmental organisations often use mass media interventions (e.g. leaflets, radio and TV advertisements, posters and social media) to encourage healthier behaviours related to physical activity, dietary patterns, tobacco use or alcohol consumption, among others. In this review, we consider the effects of mass media interventions targeted towards ethnic minorities. A targeted intervention is designed for and considers the characteristics of a specific group, ideally providing ethnic minority groups equal opportunities and resources to access information, life skills, and opportunities to make healthier choices. However, we do not know whether targeted mass media strategies are more effective in reaching and influencing ethnic minorities than mass media strategies developed for the general population.

Study characteristics

We found six studies, all from the USA, four of which targeted African Americans and two which targeted Latino or Chinese immigrants. Of the studies, four were experimental (1693 volunteers) and two reported the results of large, targeted campaigns run in whole communities and cities. The evidence is current to August 2016.

Key results

The available evidence is insufficient to conclude whether targeted mass media interventions for ethnic minority groups are more, less or equally effective in changing health behaviours than general mass media interventions. Only one study compared participants' smoking habits and intentions to quit following the receipt of either a culturally adapted smoking advice booklet or a booklet developed for the general population. They found little or no differences in smoking behaviours between the groups.

When compared to no mass media intervention, a targeted mass media intervention may increase the number of calls to smoking quit lines, but the effect on health behaviours is unclear. This conclusion is based on findings from three studies. One study gave participants access to a series of 12 live shows on cable TV with information on how to maintain a healthy weight through diet and physical activity. Compared to women who did not watch the shows, participants reported slightly increased physical activity and some positive changes to their dietary patterns; however, their body weight was no different over time. Two other studies were large-scale targeted campaigns in which smokers were encouraged to call a quit line for smoking cessation advice. The number of telephone calls from the target population increased considerably during the campaign.

This review also compared targeted mass media interventions versus mass media interventions with added personal interactions. These findings, based on three studies, were inconclusive.

None of the studies reported whether the interventions could have had any adverse effects, such as possible stigmatisation or increased resistance to messages.

Further studies directly comparing targeted mass media interventions with general mass media interventions would be useful. Few studies have investigated the effects of targeted mass media interventions for ethnic minority groups who primarily speak a non-dominant language.

Quality of the evidence

Our confidence in the evidence of effect on all main outcomes is low to very low. This means that the true effect may be different or substantially different from the results presented in this review. We have moderate confidence in the estimated increase in the number of calls to smoking quit lines.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Comparison 1: targeted mass media intervention versus general population mass media intervention for promoting healthy behaviours

Patient or population: adult, ethnic minority: self-described Americans of African heritage
Setting: volunteers, smokers, USA
Intervention: targeted mass media intervention
Comparison: general population mass media intervention

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	N of participants (studies)	Quality of the evidence (GRADE)[a]	Comments
	Assumed risk	Corresponding risk				
	General population mass media intervention	Targeted mass media intervention				
Indicators of behavioural change						
Any outcome considered an indicator of change	No study provided data for this outcome.					
Self-reported behavioural change						
Proportion smoking reduction, 3 months follow-up	94%	95%	-	255 (1 RCT)	⊕◯◯◯ Very low[b,c]	No effect measures reported by authors. Not significantly different between groups
Quit-attempts, 3 months follow-up	-	-	Adjusted OR 1.97 (1.09 to 3.55) in favour of general population mass media intervention	255 (1 RCT)	⊕◯◯◯ Very low[b,c]	24-hour and 7-day point prevalence abstinence not significantly different between groups
Knowledge and attitudes to change						

Contemplation ladder to quit smoking (1-10), 3 months follow-up	Mean score: 8.2 (SD 2.4)	Mean score: 7.3 (SD 2.6)	-	255 (1 RCT)	⊕◯◯◯ Very low[b,c]	Difference between group reported at P = 0.01
Adverse effects						
Any outcome considered an adverse effect	No study provided data for this outcome.					

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI)
CI: confidence interval; **OR**: odds ratio; **SD**: standard deviation.

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate quality: we are moderately confident in the effect estimate. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low quality: our confidence in the effect estimate is limited. The true effect may be substantially different from the estimate of the effect.
Very low quality: we have very little confidence in the effect estimate. The true effect is likely to be substantially different from the estimate of effect

[a] In the GRADE assessments for the domain 'directness', we considered the studies directly relevant to the inclusion criteria. Thus, we have not downgraded on this domain. However, the population of interest will be dissimilar in different contexts, relating to characteristics of the ethnic minority group, the country and setting overall. The transferability of results must be considered for each context specifically.
[b] Downgraded one level for unclear risk of bias.
[c] Downgraded two levels for imprecision: Only one, relatively small study.

BACKGROUND

Description of the condition

This Cochrane Review explores the effectiveness of targeted mass media interventions in advising ethnic minority groups on preventing non-communicable diseases (NCDs) through healthier behaviours. Specifically, this review addresses the question of whether or not ethnic minorities will benefit from targeted approaches, which means that interventions are designed to consider characteristics of particular groups (Kreuter 2003).

The most prevalent NCDs (cardiovascular diseases, cancers, chronic respiratory disease, and diabetes) are also the world's leading causes of morbidity and mortality. According to the World Health Organization (WHO), NCDs cause 63% of global deaths, about 40% of which occur in people between 30 and 70 years of age (WHO 2010). The burden of NCDs is a growing public health crisis worldwide, and WHO has called for more actions to prevent disease. Many NCDs share four modifiable, behavioural risk factors: lack of physical activity, poor diet, tobacco use, and excessive consumption of alcohol. Improvements in these behaviours can prevent or delay the onset of disease (Lim 2012). One of the objectives in the WHO *Global Action Plan for the Prevention of Non-communicable Diseases* deals with the need to address these four risk factors throughout populations, and mass media campaigns and social marketing initiatives are among the proposed policy options (WHO 2013a).

The WHO Commission on Social Determinants of Health highlighted how "the conditions in which people are born, grow, live, work and age" strongly determine health status and disease patterns within and between populations (CSDH 2008). This picture includes inequities in the morbidity and mortality patterns of NCDs (WHO 2010). In most countries, life expectancy and health status are correlated with social status, as measured by education, occupation, income, or wealth. The underlying forces behind this link include a wide array of unevenly distributed environmental, structural, economic, social, and cultural factors (CSDH 2008). Health inequities are not simply differences between groups, but differences that are considered both avoidable and unjust (Whitehead 1992). The Rio Political Declaration on Social Determinants of Health reaffirmed a global political commitment to reducing health inequities (WHO 2011).

Inequities in health status and disease risk are also associated with ethnic minority status. In many countries, ethnic minority groups tend to have poorer health outcomes than the majority population (Alderete 1999; Nielsen 2010; AHRQ 2013). Genetic variations only partially contribute to differences between ethnic groups in terms of disease patterns (Bhopal 2007). Differences in cultural factors (e.g. beliefs and practices) may influence health status, but social, economic and structural determinants of health during people's lifespans appear to be associated with health inequities between ethnic groups as well (Nazroo 2003; Mulia 2008; Viruell-Fuentes 2012). Therefore, cultural influences should not be overemphasised as discrete explanatory factors for health inequities (Nazroo 2003; Acevedo-Garcia 2012). Ethnic minority groups are heterogeneous, having wide-ranging living conditions within and between countries, with consequently different health statuses and disease risks. The disease patterns of ethnic minorities may converge over time towards those of the majority population. However, health inequities between groups are sufficiently pronounced in many countries to warrant specific public health considerations.

Physical activity levels, dietary habits, tobacco use and alcohol consumption vary between population groups (WHO 2010). In many countries, unhealthy behaviours tend to be more prevalent in disadvantaged groups (Mackenbach 2008), and disparities in health behaviours have recently been shown to increase over time, as more privileged socioeconomic groups adopt healthier behaviours while disadvantaged groups lag behind (Buck 2012). Thus, although behaviours have an element of personal choice, behavioural patterns reveal the influence of the wider determinants of health.

Concern has been raised that public health interventions that have benefited the population overall might have increased inequities. This effect has been observed in public health interventions aimed at voluntary behavioural change in particular (Lorenc 2013). Public health campaigns delivered through mass media or by other means appear to be less effective in socioeconomically disadvantaged groups, whether for smoking cessation (Niederdeppe 2008a; Thomas 2008), physical activity (De Bourdeaudhuij 2011), or dietary factors (Oldroyd 2008; Stockley 2008). On the contrary, structural interventions, such as taxation of tobacco products and alcoholic beverages, appear more likely to reduce differences in health parameters (Lorenc 2013). It is therefore important to identify effective public health strategies that bridge the health gap rather than amplify it.

There are reasons to believe that mass media interventions can be less effective in reaching many ethnic minority groups as well, although few studies have systematically assessed the effects of these campaigns on ethnic minority groups (Niederdeppe 2008b; Durkin 2012; Bala 2013). The health behaviours of ethnic minority groups in different countries could be both more and less healthy than those of the majority population (e.g. the higher prevalence of smokers in some indigenous populations or lower alcohol consumption among Muslim immigrants). However, by describing ethnic minority health in relative terms only, we may fail to consider the absolute magnitude of a health problem or a health need that should guide public health priorities (Bhopal 2007). The Ottawa Charter for Health Promotion declares that equal opportunities and resources to secure "access to information, life skills and opportunities for making healthy choices" are some of the prerequisites for health improvements (WHO 1986). Targeted mass media interventions are possible strategies to better disseminate health promotion messages among ethnic minorities (Webb 2010b; Gould 2013; Nierkens 2013), but their effective-

ness has not been established.

There is no internationally agreed-upon definition of ethnicity, but Bhopal 2007 has summarised some key points: "The concept of ethnicity is complex and implies, according to most accounts, one or more of the following: shared origins or social background; shared culture and traditions which are distinctive, maintained between generations, and lead to a sense of identity and groupness; a common language or religious tradition" (Bhopal 2007). Oxford Dictionaries defines an ethnic minority as "a group within a community which has different national or cultural traditions from the main population". Ethnic minority groups are sometimes divided into indigenous populations (SPFII 2004), national ethnic minorities (long-time residents) (FCNM 2012), and immigrants. Through international migration, most countries gradually become more ethnically diverse. It is important to note that these definitions use social and cultural factors rather than biological ones (physical appearance or genetic differences) to define population groups (Bhopal 2007).

Ethnic minority status is associated with lower socioeconomic status in many countries, but ethnic identity and measures of socioeconomic status have different features. Programmes targeted to ethnic minorities should consider factors such as preferred language; food traditions; different norms, values and knowledge systems; patterns of media use; collective history; and position in the society. Arguably, then, it is appropriate to explore the effectiveness of mass media interventions targeted to ethnic minority groups as distinct from interventions directed at socioeconomically disadvantaged groups.

Description of the intervention

Targeted mass media interventions that promote healthier behaviours to reduce the risk of NCDs in adult ethnic minorities are the subject of this Cochrane Review. Public health authorities, health promotion agencies and non-governmental organisations (NGOs) are the main providers of health promotion interventions. According to Ferri 2013, most mass media campaigns can be characterised as either information campaigns with messages of warning, empowerment or support, or social marketing campaigns that attempt to correct erroneous normative beliefs, clarify social and legal norms, or set positive role models or social norms. Designers of mass media interventions draw on a wide range of commercial marketing tools and principles. Health promotion campaigns partly overlap with social marketing, using concepts and approaches from marketing to influence behaviours to benefit individuals and communities for the social good (French 2010).

Kreuter 2003 describes a targeted health communication strategy as communication "intended to reach some population subgroup based on characteristics presumed to be shared by the group's members". They distinguish targeted from tailored communication, which is communication adapted to the specific characteristics of an individual. A targeted approach coincides with the principle of audience segmentation in social marketing theory, that is, the identification of meaningful differences among population groups that affect their responses to the promoted action. Thorough knowledge of the target audience is important for developing good combinations of strategic elements and approaches to achieve an intervention's goals (French 2010; MvVey 2010). Targeted communication strategies are only meaningful if the population subgroup is sufficiently homogeneous (Kreuter 2003; Castro 2010). Thus, communication targeted to broadly defined population subgroups, for instance the Latino population in the USA, may fail to recognise subcultures with different history, collective experiences, living conditions and health needs.

Interventions targeting ethnic minority groups should include cultural adaptations that consider "language, culture, and context in such a way that is comparable with the client's cultural patterns, meanings, and values" (Bernal 2009). Common strategies for cultural adaptation of health interventions include gathering information, user input, and feedback from the target group (Netto 2010; Barrera 2013). A targeted approach should also carefully consider ethical aspects to avoid stereotyping and stigmatising. Cultural adaptation strategies have been categorised into surface adjustments and deep, structural-level adjustments. Surface-level adjustments involve changing factors such as language, graphics, food, and clothing to match the target audience. Deep, structural-level adjustments are changes that reflect the cultural, social, historical, environmental, and psychological forces behind behaviours in the target population (Resnicow 1999).

This review includes only health promotion interventions delivered via mass media. Brinn 2010 and Bala 2013 describe mass media as "channels of communication that intend to reach a large number of people without direct person-to-person contact". Mass media reach audiences through print material, recordings, broadcast, the Internet, and digital technology. Mass media interventions have the potential to cost effectively reach many people and can spread a message to remote geographical areas or groups that otherwise are difficult to access, or to target certain groups through selected media channels. Mass media channels have diversified quickly in the last couple of decades, including the development of digital communication technology, and national borders now pose fewer constraints on the reach of media channels.

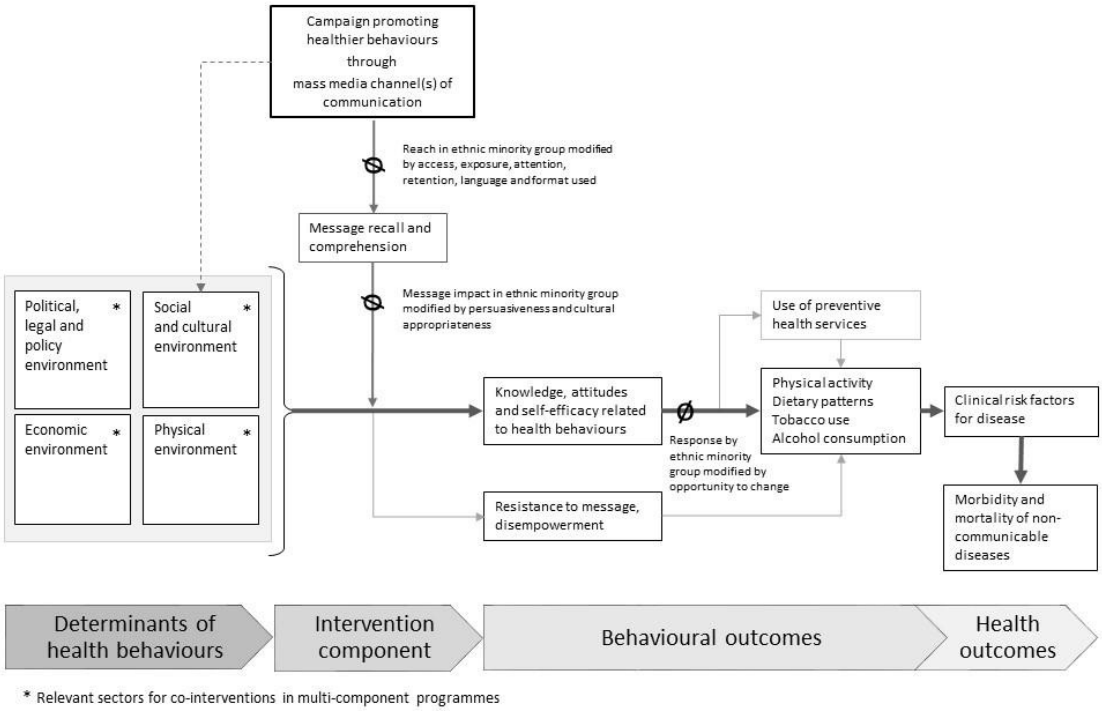
Previous systematic reviews on mass media interventions or campaigns concerning public health issues (smoking cessation, HIV testing, health services utilisation, illicit drug use, mental health-related stigma) have found that their effects on behavioural outcomes are either inconclusive or exhibit only modest short-term effects (Grilli 2002; Vidanapathirana 2006; Brinn 2010; Bala 2013; Clement 2013; Ferri 2013). Long-term effects are generally unclear. Modest effects of mass media interventions on an individual level can still have an important public health impact overall. The population strategy approach to disease prevention, as suggested by Rose 1985, aims to shift the distribution of a risk factor across entire populations. This shift includes the large proportion of the

population with only a moderate risk of disease but a significant portion of the total disease burden.

How the intervention might work

The evidence linking increased physical activity, balanced diets, avoidance of tobacco, and limited alcohol consumption to reduced morbidity and mortality from NCDs is well established (WHO 2009; WHO 2010; WHO 2013a; WHO 2013b; WHO 2014). The logic model in Figure 1 (adapted based on Bertrand 2006 and Niederdeppe 2008b) illustrates the possible elements and the relationships by which a targeted mass media intervention can influence these four health-related behaviours. An additional desired outcome could be that individuals will consult health promotion services, such as smoking cessation assistance or health counselling.

Figure 1. Logic model. Adapted based on Bertrand 2006 and Niederdeppe 2008b



Several theories and models seek to explain health behaviours on the individual level and to determine the most efficient way to influence these behaviours. These theories emphasise that increased knowledge is not sufficient to influence behaviour. Perceived barriers and risks are important moderators of behaviour, while attitudes and self-efficacy contribute to a person's motivation and competence to act (Brewer 2008). In the logic model, changes in people's knowledge of and attitudes about health behaviours, in addition to self-efficacy, are the measurable intermediate outcomes of mass media interventions. Contemporary thinking in public health and health promotion acknowledges that social norms, interpersonal interaction and the social and cultural environment influence individual behaviour strongly (Viswanath 2008). People's wider environment - physical, economic, political, legal and policy - may either enable or counteract a certain behaviour (McLeroy 1988; Davis 2014). A basic assumption in this Cochrane Review is that these theories and models are relevant to all population groups.

A mass media intervention can only influence health behaviours if the target audience receives, understands and can recall the message. Based on data and conceptual input (Sorensen 2004; Viswanath 2006; Niederdeppe 2008a), Niederdeppe 2008b has hypothesised that there are three possible sources of differences in response to smoking cessation campaigns that can be traced to socioeconomic status. These three domains probably apply to ethnic minorities as well and may be relevant to consider for targeted mass media interventions, as indicated in the logic model: differences in access, exposure, attention to and retention of the media message; differences in the message's persuasiveness and its motivational response; and differences in opportunities to change in response to the message (Niederdeppe 2008b).

Different media channels might be necessary to reach ethnic minorities, either because conventional media channels are less accessible or not preferred. The language and format of the content (language complexity, illustrations used, skills demonstration) can influence message recall and comprehension. Low health literacy levels, understood as low ability to obtain, process, and understand basic health information, have been identified in many ethnic minority groups and can influence response and compliance with health messages (Berkman 2011). Thus, planners must carefully consider media access, exposure, language and format, attention to and retention of the media message, making these relevant to the targeted ethnic minority group in order to extend the intervention reach.

The second domain relates to the persuasiveness of and motivational response to a message, which could strongly depend on its cultural appropriateness for ethnic minorities. Evidence from health promotion interventions via channels other than mass media have indicated better adherence to a promoted behavioural change when ethnic minorities receive culturally adapted health messages or counselling instead of a standard treatment (Nierkens 2013; Attridge 2014). The four health behaviours in this review relate closely to many markers of ethnic identity. The most obvious ones are dietary patterns and alcohol consumption, but physical activity and smoking patterns may also be closely related to cultural context.

Ethnic minorities might have limited opportunities to change health behaviours, either from a cultural, financial, or structural perspective. Previous reviews on the effect of mass media interventions for smoking cessation indicate that these are more likely to be successful as part of multicomponent programmes with upstream policy support and downstream community-based activities (Brinn 2010; Bala 2013). Examples of relevant co-interventions for this Cochrane Review include changes in legislation regarding advertising and taxation of food items, tobacco products, and alcoholic beverages, or changes in available spaces and social arenas for physical activity. Mass media interventions could have an indirect, amplifying effect if family, friends and the wider community adjust their attitudes, norms and behaviours according to the health message. Thus, multicomponent interventions can add benefits to efforts directed at individual change by modifying opportunities to change. Figure 1 indicates relevant sectors for co-interventions in multicomponent programmes. The logic model also indicates possible unwanted effects of an intervention. Examples of adverse effects are increased resistance to the health promotion message or that the target population will experience more feelings of disempowerment when exposed to a goal they find difficult to achieve.

Why it is important to do this review

Mass media campaigns promoting healthy behaviours are one of several recommended policy options to prevent NCDs (WHO 2009; WHO 2013a), and most countries commonly use them to encourage healthier behaviours (WHO 2009; WHO 2013b; WHO 2014), despite the potentially limited effectiveness. The concern that mass media interventions could widen health inequities warrants more focus on the effect of targeted strategies in population subgroups. It is unclear whether targeted mass media interventions are more effective in changing health behaviours in ethnic minorities than a universal population strategy. This is important to explore, as segmentation of interventions to reach different subgroups may increase programme costs.

The Norwegian Directorate of Health and the Norwegian Cancer Society commissioned a systematic review on this issue to inform public health policy on how to deliver health promotion messages to the growing and increasingly diverse immigrant population. This systematic review has been widened to encompass an international perspective, including a wide focus on ethnic minority groups, as the question may be useful for other national authorities and NGOs as well.

The primary focus of this Cochrane Review is the mode of delivery (mass media intervention) and the strategies used to target such interventions to ethnic minority groups and prevention of NCDs, rather than any of the four specific health behaviours separately. The four behaviours have distinct features and require different

messages regarding the suggested action (i.e. to increase physical activity, modify diets, decrease alcohol consumption, or refrain from smoking). At the same time, the behaviours are similar in their focus on preventing negative health outcomes in the future. Thus, the target audience may be less motivated to change ingrained habits in favour of longer-term - and hence more uncertain - benefits. Our objectives intersect with two Cochrane Reviews on mass media interventions for smoking cessation (Brinn 2010; Bala 2013). Two other systematic reviews have examined the effects of smoking cessation interventions in indigenous populations but are not limited to mass media interventions (Carson 2012a; Carson 2012b). Our objectives include interventions focusing on tobacco use to obtain a full picture of mass media strategies as a means of disseminating health-promoting messages among ethnic minorities. We gathered additional information on features of these interventions, theoretical frameworks and co-interventions.

OBJECTIVES

Primary

• To determine the effect of mass media interventions targeting adult, ethnic minorities with messages about physical activity, dietary patterns, tobacco use or alcohol consumption to reduce risk of NCDs.

Secondary

• To examine the effect of targeted mass media interventions alone compared to targeted mass media interventions given as part of multi-component interventions.

METHODS

Criteria for considering studies for this review

Types of studies

By definition, mass media communication strategies target large groups of people. Individually randomised controlled trials (RCTs) may be neither the most appropriate nor most feasible study design. Therefore, we included the following study designs and specified features, guided by recommendations from the Effective Practice and Organisation of Care Group (EPOC) review group (EPOC 2016).

- RCTs.
- Cluster-RCTs with at least two intervention groups and two control groups.
- Non-RCTs (NRCTs) with at least two intervention sites and two control sites.
- Controlled before-and-after (CBA) studies with at least two intervention sites and two control sites.
- Interrupted-time-series (ITS) or repeated measures studies (RMSs) with a clearly defined point in time when the intervention occurred and at least three data points before and three after the intervention.

Types of participants

The population of interest was adults (≥ 18 years) described as being from an ethnic minority group in their country of residence. We use the terms ethnicity and ethnic minorities as described in the Background but did not limit the eligibility of participants to studies using these terms. Different countries and research traditions have dissimilar terminology relating to aspects of ethnicity (Bhopal 2007). Not all use the terms ethnicity and ethnic minorities. We based inclusion on any direct or implicit description by the study authors that the study participants were selected based on ethnic minority characteristics and that the intervention was targeted to such a population group. Examples of applicable terms are indigenous populations, native, aboriginal, racial groups, immigrants, ancestral origin (countries or continents), countries of birth, or specified first language/mother tongue/language preference.

Types of interventions

To be eligible for inclusion, the intervention had to meet all of the following three criteria.

1. The purpose of the intervention was to promote healthier behaviours related to physical activity, dietary patterns, tobacco use, or alcohol consumption.
2. The intervention was disseminated via a mass media channel.
3. The intervention was targeted to an ethnic minority group.

We used the same definition of mass media as in two related Cochrane Reviews (Brinn 2010; Bala 2013): "Mass media is defined here as channels of communication such as television, radio, newspapers, billboards, posters, leaflets or booklets intended to reach large numbers of people and which are not dependent on person-to-person contact". In addition, we aimed to include other contemporary mass media channels, such as campaigns delivered through the Internet, social media, and mass distribution through mobile phones. We used the definition by Kreuter 2003 for targeted interventions but did not limit the inclusion to studies using the same terminology.

We included studies that compared the intervention with a general population mass media intervention, no intervention or any other intervention. We included studies that compared targeted mass media interventions alone with targeted mass media interventions

delivered as part of multicomponent interventions to explore the secondary research objective.
There were no set requirements on minimum length of intervention.
We excluded the following interventions.

- Courses, teaching activities and programmes, interactive self-help programmes or self-monitoring services, as these are not considered mass media interventions even though they can be delivered through the Internet, digital applications, or similar media.
- Interventions with mass distributed print, audio, or visual material where the content has been tailored/personalised to each individual (i.e. based on answers from questionnaires or similar information sources).
- Interventions for patient groups/patient education (including treatment of alcohol dependency and eating disorders), or interventions aimed specifically at relatives of patients.

Types of outcome measures

We did not expect to find any studies of targeted mass media interventions using morbidity or mortality of NCDs as outcome measures, nor clinical risk factors of disease. We intended to examine a number of surrogate endpoints relating to the four specified health behaviours as primary outcomes as relevant, including both objectively measured and self-reported outcomes.
There was no requirement for a minimum duration of follow-up for the outcome measures. We intended to present outcomes separately for short-term (< six months) and long-term (≥ six months) follow-up.

Primary outcomes

- Physiological or clinical parameters that indicate changes in physical activity, dietary intake, use of tobacco, or alcohol consumption
- Objective or self-reported measurements of physical activity, dietary intake, use of tobacco, or alcohol consumption
- Measures of knowledge and attitudes concerning physical activity, dietary intake, use of tobacco, or alcohol consumption

Secondary outcomes

- Use of health promotion services (for instance smoking quit lines and counselling) or other relevant services
- Costs related to the project

Adverse outcomes

- Any reported outcome considered an adverse effect, such as measures of participants' resistance to the health promotion message or measures of perceived disempowerment in participants.

Search methods for identification of studies

A research librarian conducted the electronic literature searches.

Electronic searches

We performed a scoping search to identify any systematic reviews in the last five years with a similar primary research objective. We based the search terms on the strategy described in Appendix 1 but with a filter for systematic reviews. We searched the following electronic databases from the beginning of 2009 until September 2014.

- Cochrane Database of Systematic Reviews, part of the Cochrane Library (www.thecochranelibrary.com).
- Database of Abstracts of Reviews of Effects (DARE), part of the Cochrane Library (www.thecochranelibrary.com).
- Health Technology Assessment Database (HTA), part of the Cochrane Library (www.thecochranelibrary.com).
- Centre for Reviews and Dissemination (DARE, HTA).

We did not identify any systematic reviews with a similar research objective. As previously described, we are aware of that four Cochrane systematic reviews intersect with the objectives of this Cochrane Review (Brinn 2010; Carson 2012a; Carson 2012b; Bala 2013).
We searched for primary studies without any time limitations or language restrictions on 22 May 2015 and later updated the search to 23 August 2016. We present the search strategies in Appendix 1. We modified the search strategy, subject headings, and syntax to each database and searched the following databases.

- Cochrane Central Register of Controlled Trials (CENTRAL; 2016; Issue 7), part of the Cochrane Library.
- MEDLINE Ovid (from 1946).
- PubMed (from 1946).
- Embase Ovid (from 1974).
- PsycINFO Ovid (from 1806).
- CINAHL EBSCO (Cumulative Index to Nursing and Allied Health Literature; from 1981).
- ERIC EBSCO (from 1966).
- SweMed+ (from 1977).
- ISI Web of Science (from 1987).

After merging the databases from each search into the reference management software Endnote 2015, the librarian removed studies retrieved in duplicate.

Searching other resources

We screened related systematic reviews, as found in the scoping search, for relevant primary studies. We also conducted cited reference searches for all included studies using ISI Web of Knowledge and screened their reference lists.

Trial registries

We searched the following websites to 19 October 2016.

- WHO International Clinical Trials Search Portal (http://apps.who.int/trialsearch).
- ClinicalTrials.gov (http://clinicaltrials.gov).

Grey literature

We searched the following websites to 19 October 2016.

- OpenGrey (www.opengrey.eu).
- Grey Literature Report (www.greylit.org).
- Eldis (www.eldis.org).

Data collection and analysis

Selection of studies

Two review authors screened titles and abstracts independently (AM with either IBL or GEV). We retrieved the full text of all potentially relevant studies. Two review authors (AM with either IBL or GEV) independently assessed these for eligibility using a checklist. At each stage, we resolved any disagreement by discussion or consensus with a third review author. The project group read articles in English, Scandinavian languages and German. Staff members at the Norwegian Institute of Public Health read other languages or considered them for translation. We list the studies excluded based on full-text assessment in the Characteristics of excluded studies table.

Data extraction and management

We extracted data using a form based on the Data Extraction and Assessment Template from the Cochrane Public Health Group (CPHG). This data extraction form embeds items relating to the PROGRESS-Plus criteria and the PRISMA-Equity 2012 Extension (Tugwell 2010; Welch 2012). We revised the form before data extraction. One review author retrieved the specified information and data from the included studies, and another review author checked data extraction. We resolved any disagreements by discussion or consensus with a third review author. We contacted the study authors if key information was missing. We entered the extracted data into RevMan 2014 as appropriate.

When more than one publication referred to the same study, we used the relevant paper with the most comprehensive and clear description of methods and outcome reports from a peer-reviewed journal as the primary reference. If necessary, we used all papers from one study to extract the relevant information. We contacted investigators in cases of contradiction or incomplete reporting.

In addition to the items from the Data Extraction and Assessment Template, which included descriptions of study details (reference, design), participants, setting, intervention, outcomes, and adverse outcomes, we also extracted the following information when available.

- Context of the intervention (sociodemographic, organisational, political, media structure).
- Content of the message (health behaviour targeted).
- Theoretical basis of the intervention, including message development and framing.
- Theoretical basis for how the intervention and message were adapted to the target population.
- Media channel(s) used for delivery and frequency of exposure.
- Intervention fidelity (whether the intervention was delivered as planned).
- Information on the nature and extent of any additional actions given as part of the intervention (co-interventions).
- Intervention costs.
- Source of funding.

We present these data in the Characteristics of included studies section.

Assessment of risk of bias in included studies

Two review authors independently assessed the included studies with respect to risk of bias (AM, GEV). We assessed all study designs using the suggested 'Risk of bias' criteria for EPOC reviews (EPOC 2015). There are nine standard criteria for RCTs, cluster-RCTs, NRCTs, and CBAs: adequate generation of allocation sequence; adequate allocation concealment; similar baseline outcome measurements; similar baseline characteristics; adequate handling of incomplete outcome data; adequate prevention of knowledge of the allocated interventions during the study; adequate protection against contamination; freedom from selective outcome reporting; and other risks of bias. For ITS studies we considered the following criteria: intervention independent of other changes, shape of the intervention effect pre-specified, intervention unlikely to affect data collection, knowledge of the allocated intervention adequately prevented during the study, incomplete outcome data adequately addressed, study free from selective outcome reporting, and any other risks of bias. We resolved any disagreement in the assessment between the two review authors by discussion. We assessed the likely magnitude and direction of the bias on the findings.

Measures of treatment effect

If possible, we presented continuous outcomes with mean difference and standard deviations. When studies had measured the same outcome using different instruments or scales, we considered combining the outcomes using the standardised mean difference. We did not consider any of the outcomes to be appropriate for such a combination. For dichotomous outcomes, where available from RCTs, cluster-RCTs, NRCTs, and CBA studies, we intended

to present the number of events and number of people in groups as proportions and if appropriate, express effect as relative risk ratio (RR) or odds ratio (OR) with 95% confidence intervals (CIs).

For ITS studies, we present the effect as the difference between the expected value at a given point in time based on the pre-intervention trend and the expected value at the same point in time based on the postintervention trend. We contacted authors of Kennedy 2013, who provided the original data set for re-analysis as an ITS for this review as described in EPOC 2013.

We present results from randomised studies, non-randomised studies and ITS separately, as recommended (Higgins 2011). We present the follow-up according to our predefined categories: short-term (< six months) and long-term (≥ six months) follow-up. Where study authors report several follow-up times from the same study, we present the longest follow-up.

Unit of analysis issues

Unit of analysis error can occur if trials based on group allocation to treatment condition (cluster-RCTs, NRCTs, and CBA studies) have not accounted for the effect of clustering in the statistical analyses. The included cluster-RCT by Boyd 1998 did not adjust the results for the effect of clustering, while Jih 2016 did. We did not have sufficient information to re-analyse the data by Boyd 1998. See Appendix 2 for the methods we intended to use.

Dealing with missing data

We consider that incomplete or missing data was not a problem in any of the included studies and thus did not contact any of the authors for such information. See Appendix 2 for the methods we intended to use.

Assessment of heterogeneity

We did not combine data in meta-analysis and hence did not assess heterogeneity in the results. See Appendix 2 for the methods we intended to use.

Assessment of reporting biases

We planned to generate funnel plots if 10 or more studies reported the same outcome. See Appendix 2 for the methods we intended to use.

Data synthesis

We categorised the included studies according to the intervention, measures and comparisons made. We assessed results for each comparison and collated them separately. If population, study design, intervention, and outcome measures had been similar enough across studies, we could have conducted meta-analyses using Review Manager 5 (RevMan) software (RevMan 2014). One comparison had only one included study. Otherwise, the interventions, outcome measurements, or study designs differed in ways that did not support meta-analyses. We based our judgements on the recommendations in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We considered that one outcome had sufficiently homogeneous populations, interventions, and comparisons to consider a pooled risk ratio, but only one of these two studies reported a measurement of dispersion in the published paper. See Appendix 2 for the methods we intended to use for meta-analyses. Since meta-analysis was not appropriate, we present descriptive data in text and tables. Authors of Kennedy 2013 provided data so we could re-analyse these results as an ITS through segmented time series regression (Ramsay 2003).

Subgroup analysis and investigation of heterogeneity

The included studies did not provide sufficient data for subgroup analyses or investigation of heterogeneity. See Appendix 2 for the methods we intended to use and planned subgroups.

Sensitivity analysis

We intended to perform a sensitivity analysis excluding studies at high risk of bias if there had been a sufficient number of included studies; see Appendix 2.

Summary of findings table

We present the main outcome measures in a 'Summary of findings' table, along with our assessment of the certainty of effect for each outcome using the GRADE methodology (Guyatt 2011). Using GRADE, we reflect on the extent to which we have confidence that the estimates of effect are correct. Our confidence is presented as either high, moderate, low or very low quality evidence. We assess the results for each outcome measure against eight criteria. We consider the first five criteria for possible downgrading of the quality of documentation: study quality (risk of bias), consistency (consistency between studies), directness (the same study participants, intervention, comparator and outcome measures in included studies for the population, measures and outcomes we wanted to study), precision of results, and reporting biases. Results can be upgraded by three criteria: strong or very strong associations between intervention and outcome; large or very large dose-response effect; and situations where all plausible confounders would have reduced the effect.

RESULTS

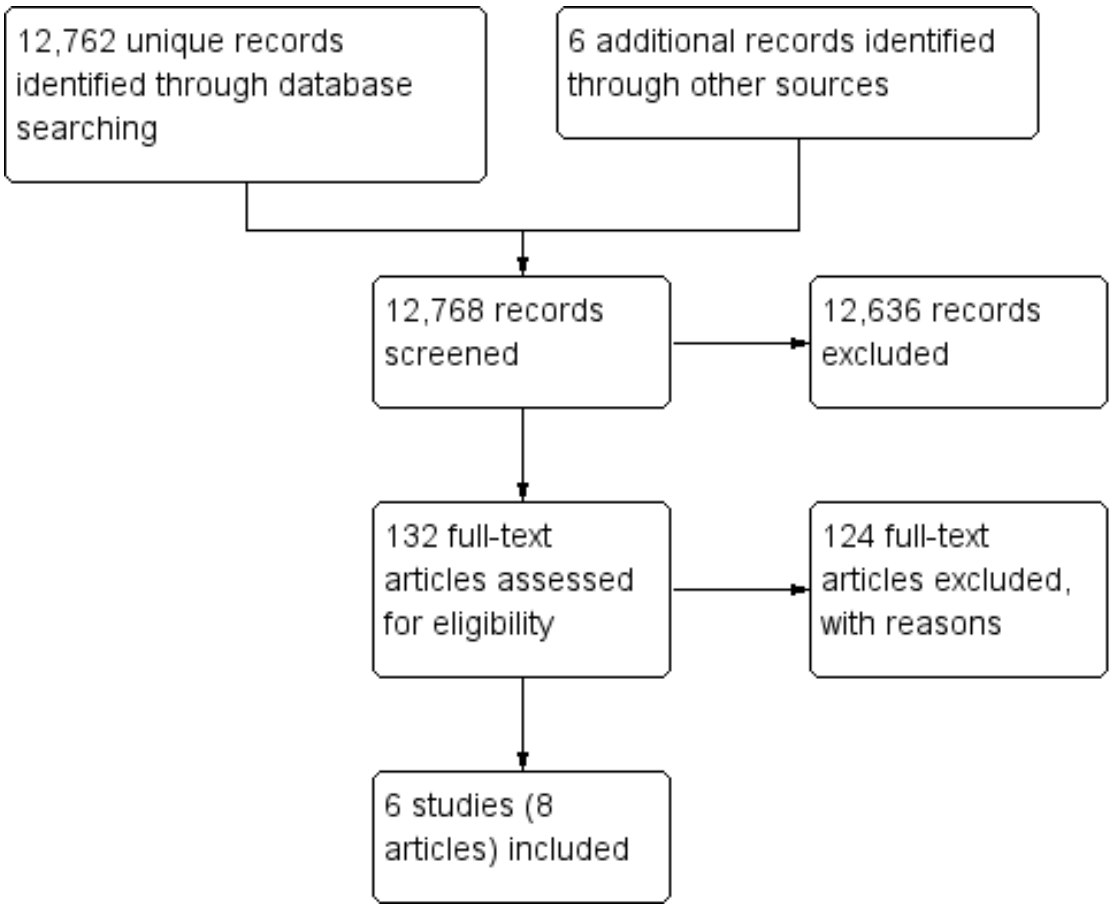
Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

Searches in the electronic databases identified 12,762 unique records (see Figure 2: Study flow diagram). We discovered six additional records through other sources. Based on screening of titles and abstracts, we excluded 12,636 records and retrieved the full text of 132 articles, excluding 124. Six studies (8 articles) were eligible for this review. We did not identify any ongoing studies.

Figure 2. Study flow diagram.



Included studies

Of the included studies, three were individual RCTs (Elder 2005; Webb 2009; Risica 2013), and two were cluster-RCTs (Boyd 1998; Jih 2016). We obtained the original data from the authors of Kennedy 2013 and were able to re-analyse this study as an ITS. All of the studies took place in the USA and were published between 1998 and 2016. In four studies, the interventions targeted groups self-described as Americans of African heritage (Boyd 1998; Webb 2009; Kennedy 2013; Risica 2013), while Elder 2005 targeted Spanish-language-dominant Latino immigrants (95% born in Mexico), and Jih 2016, elderly people of Chinese ethnicity (predominantly foreign-born). Three studies targeted women only (Elder 2005; Kennedy 2013; Risica 2013). In Boyd 1998 and

Kennedy 2013, the entire populations of geographically defined areas were potentially exposed to the targeted mass media intervention. The objectives of the interventions were to promote smoking cessation (Boyd 1998; Webb 2009; Kennedy 2013); to encourage dietary changes (particularly regarding fibre and fat intake) (Elder 2005); to promote weight management through modifications to diet and physical activity (Risica 2013); or to increase vegetable intake, fruit intake, and physical activity levels to meet guidelines (Jih 2016). None of the studies examined alcohol intake.

Webb 2009 recruited 261 African American adults who were randomised to receive either a culturally specific smoking cessation booklet or a booklet intended for the general population. The booklet in the intervention arm was culturally adapted using values, communication patterns, statistics, pictures, and other elements considered relevant for the targeted population, and it contained information about smoking and quitting strategies. The booklet used for the control group was identical in format and content and was developed by removing any references to a specific population group and using more general information and graphics.

In Boyd 1998 and Kennedy 2013, the intervention consisted of paid radio advisements, and in Boyd 1998, also some television advertisements, aired repeatedly in two waves that varied from three to six weeks in length. Both studies also included substantial distributions of posters, flyers, and other types of small media. The investigators targeted African American communities by adapting their message, language, and format to the assumed preferences of the group and by user-testing the intervention with the target population. Advertisements were aired through media channels popular with the target audience or placed in relevant residential areas. The comparator in both studies was no intervention. The main message was to quit smoking and to make use of free telephone smoking cessation information or counselling (quit lines). Calls to this service were also the studies' outcome measurement. Since these studies exposed whole populations to the intervention, the study populations were not fixed. Boyd 1998's targeted mass media intervention was run in seven communities (estimated 310,471 African American smokers), compared to no intervention in seven communities (estimated 331,360 African American smokers). The size of Kennedy 2013's target population was indicated by the 400 births per month among African American women in the catchment area and survey results showing that approximately 40% of pregnant women in this population group were recent smokers.

The study by Risica 2013 gave study participants access to 12, one-hour live programmes on cable TV over three months, bi-weekly mailings with printed material corresponding to the shows and, afterwards, four monthly mailings with written material and booster videotapes. The material was culturally adapted based on formative research on the target population. The TV shows had African American female casts, including all experts used. The shows and material contained educational content regarding nutrition and physical activity to improve health and control weight. In total, 71 women received this targeted intervention compared to 82 women on a wait-list control until the study ended. Another 214 women received both this targeted intervention and the opportunity to engage in personal contact with study staff, either access to a toll-free number they could use to ask questions during the live-sharing segments of the shows, and/or weekly telephone support calls with outreach educators. Thus, this study compared the targeted mass media intervention with both a no-intervention control group and a group receiving the mass media intervention with additional personalised content.

The target mass media intervention in Elder 2005 comprised newsletters in Spanish, mailed to the participants' home (119 women). The targeted newsletters and activity inserts were based on off-the-shelf information material developed for the Latino population and contained suggested strategies to change food purchasing, food preparation, and food consumption to reduce the risk of NCDs. This targeted intervention was compared to personalised newsletters and activity inserts in Spanish that were based on baseline questionnaires and specified personal goals. The personalised newsletters (118 women) otherwise focused on the same dietary messages as the targeted materials. A third intervention group (120 women) received both the personalised newsletters and 12 weekly visits by a Spanish-speeking lay health worker (LHW, called *promotora*) who reinforced the dietary messages. Similarly, Jih 2016 compared targeted lecture handouts and brochures in 357 participants to the same material delivered through two small-group, LHW-facilitated lectures in 361 participants. The main aim was to increase fruit and vegetable intake and physical activity levels to meet guidelines. The researchers developed the lectures and materials using culturally appropriate examples of common foods, relevant physical activities and familiar portion size models for the target group. The lectures were presented in the participants' preferred language (Cantonese, Mandarin, or English).

Figure 3 presents an overview of the strategies that the included studies used to adapt their interventions to the target populations. The strategies are categorised according to the logic model (Figure 1). All of the studies made adaptations to modify message appropriateness, including adapting the message to be culturally appropriate, using selected images or cultural expressions, user-testing the intervention in the target group, or attempting to address unique barriers and facilitating factors for group change. Two campaigns were implemented in a real context and made adaptations to modify reach by using selected media channels, placing small media in residential areas, distributing outreach packets through community networks, and using people from the target group to convey the media content (Boyd 1998; Kennedy 2013). Two studies presented the mass media interventions in languages that differed from the dominant language of the country (Elder 2005, Jih 2016).

Figure 3. Approaches used in the included studies to target the intervention to the study population, by categories according to logic model.

	Boyd 1998	Elder 2005	Jih 2026	Kennedy 2013	Risica 2013	Webb 2009
Adaptations to modify reach						
- Different language used		✓	✓			
- Selected media channels used	✓			✓		
- Small media in residential areas	✓			✓		
- Outreach packets distributed through community networks	✓		✓	✓		
- Media content conveyed by people from target group	✓			✓	✓	
Adaptations to modify message appropriateness						
- Context of message culturally adapted		✓	✓		✓	✓
- Selected images and cultural expressions	✓	✓	✓	✓	✓	✓
- User testing in target group	✓		✓	✓	✓	
- Addressed unique barriers and facilitating factors for change in target group	✓			✓		✓
Adaptations to modify the opportunity to change						
- Services free of charge/more available	*			*		

* Services (use of smoking quit lines) free of charge to all citizens, including target group

Three of the included studies received support from the National Cancer Institute (USA) (Boyd 1998; Elder 2005; Risica 2013), and one received funding from both the National Institutes of Health and the National Cancer Institute (Jih 2016). The National Center on Minority Health Disparities, part of the National Institutes of Health (USA), supported Kennedy 2013, and Syracuse University (USA) funded Webb 2009.

Excluded studies

After screening the full texts, we excluded 124 articles (see Characteristics of excluded studies). The main reasons for exclusion were: no mass media intervention or combining the media various forms of personal interaction with the participants; not targeting the intervention to ethnic minorities; or not meeting the inclusion criteria with respect to study design.

Risk of bias in included studies

The Characteristics of included studies table assesses the risk of bias and provides comments for each of the included studies. We used the study-appropriate risk of bias domains as developed by EPOC 2015, which proposes different domains for assessing ITS studies and the other study designs included in this review. The risk of bias assessment for the ITS study is discussed under the section Other potential sources of bias. Figure 4 and Figure 5 summarise the 'Risk of bias' assessments. These figures present all domains used for both the ITS study and the other study designs but are only filled in for the appropriate categories for each study.

Figure 4. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

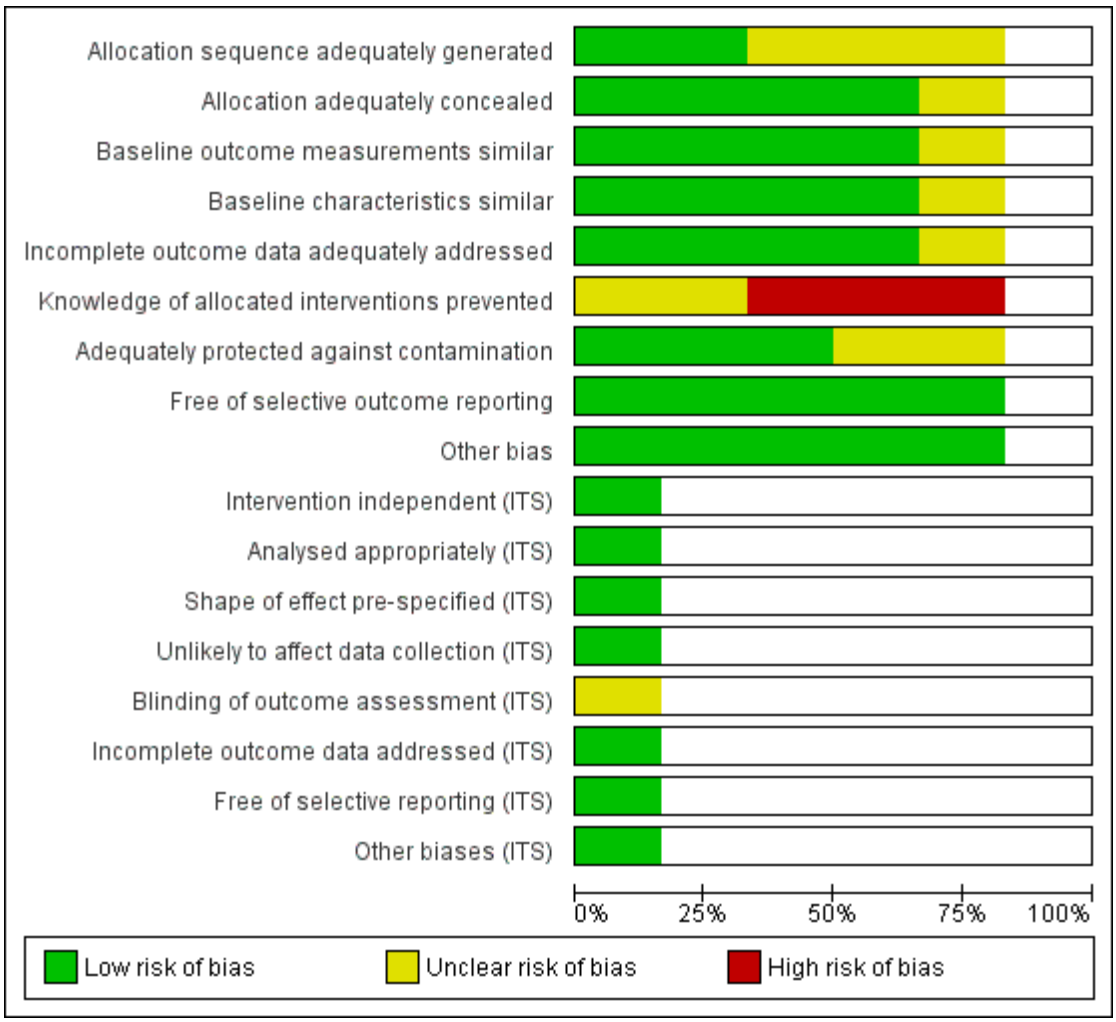
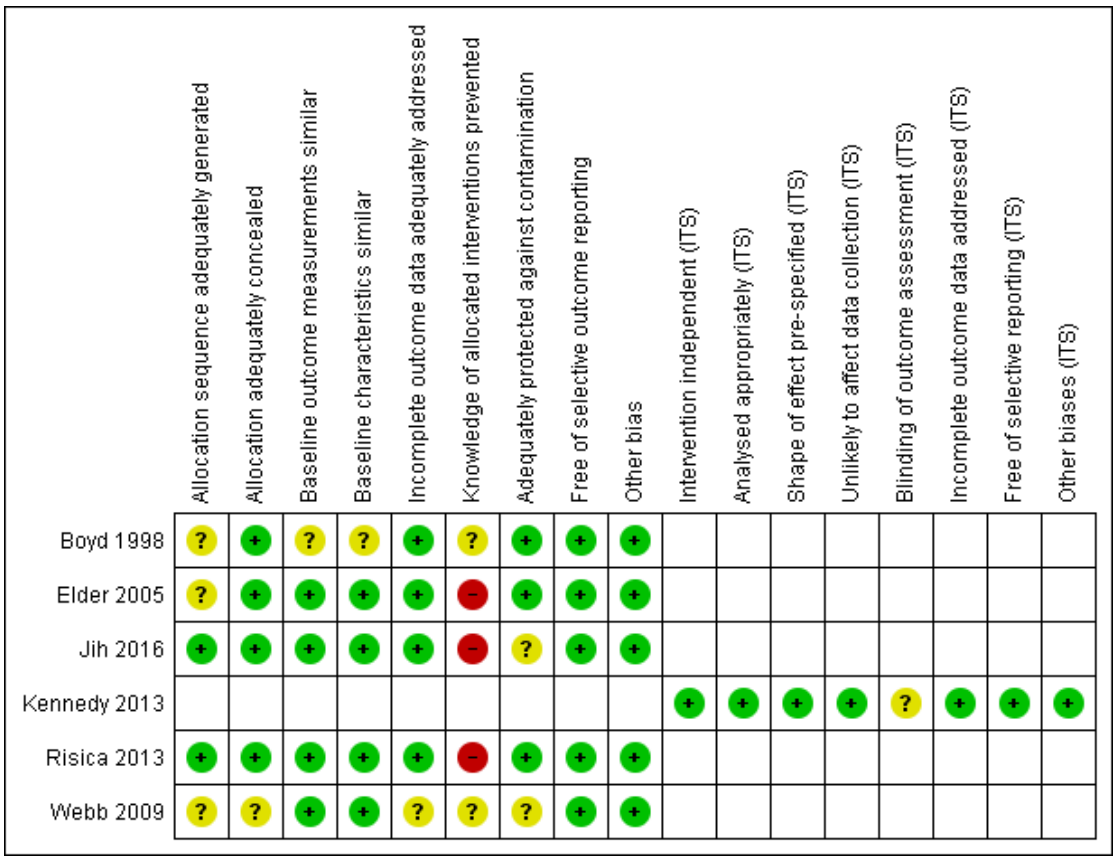


Figure 5. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

Two studies reported adequate methods for random sequence allocation (Risica 2013; Jih 2016). Otherwise, the allocation method described in the papers was unclear. We also considered that the method used for allocation concealment in Webb 2009 was at unclear risk of bias. Four studies presented data showing that the groups were similar at baseline with regard to the outcome variables and the participant characteristics (Elder 2005; Webb 2009; Risica 2013; Jih 2016). In Boyd 1998, the communities were matched on selected characteristics before randomisation, but based on the published descriptions we found the distribution of the baseline characteristics to be unclear.

Blinding

It can be difficult to achieve blinding in studies intending to change behaviours. Since most or all the outcomes in Elder 2005, Risica 2013, and Jih 2016 were self-reported outcomes from non-blinded studies, we considered these results to be at high risk of bias. In Webb 2009, participants in both study arms received a non-blinded smoking cessation intervention; we could not tell whether the trial misreported any of the study outcomes with unequal distribution between the groups. Kennedy 2013 reported on a whole-population mass media campaign, and we considered it to be unclear whether knowledge of the allocated intervention was adequately prevented during the study and in what way this may have biased the findings.

Incomplete outcome data

Loss to follow-up was unaccounted for in Webb 2009, so we consider the risk of bias to be unclear.

Selective reporting

We found no published study protocols for any of the studies but considered the risk for selective reporting of outcomes to be low in all the studies. This conclusion is based on descriptions

in the Methods, expected outcomes reported, and corresponding presentations of results.

Other potential sources of bias

We considered the included studies to be at low risk of other biases. We re-analysed Kennedy 2013 as an ITS for this systematic review using the methodology described above. We noted that the second wave of advertisements coincided with a known seasonal increase in call volume and therefore excluded these data from the re-analysis. We considered the remaining results, as re-analysed according to the EPOC methods for ITS studies, to be at low risk of bias in all domains except one. As with the study by Boyd 1998, it was unclear whether knowledge of the allocated intervention in Kennedy 2013 (whole population mass media campaign) was adequately prevented during the study and in what way this may have biased the findings.

Effects of interventions

See: **Summary of findings for the main comparison** Targeted mass media intervention versus general population mass media intervention for promoting healthy behaviours; **Summary of findings 2** Targeted mass media intervention for promoting healthy behaviours versus no intervention; **Summary of findings 3** Targeted mass media intervention versus targeted mass media intervention plus personalised content

Comparison 1: targeted mass media intervention versus general population mass media intervention

See: Summary of findings for the main comparison.

Only one study assessed the effect of a targeted mass media intervention versus a mass media intervention intended for the general population (Webb 2009).

Primary outcomes

Webb 2009 did not assess any outcomes using indicators of behavioural change but reported several self-reported measures, including smoking reduction, attempts to quit, 24-hour point prevalence abstinence and 7-day point prevalence abstinence. The authors report that they found no significant difference in smoking reduction between the two conditions at the three-month follow-up (94% and 95% reported smoking reduction; adjusted OR for quit attempts was 1.97 (95% CI 1.09 to 3.55) in favour of the general population mass media intervention). Knowledge and attitudes toward change were reported as readiness to quit, measured by a 10-point contemplation ladder (1: no thoughts of quitting; 10: taking action to quit). The mean score was higher in participants who received the mass media intervention intended for the general population compared to the targeted mass media intervention (8.2 points, SD 2.4 versus 7.3 points, SD 2.6, P = 0.01). We considered all effect estimates of these self-reported behavioural outcome measures to be very low quality evidence as assessed by the GRADE methodology.

Secondary outcomes

The included study did not assess any outcomes on the use of health promotion services or costs of the project.

Adverse outcomes

The included study did not assess any variables measuring adverse outcomes.

Comparison 2: targeted mass media intervention versus no intervention

See: Summary of findings 2.

Three studies compared targeted mass media interventions versus no intervention (Boyd 1998; Kennedy 2013; Risica 2013). We could not pool the findings due to differences in outcome measurements and study designs.

Primary outcome

Only one of the included studies reported any of our primary outcomes (Risica 2013). These were: BMI (kg/m^2) as an indicator of behavioural change and self-reported behavioural change using a Food Habits Questionnaire (fat behaviour score) and total leisure activity questionnaire. The included study did not assess knowledge or attitudes toward change.

Changes in BMI were comparable in the two groups 12 months after baseline (longest follow-up, mean difference in change 0.1 kg/m^2, 95% CI −0.4 to 0.6). Fat behaviour scores (no unit described, high scores reflecting high fat intake) were lower in participants who received the targeted mass media intervention compared to the no intervention control group at 12 months (longest follow-up, mean difference in change −0.2, 95% CI −0.3 to −0.1), while total leisure activity score (no unit described, high scores reflecting more activity) was higher in the intervention group (longest follow-up, mean difference in change 12.0, 95% CI 1.0 to 23.0). We considered the effect measures based on the outcome BMI to be low quality evidence and the self-reported behavioural changes to be very low quality evidence.

Secondary outcomes

Two studies reported our secondary outcome: use of health promotion services - in both cases as the number of calls to smoking quit lines (Boyd 1998; Kennedy 2013). During the year of the campaign by Boyd 1998, the quit lines received 558 calls from African American smokers residing in the intervention communities (18 calls per estimated 10,000 African American smokers)

compared to 7 calls in the control communities (0.2 calls per estimated 10,000 African American smokers). The proportion of calls from African Americans was 82% of the total number in the experimental communities compared to 26% in the control communities (no measure of dispersion reported). Calls peaked significantly during waves of intense media coverage. We present the re-analysis of Kennedy 2013 as an ITS for this systematic review in Table 1. During the first and the last month of the campaign, the number of calls from new pregnant women increased by 8 per month (95% CI 1 to 14) over pre-campaign call rates. Compared to the pre-campaign monthly call rate, the number was 6 more calls (95% CI −1 to 12) in the first month after the campaign and 3 more calls (95% CI −4 to 10) four months after. The proportion of calls from African American women was 86% during the campaign, compared to 41% before the campaign and 28% after (no measure of dispersion reported). We considered the overall results measured as changes in call volume overall to be moderate quality evidence based on results from the RCT and low quality evidence from the ITS. The change in the proportion of calls from the target population provided low and very low quality evidence from the two respective studies.

Kennedy 2013 and Risica 2013 did not report the costs of their projects. Boyd 1998 reported the costs to be USD 106,821 for radio advertisements and USD 6744 for television advertisements but did not mention other costs or required resources overall.

Adverse outcomes

The included studies did not assess any variables measuring adverse outcomes.

Comparison 3: targeted mass media intervention versus targeted media intervention plus personalised content

See: Summary of findings 3.

Comparison 3 examined targeted mass media interventions versus targeted media interventions plus personalised content and included data from three studies (Elder 2005; Risica 2013; Jih 2016). Elder 2005 compared a targeted mass media intervention (newsletters based on off-the-shelf targeted material) with two intervention arms categorised as media intervention plus personalised content: one arm received individually tailored newsletters, and the other arm received individually tailored newsletters followed by home visits. Risica 2013 had three intervention arms that we categorised as media intervention plus personalised content. The authors reported incomplete delivery of the interactive programme sessions and support calls in these intervention arms; therefore, tor the purpose of this systematic review, we combined the results of these three intervention arms into a single comparison group. Jih 2016 compared a targeted mass media intervention (targeted print material) with a mass media intervention plus personalised content (lectures).

Primary outcomes

Elder 2005 and Risica 2013 reported BMI an as indicator of behavioural change at 3 months and Risica 2013 also at 12 months from baseline. Neither reported any difference in BMI change over time. Mean difference in change between the groups 12 months after baseline was 0.4 kg/m^2 (95% CI −0.1 to 0.8) between groups. All three included studies assessed self-reported behavioural changes. At three months, participants in Jih 2016 who received media interventions plus personalised content had higher odds of adhering to guidelines on vegetable intake than participants who received targeted mass media alone (adjusted OR 5.53, 95% CI 1.96 to 15.58), but there was no difference for fruit intake (adjusted OR 1.77, 95% CI 0.99 to 3.15). Risica 2013 assessed self-reported behavioural changes using a Food Habits Questionnaire (fat behaviour score) and a total leisure activity questionnaire, as above, while Elder 2005 used a 24-hour dietary recall interview. Their papers present results for several nutrients and groupings, but in this review we present only the authors' main outcomes: percentage of calories from fat and total dietary fibre (g). Elder 2005 reported no significant differences (P > 0.05) at the end of the intervention between the tailored intervention group and the two comparison groups for either percentage of calories from fat (30.0%, 30.4%, and 29.3%; no measure of dispersion reported) or total dietary fibre (15.6 g, 17.2 g, and 16.1 g; no measure of dispersion reported). In Risica 2013, the participants who received only the targeted mass media intervention had somewhat larger reductions in fat behaviours scores (no unit described, high scores reflecting high fat intake, mean difference in change −0.1, 95% CI −0.2 to −0.02) and greater increases in total leisure activity score (no unit described, high scores reflecting more activity, mean difference in change 12.9, 95% CI 3.5 to 22.3) compared to the groups with additional personalised components after 12 months. In Jih 2016, results indicated no difference in weekly physical activity meeting guidelines (adjusted OR 1.27, 95% CI 0.89 to 1.80). The same study indicated that more participants receiving personalised content had increased knowledge of nutrition guidelines than participants receiving the targeted mass media alone (knowledge of guideline for vegetables, adjusted OR 12.6, 95% CI 6.5 to 24.5, and fruit, adjusted OR 16.2, 95% CI 5.6 to 46.5), but this finding did not hold for knowledge of physical activity guidelines (adjusted OR 2.70, 95% CI 0.31 to 23.2).

We considered the effect measures based on the outcome BMI to be low quality evidence and all self-reported behavioural changes and knowledge of guidelines to be very low quality evidence.

Secondary outcomes

The included studies did not assess any outcomes concerning the use of health promotion services. Elder 2005 reported that the costs per participant in the three intervention arms were USD 9.00 for targeted newsletters, USD 45.00 individually tailored newsletters,

and USD 135 for individually tailored newsletters followed by home visits. Jih 2016 and Risica 2013 did not report project costs.

Adverse outcomes

The included studies did not assess any variables considered adverse outcomes.

ADDITIONAL SUMMARY OF FINDINGS [*Explanation*]

Comparison 2: targeted mass media intervention for promoting healthy behaviours versus no intervention

Patient or population: adult, ethnic minority group: self-described Americans of African heritage
Setting: volunteers, community setting, USA
Intervention: targeted mass media intervention
Comparison: no intervention

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	N of participants (studies)	Quality of the evidence (GRADE)[a]	Comments
	Assumed risk	Corresponding risk				
	No intervention	Targeted mass media intervention				
Indicators of behavioural change						
BMI (kg/m^2), 12 months from baseline	34.4 (SD 8.5)[b]	Mean difference in change 0.1 (−0.4 to 0.6)	-	154 (1 RCT)	⊕⊕◯◯ Low[c]	Corresponding risk at 3 months: mean difference in change −0.4 (−0.7 to −0.02)
Self-reported behavioural change						
Changes in dietary composition, 12 months from baseline	Food habits questionnaire, score on fat behaviours (no scoring scale provided by study authors): 1.0 (SD 0.4)	Mean difference in change −0.2 (−0.3 to -0.1)	-	154 (1 RCT)	⊕◯◯◯ Very low[c,d]	Corresponding risk at 3 months: mean difference in change −0.1 (−0.2 to −0.02)
Leisure time physical activity, 12 months from baseline	Physical activity score (no scoring scale provided by study authors) : 60.0 (SD 47.0)[e]	Mean difference in change 12.0 (1.0 to 23.0)	-	154 (1 RCT)	⊕◯◯◯ Very low[c,d]	Corresponding risk at 3 months: mean difference in change 10.0 (−1.7 to 21.8)

Knowledge and attitudes to change				
Any measure of knowledge and attitude	No study provided data for this outcome.			
Adverse effects				
Any outcome considered an adverse effect	No study provided data for this outcome.			
Use of health promotion services (secondary outcome)				
Calls to smoking quit lines, during campaign	18 calls per estimated 10,000 African American smokers in the intervention group versus 0.2 calls in the control communities[f].	Estimated target population 641,800 (1 RCT)	⊕⊕⊕◯ Moderate[g,h]	-
Calls to smoking quit lines, during and after campaign	Change from pre-campaign, calls per month (95% CI) from new pregnant smokers: 8 (1 to 14) first month of campaign, 8 (1 to 14) last month of campaign, 6 (−1 to 12) first month after campaign, 3 (−4 to 10) 4 months after campaign	Population in target city ~300,000 (1 ITS)	⊕⊕◯◯ Low[i,j]	-
Proportion of calls from target population during campaign	Proportion of calls from African Americans during trial: 82% in intervention and 26% in control communities	Estimated target population 641,800 (1 RCT)	⊕⊕◯◯ Low[g,k]	-
Proportion of calls from target population during and after campaign	Proportion African Americans among pregnant callers: 41% before campaign, 86% during the campaign, 28% after campaign	Population in target city ~300,000 (1 ITS)	⊕◯◯◯ Very low[i,k]	-
Costs of the project (secondary outcome)				
Programme costs	USD 106,821 for radio advertisements and USD 6744 for television advertisements. No overall costs reported	Estimated target population 641,800 (1 RCT)	⊕⊕◯◯ Low[g,k]	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).
CI: confidence interval; **ITS**: interrupted time series; **RTC**: randomised controlled trial; **SD**: standard deviation.

GRADE Working Group grades of evidence
High quality: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate quality: we are moderately confident in the effect estimate. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low quality: our confidence in the effect estimate is limited. The true effect may be substantially different from the estimate of the effect.
Very low quality: we have very little confidence in the effect estimate. The true effect is likely to be substantially different from the estimate of effect

[a] In the GRADE assessments for the domain 'directness', we considered the studies directly relevant to the inclusion criteria. Thus, we have not downgraded on this domain. However, the population of interest will be dissimilar in different contexts, relating to characteristics of the ethnic minority group, the country and setting overall. The transferability of results must be considered for each context specifically.
[b] Mean BMI at baseline in comparison group.
[c] Downgraded two levels for imprecision: only one relatively small study.
[d] Downgraded one level for unclear risk of bias.
[e] Mean score at baseline in comparison group
[f] Measures of dispersion not reported. No adjustment for cluster-randomised design.
[g] Downgraded one level for unclear risk of bias in the largest study.
[h] Unclear precision of estimate and no adjustment for cluster-randomised design, but substantial effect. Results from ITS study concludes similarly. Therefore, we have not downgraded for imprecision.
[i] Grading of ITS study (observational study) starts at low quality evidence.
[j] Results from RCT study concludes similarly. Therefore, we have not downgraded for imprecision.
[k] Downgraded one level for imprecision.

Comparison 3: targeted mass media intervention versus targeted mass media intervention plus personalised content

Patient or population: adult, ethnic minority groups: Latino immigrants, elderly Chinese immigrants, self-described Americans of African heritage
Setting: volunteers, community setting, USA
Intervention: targeted mass media intervention
Comparison: media intervention combined with personalised content

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	N of participants (studies)	Quality of the evidence (GRADE)[a]	Comments
	Assumed risk	Corresponding risk				
	Media intervention with personalised content (comparison)	Targeted mass media intervention				
Indicators of behavioural change						
BMI (kg/m^2), 12 months from baseline	34.9 (SD 7.7)[b]	Mean difference in change 0.4 (−0.1 to 0.8)	-	286 (1 RCT)	⊕⊕◯◯ Low[c]	Two RCTs (643 participants) reported BMI at 3 months. None found significant differences in weight change between study groups
Self-reported behavioural change						
Intake meeting target from dietary guidelines, 3 months from baseline	Vegetables: adjusted OR 5.53[d] (1.96 to 15.58) Fruit: adjusted OR 1.77[d] (0.99 to 3.15)			718 (1 RCT)	⊕◯◯◯ Very low[c,e]	-
Changes in dietary composition, 12 months from baseline	Food habits questionnaire, score on fat behaviours (no scoring scale provided by study authors): 1.0 (SD 0.4)[f]	Mean difference in change −0.1 (−0.2 to −0.02)	-	286 (1 RCT)	⊕◯◯◯ Very low[c,e]	Two RCTs (643 participants) reported changes in dietary composition at 3 months. None found significant

					differences/mean difference in change for energy or dietary fibre intake (study 1) or food habits questionnaire (fat behaviours) (study 2)
Weekly physical activity meeting target from guidelines, 3 months from baseline	Adjusted OR 1.27[d] (0.89 to 1.80)		718 (1 RCT)	⊕◯◯◯ Very low[c,e]	-
Leisure time physical activity, 12 months from baseline	Physical activity score (no scoring scale provided by study authors) : 68.0 (47.6)[f]	Mean difference in change 12.9 (3.5 to 22.3)	-	286 (1 RCT)	⊕◯◯◯ Very low[c,e]	Corresponding risk at 3 months: mean difference in change −2.2 (−12.9 to 8.5)
Knowledge and attitudes to change					
Knowledge of nutrition and physical activity guidelines	Daily vegetable intake: adjusted OR 12.6[d] (6.50 to 24.5) Daily fruit intake: adjusted OR 16.2[d] (5.61 to 46.5) Weekly physical activity: adjusted OR 2.70[d] (0.31 to 23.2)			⊕◯◯◯ Very low[c,e]	-
Adverse effects					
Any outcome considered an adverse effect	No study provided data for this outcome.				
Costs of the project (secondary outcome)					
Costs per person in each treatment arm	USD 9.00 for targeted newsletters, USD 45.00 individually tailored newsletters, and USD 135 for individually tailored newsletters followed by home visits		357 (1 RCT)	⊕◯◯◯ Very low[c,e]	-

*__The risk in the intervention group__ (and its 95% confidence interval) is based on the assumed risk in the comparison group and the __relative effect__ of the intervention (and its 95% CI).
__CI__: confidence interval; __OR__: odds ratio; __RCT__: randomised controlled trial;__RR__: risk ratio.

GRADE Working Group grades of evidence

High quality: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate quality: we are moderately confident in the effect estimate. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low quality: our confidence in the effect estimate is limited. The true effect may be substantially different from the estimate of the effect.

Very low quality: we have very little confidence in the effect estimate. The true effect is likely to be substantially different from the estimate of effect

[a] In the GRADE assessments for the domain 'directness', we considered the studies directly relevant to the inclusion criteria. Thus, we have not downgraded on this domain. However, the population of interest will be dissimilar in different contexts, relating to characteristics of the ethnic minority group, the country and setting overall. The transferability of results must be considered for each context specifically.

[b] Mean (SD) BMI at baseline in comparison group.

[c] Downgraded two levels for imprecision: Relatively small studies and few measurement points.

[d] OR > 1 in favour of targeted mass media combined with personalised content (control intervention). Effect estimates adjusted for cluster-randomised design.

[e] Downgraded one for unclear risk of bias.

[f] Mean (SD) score at baseline in comparison group.

DISCUSSION

Summary of main results

Six studies met the inclusion criteria: three RCTs, two cluster-RCTs, and one ITS. All took place in the USA and consisted of mass media interventions targeting either African Americans (4 studies), Spanish-language-dominant Latino immigrants (1 study) or Chinese immigrants (1 study). Furthermore, three targeted women only, and one specifically targeted pregnant women. The interventions addressed physical activity, dietary patterns, or tobacco use, but none addressed alcohol consumption. The studies were diverse with respect to the comparisons made, the outcomes and the study designs. We did not pool data for meta-analyses.

We categorised the comparisons into three groups: a targeted mass media intervention versus a general mass media intervention; a targeted mass media intervention versus no intervention; and a targeted mass media intervention versus a media intervention plus personalised content.

Only one study compared the relative effects of a culturally targeted mass media intervention and a general mass media intervention on smoking behaviours. The results were inconclusive.

Two studies compared the relative effects of a targeted mass media intervention versus no intervention. The findings suggested that, compared to no intervention, the targeted mass media intervention possibly produced small, short-term shifts in physical activity and dietary patterns and probably increased calls to smoking quit lines.

Three studies compared a targeted mass media intervention versus a media intervention combined with personalised content. Overall, the results of these studies were too uncertain to conclude whether there were differences between groups with respect to weight changes, dietary changes, or physical activity. Most of the outcomes had either small effects or inconclusive confidence intervals, and the evidence of effect was low to very low quality.

Overall completeness and applicability of evidence

Given the widespread interest in mass media interventions targeting ethnic minority populations with health-promoting messages regarding physical activity, dietary patterns, tobacco use, or alcohol consumption, the number of relevant studies was small. Only one study, Webb 2009, directly compared the effect of a culturally targeted mass media intervention with the effect of a general mass media intervention using the same format (i.e. smoking cessation advice and general content). The targeting did not involve any change in language use. In the included study, the delivery methods and, therefore, the expected reach were the same between groups. Although this comparison focuses on the value and effectiveness of targeting strategies on their own, the included study only assessed the value of targeting through cultural adaptation. The study was inconclusive regarding the differential effects on smoking behaviours and attitudes. We have very little confidence in the effect estimates and believe that any true effect could be substantially different from the authors' reports. Thus, the evidence is insufficient to conclude whether targeted mass media interventions are more effective than mass media interventions intended for the general population in changing health behaviours among ethnic minority groups.

When comparing the effects of targeted mass media interventions versus no interventions, findings from two large campaigns showed that these probably produce a considerable response, as measured by a surrogate outcome: the use of health promotion services in the form of smoking quit lines (Boyd 1998; Kennedy 2013). These studies did not measure changes in actual smoking behaviours. Calling a smoking quit line may not lead to an actual change in smoking habits or to long-term smoking cessation. Population-wide campaigns, such as those reported here (Boyd 1998; Kennedy 2013), may, however, contribute to population changes in attitudes toward smoking, intentions to quit, self-administered attempts to quit, or use of other health services offering smoking cessation support, thereby providing additional effects through the measured outcomes. Self-reported changes in behaviours are, when sustained, important outcomes in causal pathways (see Figure 1); however, they are not the ultimate aim, which is to improve health status and decrease the mortality and morbidity of NCDs. The one study in this comparison that measured a physiological indicator of change (BMI), using self-reported changes in dietary patterns and physical activity, found small effects in the expected direction after three months (the end of the main intervention). The longer-term effects were more uncertain (Risica 2013). It should be noted that this targeted mass media intervention was relatively high-intensity, comprising 12, one-hour live cable TV programmes over three months, with additional mailings over an extended period. The measured effect size was relatively small, and we have low to very low confidence in the effect estimates.

All three studies in this comparison targeted population groups with the same native language as the general population. During the campaigns, these studies also registered smaller or larger increases in call rates in non-targeted population groups (Boyd 1998; Kennedy 2013). However, the relative shifts in the proportions of callers, as well as the increases in total numbers of calls from the target populations, still indicate that these interventions had specific effects on the intended population group. These results cannot distinguish whether higher responses by the target population were due to the targeting of media content and format, better reach through the targeting of media channels, or both.

Overall, the three studies comparing a targeted mass media intervention with a media intervention plus personalised content were inconclusive (Elder 2005; Jih 2016; Risica 2013). It could be expected that person-tailored or one-to-one intervention content would produce a better response than a mass media intervention

alone. In two of these studies (Elder 2005; Risica 2013), all study arms had a relatively high exposure to the intervention, with at least 12 deliveries of mass media content over an extended period. Thus, the intervention groups may not have been sufficiently different to constitute a meaningful comparison.

All six studies in this systematic review were conducted in the USA, and four targeted African American population groups. Only two studies examined the effect of a targeted mass media intervention in a population group with a first language that differed from the national language (Spanish-dominant Latino immigrants and Chinese immigrants). The current evidence is therefore very limited with respect to different ethnic groups and contexts beyond the USA. Additionally, the cultural gap between the populations considered minorities and majorities may be more or less wide. All of the studies adapted their interventions to the target group by culturally customising the content or format (Figure 3). It is unclear to what extent these adaptations also considered other relevant factors that may characterise the target group, such as gender or socioeconomic status related to income, education, health literacy level, living conditions, or other resources available to the target population. The transferability of the results from this review must be considered for each context specifically.

None of the studies reported or discussed possible adverse effects of the intervention. A targeted mass media intervention can be a means to provide ethnic minority groups with equal opportunities and resources to access information, life skills, and opportunities for making healthier choices; however, by treating the target group differently, targeted efforts may also create a stigma. Drawing attention to the need for additional public health efforts directed toward a particular population subgroup may, in some situations, be considered or experienced as discrimination (Nayar 2014). Different population segments may also experience public health efforts to change personal behaviours as more or less intrusive or unacceptable to their rights to personal freedom. None of the included studies reported resistance to the message or other possible adverse effects as outcomes.

Targeted interventions are considered to be more expensive; however, this may not be universally true. Though the production of a targeted intervention or several adapted versions of the same intervention for different population groups may increase programme costs, the budget upside of a targeted intervention may be the need for fewer or potentially less costly media channels to reach the target group. Furthermore, new digital media channels have significantly changed the picture of media costs. This can make it easier to target specific groups at a low cost, but the new diversity in media markets can also create more 'noise' and increase reach dispersion. Overall, research still needs to explore the cost aspects of targeted interventions.

Quality of the evidence

In the GRADE assessments for the domain 'directness' (Guyatt 2011), we considered the studies directly relevant to the inclusion criteria. Thus, we did not downgrade quality for this domain. The population of interest, and therefore also the directness of these findings, will be dissimilar in different contexts, relating to characteristics of the ethnic minority group, the country, and the overall setting.

Based on the GRADE methodology (Guyatt 2011), we have moderate confidence in the estimated short-term increase in the number of calls to smoking quit lines. The cluster-RCT reporting this outcome did not provide measures of dispersion or adjust for effects of the cluster-randomised design (Boyd 1998). Failing to adjust for cluster effects will overestimate the precision of the effect estimate. However, the study reported a large effect, and additional results from the ITS study had similar conclusions (Kennedy 2013). Otherwise, our confidence in the described effect sizes ranged from low to very low. A low to very low confidence in the evidence means that the true effect can be either different or substantially different from the numbers presented in this review.

Potential biases in the review process

In this review, we focused on the effect of targeted mass media interventions on their own. This means that we have excluded targeted mass media interventions that were combined with any form of personal interaction or feedback (including digital feedback), group sessions, or changes in available resources. We also excluded studies in which a mass media component was part of a complex community intervention involving many intervention activities across several institutions. The only exceptions were studies in which this type of complex intervention served as a comparator for a targeted mass media intervention alone (Elder 2005; Risica 2013; Jih 2016). A boundary that we found difficult to operationalise was the distinction between a mass media intervention and a self-help programme. We included Webb 2009, where the intervention was a smoking cessation booklet, while we excluded more extensive self-help programmes with teaching modules and worksheets.

Inclusion criteria regarding study design were based on recommendations from the EPOC group (EPOC 2016). These criteria are well reasoned and include several different study designs but are slightly narrower than those used in other Cochrane Reviews on mass media interventions for smoking cessation. We excluded a few studies that Bala 2013 included, as we used different inclusion criteria regarding study designs; however, we believe that the inclusion of their studies would not have altered our conclusions.

Agreements and disagreements with other studies or reviews

We have not found any other systematic reviews regarding the specific effects of mass media interventions targeting adult ethnic minorities with health promotion messages. One mixed-methods evidence synthesis identified and assessed the effects of adapted health promotion interventions for ethnic minority populations of African, Chinese, and South Asian origin (Liu 2012). They identified only nine studies (among them Webb 2009, included in our review) directly comparing a culturally adapted health promotion intervention with a standard intervention of equal format, intensity and content. The included studies did not indicate any tendency toward increased effectiveness for culturally adapted interventions. The studies were either inconclusive (k = 5) or found increased effectiveness in the opposite direction of the hypothesis on some outcome variables (k = 3). Only one study found increased effectiveness of the culturally adapted intervention over the standard intervention. All nine studies were conducted in the USA, and eight targeted African Americans. The review authors of Liu 2012 considered that most studies considered in the evidence synthesis were inappropriately designed to establish the effectiveness of the cultural adaptations. Another Cochrane Review, focusing on culturally appropriate health education for people in ethnic minority groups with type 2 diabetes mellitus, found that such education likely improves glycaemic control compared to standard diabetes care. Here, the contexts and the targeted ethnic minority groups were more variable, including several studies of programmes targeting immigrants. Many of the diabetes education programmes in that review were more comprehensive than their standard care counterparts in terms of counselling frequency, personal interaction, and other intervention components (Attridge 2014). Another review found that cultural adaptations resulting in higher-intensity health promotion interventions appeared to be more effective (Nierkens 2013). However, these reviews also failed to scrutinise the specific effect of the cultural adaptations to the ethnic minority group. Reviews and guidelines increasingly acknowledge ethnic health inequalities and the possibility of differential effects of health promotion interventions (Davidson 2013a). Recommended adaptation strategies can be derived based on current strategies in use; however, there is still little evidence regarding which health promotion interventions are effective for ethnic minority populations (Davidson 2013b).

Of the studies included in our review, three compared targeted mass media interventions to no intervention. Their findings contribute more to the general evidence regarding the effectiveness of mass media interventions addressing health behaviours to reduce the risk of NCDs. In two of the included studies, the interventions were mass media campaigns for smoking cessation. The effectiveness of mass media interventions for smoking cessation is also addressed in two Cochrane Reviews: Bala 2013 in adults and Brinn 2010 in young people (up to age 25). These conclude that there is evidence of some positive effect of these interventions on smoking behaviours, at least in the short term.

AUTHORS' CONCLUSIONS

Implications for practice

The evidence is insufficient to determine whether targeted mass media interventions are more effective than mass media interventions intended for the general population for changing health behaviours in ethnic minority populations (based on very low quality evidence; Summary of findings for the main comparison). It is uncertain whether, compared to no intervention, targeted mass media interventions may slightly improve physical activity and dietary patterns and BMI in the short term (based on the low quality evidence of a small effect for this outcome; Summary of findings 2). The intervention may probably increase the number of calls to smoking quit lines during and immediately after campaigns (based on moderate quality evidence; Summary of findings 2). The studies in this comparison could not distinguish between the impacts of exposure to an intervention, cultural adaptation to an ethnic minority group, and choice of mass media channels to increase reach to the target group.

Implications for research

Overall, there is also limited research on targeted mass media interventions physical activity, dietary patterns, and tobacco use. We found no studies fulfilling the inclusion criteria that assessed targeted mass media interventions regarding alcohol consumption.

Further research that is specifically related to the following aspects is necessary.

New studies should be designed to directly compare the effects of targeted versus general mass media interventions with equal intensities and broader frames. If possible, studies should be designed to explore how different components impact intervention effectiveness.

Studies from different contexts, involving different media structures and economic environments, and studies that target populations with a broader range of ethnic minority populations, particularly ethnic minority groups with different first languages than the general population. Studies should consider the impacts of socioeconomic factors, health literacy, and other contextual factors that may modify intervention reach and appropriateness.

Follow-up times should be longer than the 3 to 12 months presented here, and outcomes related to measurements of behaviours and changes in health status should be prioritised. New studies should report study costs.

The included studies demonstrate that the research objective of this review can be investigated through rigorous study designs, such as individual and cluster-RCTs, or on a population levels using ITS designs.

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- Jostein Rise, the Norwegian Institute of Public Health;
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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Boyd 1998

Methods	*Study design*: cluster-randomised trial. 14 communities (from 35,600 to 630,000 inhabitants), matched in pairs before randomisation *Year of study*: 1994-1995 *Intervention period*: baseline data collected the year preceding the intervention. Continuous data collection for 15 months. 2 waves of paid advertisements running 6 weeks and 4 weeks in the intervention communities, with some activities (public service announcements (PSAs) and community outreach) throughout the whole period *Follow-up period (postintervention)*: data collection ended 2 months after last wave of paid advertisement
Participants	*Country*: USA (communities in 4 US regions) *Language*: English *Target population*: adult African American smokers *Exposure population*: broad population exposure in the intervention communities through mass media exposure. Proportion of African American residents ranged from 17% to 42% in the study communities. Estimated number of African American smokers in intervention communities was N = 310,471 and in control communities, N = 331,360. Socioeconomic profile of the communities not reported
Interventions	*Study objective/aim*: to evaluate whether a targeted communications campaign would lead more adult African Americans to call the CIS for smoking cessation resources *Control*: no intervention *Intervention*: 10 weeks of paid advisements aired in 2 waves of 6 and 4 weeks (in total 3364 radio and 208 television advertisements) in the intervention communities. Attempts were made to use the advertisements as PSAs (media advertisements in the public interest aired free of charge) particularly during times when interest in smoking cessation was expected (i.e. New Year holiday). Outreach packets containing a 12 min video, posters, and flyers (all mass media components) distributed to the target population (1449 packets distributed) *Content of the mass media message*: encourage smokers to call the CIS for help to quit smoking; emphasis that the CIS service is free of charge *Media channel(s) of dissemination*: radio, television, video, posters, and flyers *Theoretical basis*: no theories specifically mentioned *Targeting approach*: 6 radio and 1 television advertisements developed using programming formats, language and music adapted to the target population. Messages and advertisements were developed through 3 steps: review of past research on unique quitting motives and barriers in target group; focus groups with target population and 40 individual interviews to identify barriers and facilitators for calling the CIS for help to quit smoking; and pre-test of intervention material in (new) focus groups with target population and feedback from health communication specialists. Radio and television stations with high African American listenership/viewership identified for placement of advertisements. Outreach packets distributed to leaders and contact persons in community organisations, churches, and social groups in African American communities

Boyd 1998 (*Continued*)

Outcomes	*Use of health promotion services*: calls to the CIS for smoking cessation information and materials by African American adults residing in the intervention and control communities *Intervention costs:* partial description *Adverse outcomes*: none reported
Notes	*Intervention fidelity*: the delivery of the intervention assessed through media "target rating points". Range of estimated reach among African Americans in the seven intervention communities 88.0%-95.5%; with the target audience hearing or seeing an advertisement at estimated frequency of 7.02-12.60 times in the study communities *Sources of funding*: the National Cancer Institute (USA), the Robert Wood Johnson Foundation

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation sequence adequately generated	Unclear risk	Allocation method not presented
Allocation adequately concealed	Low risk	All clusters randomised at once
Baseline outcome measurements similar	Unclear risk	Not presented
Baseline characteristics similar	Unclear risk	Not presented. Communities matched in pairs based on number and proportion of population that was African American, income, sex, age, education, population proportion below the poverty line, and proportion of dwellings with telephones
Incomplete outcome data adequately addressed	Low risk	This was a population study using routinely collected call data
Knowledge of allocated interventions prevented	Unclear risk	Neither participants nor outcome assessors blinded to allocation
Adequately protected against contamination	Low risk	Geographically spread communities and non-overlapping media markets
Free of selective outcome reporting	Low risk	Selctive reporting not likely; only few relevant outcomes
Other bias	Low risk	Judged low risk, but noted that both the study and the quit line services were funded by the National Cancer Institute

Elder 2005

Methods	*Study design*: RCT *Year of study*: not stated *Intervention period*: 12 weeks *Follow-up period (postintervention)*: immediately postintervention (relevant data at 6 and 12 month follow-up not published)
Participants	*Country*: USA (San Diego, CA) *Language*: Spanish *Target population*: Spanish-speaking Latino immigrants or Latino American *Inclusion criteria*: women aged 18-65 years living in a Spanish-language dominant household *Exclusion criteria*: pregnant, on special diet for medical reasons, or planning to leave the area during the study period *Participants*: intervention 1, N = 119; intervention 2, N = 118; intervention 3, N = 120 *Sex*: women *Socioeconomic characteristics*: 95% born in Mexico, 27% with little or no formal education, 27% with some college education, > 50% homemakers, 25% working full-time. Wide range of family income, 13% with USD 500-USD 1000 per month, 25% with > USD 2501 per month. Low acculturation score. Described by authors as women with low levels of acculturation, income, and education *Other*: mean BMI 29.6 kg/m^2 ± 5.6
Interventions	*Study objective/aim*: to assess the effect of person-tailored nutrition education materials, with or without personal delivery and counselling from lay health advisor*(promotora)*, compared to off-the-shelf materials targeted to a Latino population *Intervention 1 (study control): targeted mass media intervention* The women received 12 weekly Spanish-language newsletters mailed to the participant's home. These were based on brochures containing information on food purchasing, food preparation, and food consumption from the American Heart Association, American Dietetic Association and the American Cancer Society (off-the-shelf materials targeted to a Latino population) *Intervention 2: individually-tailored newsletters* The women received 12 weekly individually tailored newsletters and activity inserts mailed to the participant's home. The newsletters were tailored by using the participants' baseline data. They provided feedback on the assessment process, opportunity for personalised goal setting and for dealing with identified barriers *Intervention 3: individually-tailored newsletters + home visits* The women received individually tailored newsletters as for intervention 2 and in addition weekly home visits or telephone calls from *promotoras* over the 12-week period. *Content of the mass media message*: behavioural strategies to reduce dietary fat and to increase fibre, fruit and vegetable intake *Media channel(s) of dissemination*: newsletters *Theoretical basis*: none stated for the targeted mass media intervention *Targeting approach*: material presented in participants' first language (Spanish). Some cultural adaptation of targeted print condition may be assumed (off-the-shelf materials targeted to a Latino population by national health organisations), but is not described by authors. Recruitment of Spanish-speaking Latino participants only

Elder 2005 (*Continued*)

Outcomes	*Self-reported behavioural change*: energy % calories from fat, dietary fibre intake (g) *Intervention costs:* partial description *Adverse outcomes*: none reported
Notes	*Intervention fidelity*: not reported *Sources of funding*: the National Cancer institute (USA)

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation sequence adequately generated	Unclear risk	Block randomisation. Allocation method otherwise not presented
Allocation adequately concealed	Low risk	Participants agreed to participate before randomisation.
Baseline outcome measurements similar	Low risk	Analyses adjusted for baseline values
Baseline characteristics similar	Low risk	Analyses adjusted for baseline values
Incomplete outcome data adequately addressed	Low risk	Missing data imputed with baseline values
Knowledge of allocated interventions prevented	High risk	Unclear risk for the BMI measurements. High risk for self-reported behaviours in non-blinded study
Adequately protected against contamination	Low risk	Primary intervention material delivered by mail
Free of selective outcome reporting	Low risk	Width of data presented in 3 papers
Other bias	Low risk	None considered

Jih 2016

Methods	*Study design*: cluster-RCT. ~15 participants recruited by each of 58 lay health workers (LHW). LHW-groups randomised *Year of study*: August 2010-September 2013. *Intervention period*: 2 months *Follow-up period (postintervention)*: assessment at 6 months (4 months postintervention)
Participants	*Country*: USA (San Francisco, CA) *Language*: Chinese *Target population*: Chinese American immigrants *Inclusion criteria*: self-identifying as Chinese immigrants (foreign born) or Chinese Amer-

	ican; aged 50-75 years; Cantonese, Mandarin or English speaker; intending to stay in area > 6 months *Exclusion criteria*: other participants in household, personal history of colorectal cancer (focus of parallel RCT) *Participants*: intervention 1, N = 360; intervention 2, N = 365 *Sex*: both, 83% women in intervention group 1, 79% women in intervention group 2 *Socioeconomic characteristics*: mean 17 years in the US, ~70% with less education than high school diploma, ~96% self-reported spoken English proficiency as 'so-so', 'poor', or 'not at all'. Wide range of family income *Other*: mean BMI 24.2 kg/m^2 ± 3.4 in intervention group 1; 23.3 kg/m^2± 4.0 in intervention group 2
Interventions	*Study objective/aim*: to evaluate the efficacy of an in-language intervention of 2 lectures plus printed materials versus printed materials alone on knowledge and adherence to nutrition and physical activity guidelines among older Chinese Americans *Intervention 1 (study control): targeted mass media intervention* Participants received the printed lecture handouts made for intervention group 2 that focused on culturally appropriate examples of food and physical activity and a Chinese nutrition brochure. Lay health workers (LHW) delivered 2 small group education sessions with follow-up calls on colorectal cancer (control component) *Intervention 2: lectures and targeted mass media intervention* Participants received two 60-90 min lectures, printed lecture handouts and a nutrition brochure about 2 months apart, delivered by an instructor. LHW called about 1 month after each lecture to ask them recall the lecture and remind to attend the next lecture or final assessment *Content of the mass media message*: basic nutrition and physical activity education, with focus on recommended daily 5 servings of vegetables and 4 servings of fruit, and ≥ 150 min moderate intensity physical activity weekly *Media channel(s) of dissemination*: printed information material *Theoretical basis*: none stated *Targeting approach*: the lectures were presented in the participants' preferred language (Cantonese, Mandarin, or English). Lectures and material were developed with culturally appropriate examples of common foods, relevant physical activities and familiar portion size models for target group. A community advisory board reviewed the material for cultural and linguistic appropriateness, with subsequent testing in focus groups
Outcomes	*Self-reported behavioural change*: self-reported behaviour meeting guidelines for ≥ 5 servings of vegetables/day, ≥ 5 servings of fruit/day, ≥ 150 minutes moderate physical activity/week Knowledge or attitudes to change: self-reported knowledge of recommended ≥ 5 servings of vegetables/day, ≥ 5 servings of fruit/day, ≥ 150 minutes moderate physical activity/week *Adverse outcomes*: none reported
Notes	*Intervention fidelity*: not reported *Sources of funding*: National Institutes of Health, the National Cancer institute (USA)

Risk of bias

Jih 2016 (*Continued*)

Bias	Authors' judgement	Support for judgement
Allocation sequence adequately generated	Low risk	Computer-generated randomisation
Allocation adequately concealed	Low risk	LHW-groups randomised in blocks. Allocation concealed until LHW had recruited all his/her participants
Baseline outcome measurements similar	Low risk	Baseline outcome measurement presented without statistical tests; appears balanced
Baseline characteristics similar	Low risk	Baseline characteristics presented with statistical tests. Balances apart from small difference in baseline BMI between groups; adjusted in final analysis
Incomplete outcome data adequately addressed	Low risk	Small attrition overall, < 1% of sample. 6. 5% had missing data for 1 or more covariates
Knowledge of allocated interventions prevented	High risk	Self-reported behavioural change and knowledge in non-blinded study
Adequately protected against contamination	Unclear risk	No discussion of possible contact between participants in different groups
Free of selective outcome reporting	Low risk	Few relevant outcome measures; all reported
Other bias	Low risk	Analyses adjusted for clustering

Kennedy 2013

Methods	*Study design*: interrupted time series study (as re-analysed for this systematic review) *Year of study*: 2009-2011 *Intervention period*: continuous data collection from March 2009 to June 2011. 2 waves of campaign activities, June-October 2009 and January-March 2011 *Follow-up period (postintervention)*: see intervention period
Participants	*Country*: USA (Richmond, VA) *Language*: English *Target population*: pregnant African American smokers *Exposure population*: full population exposure through media exposure in a city (approximately 200,000 inhabitants). Total target population not known. Approximately 400 births by African American women per month. Interviews indicated that ~40% of pregnant African American women had smoked the past 3 months. Socioeconomic profile of area not reported

Interventions	*Study objective/aim*: to evaluate the effect of a social marketing campaign aiming to encourage pregnant African American smokers to call telephone counselling *Control (pre-campaign)*: no intervention *Intervention*: 3.5 months of paid radio advisements, billboards and bus ads, with estimated 17 million of impressions (i.e. opportunities to hear the campaign messages). In addition, the campaign consisted of other small media, social media content, press coverage, and distribution of campaign-branded items (tins of mint, lip balm). Outreach workers and frontline clinic and social service agency staff distributed campaign material and reinforced message. A second wave of advertisements starting at New Year 1.5 years after baseline were not re-analysed for this systematic review *Content of the mass media message*: 'One tiny reason to quit' - message from the baby. Encourage pregnant women to quit smoking and make use of free telephone smoking cessation counselling *Media channel(s) of dissemination*: radio, billboards, bus ads, newspaper ads, Facebook page, press coverage, and campaign-branded items *Theoretical basis*: no theories specifically mentioned for development of intervention content, message, or framing. Positive framing chosen based on previous experiences *Targeting approach*: message concepts were tested for appropriateness and appeal with pregnant African American current and recent smokers, with additional audience testing of creative material. Creative material featuring African American baby. Outreach workers from the African American community were trained to approach pregnant workers with campaign messages and distribute campaign material. Radio ads in the contemporary radio station most popular with young African American adults according to ratings. Billboards in relevant neighbourhoods. Newspaper ads in African American weekly papers
Outcomes	*Use of health promotion services*: all calls to telephone smoking cessation counselling by adults between 18-45 years in counties in the local broadcast range of the radio station that ran the advertisements *Adverse outcomes*: none reported
Notes	*Intervention fidelity*: not reported *Sources of funding*: National Center on Minority Health Dispartities, National Institues of Health (USA)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Intervention independent (ITS)	Low risk	The second wave of advertisements started at New Year, and thus influenced by the normal increase in calls to quit lines at this time of year. This second wave is not included in the re-analysed material
Analysed appropriately (ITS)	Low risk	Data re-analysed for this systematic review according to standards (see Methods section)

Kennedy 2013 (*Continued*)

Shape of effect pre-specified (ITS)	Low risk	Data re-analysed for this systematic review according to standards (see Methods section)
Unlikely to affect data collection (ITS)	Low risk	Study based on routinely collected call data
Blinding of outcome assessment (ITS)	Unclear risk	Unclear if assessors were aware of campaign
Incomplete outcome data addressed (ITS)	Low risk	Not relevant
Free of selective reporting (ITS)	Low risk	Selctive reporting not likely; only a few relevant outcomes from routinely collected call data
Other biases (ITS)	Low risk	No other biases identified

Risica 2013

Methods	*Study design*: RCT *Year of study*: not reported *Intervention period*: participants had access to 12 weekly cable TV shows and 4 months follow-up intervention *Follow-up period (postintervention)*: assessment at 3 months (end of TV shows), 8 months (end of follow-up intervention) and 12 months (4 months postintervention)
Participants	*Country*: USA (Massachusetts) *Language*: English *Target population*: African American women *Inclusion criteria*: self-identified as African American or black women, aged 18-70 years, resided in catchment area of the cable TV company, planned to stay in area for ≥ 1 year, access to telephone, television and videocassette recorder (VCR), available to watch the TV programme at its airtime, BMI ≥ 22 kg/m^2 *Exclusion criteria*: pregnant or < 4 months postpartum, physical problems that would prevent mild physical activity, previous history of treatment for eating disorders, unable to speak and read English, participation in other weight-control research project *Participants*: control, N = 82; intervention 1, N = 71, Intervention 2, N = 210 (3 intervention arms combined) *Sex*: women *Socioeconomic characteristics*: all self-described African American, black or West Indian/ Caribbean ethnicity. 12% foreign-born. 12% had not completed high school, 40% with college education. 44% in lowest income category. The study paid for cable TV service for participants who could not afford it (19% of participants) *Other*: 71% obese. Self-reported hypertension > 25%, diabetes 12%, and on medication for hypertension or heart condition > 25%
Interventions	*Study objective/aim*: to evaluate the effectiveness of a culturally tailored weight control cable TV programme for black women *Control*: wait-list/attention placebo comparison. Biweekly mailings for 12 weeks with

	other health-related information. Received all the TV shows as videos and other intervention material after the 12-month follow-up (i.e. after final outcome assessment) *Intervention 1*: participants were given access to 12 one-hour live programmes on cable TV and printed material corresponding to the shows biweekly by post. After the shows, participants received 4 monthly mailings with written material and booster videotapes including an exercise video *Intervention 2 (combination of 3 study arms)*: in addition to all intervention content described under intervention 1, participants received either access to a toll-free number to call during a live sharing part of show; 12 weekly and 4 monthly telephone support calls from a community outreach educator; or both access to call the 'live' sharing and the 16 telephone support calls *Content of the mass media message*: educational content regarding nutrition and physical activity to improve health and weight control as defined by each woman. Practical cooking demonstration or physical activity breaks. 20 min of each show devoted to a live 'sharing' between social worker, featured guest, and live callers *Media channel(s) of dissemination*: cable TV, print material, video *Theoretical basis*: intervention based on Social Action Theory. Behavioural change, stress reduction and self-management principles integrated into nutrition and physical activity sections *Targeting approach*: designed to be culturally appropriate based on formative research with 500 people from the target population. All African American female cast in the TV shows, including all experts; recruited only target population
Outcomes	*Indicators of behavioural change*: BMI (kg/m^2), weight (kg) *Self-reported behavioural change*: food habits questionnaire (fat behaviours), leisure activity score *Adverse outcomes*: none reported
Notes	*Intervention fidelity*: random participants were called during shows to monitor who was watching. Calls to live sharing part and support calls logged. At 3 months follow-up, 69% of participants had watched 7-12 shows and 57% had read most or all written material. Participants in intervention 2 were more reluctant to call live than expected. < 50% of the planned support calls were completed *Sources of funding*: the National Cancer Institute (USA)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation sequence adequately generated	Low risk	After baseline assessment, participants drew an envelope from a container with concealment of allocation
Allocation adequately concealed	Low risk	After baseline assessment, participants drew an envelope from a container with concealment of allocation
Baseline outcome measurements similar	Low risk	Baseline outcome measurements presented and analysed as balanced

Risica 2013 (*Continued*)

Baseline characteristics similar	Low risk	Baseline characteristics presented and analysed as balanced
Incomplete outcome data adequately addressed	Low risk	ITT analyses conducted
Knowledge of allocated interventions prevented	High risk	Unclear risk for the BMI measurements. High risk for self-reported behaviours in non-blinded study
Adequately protected against contamination	Low risk	Participants reported to be geographically spread
Free of selective outcome reporting	Low risk	Results compared with published protocol
Other bias	Low risk	None considered

Webb 2009

Methods	*Study design*: RCT *Year of study*: 2006-2007 *Intervention period*: 1 mailing of print material *Follow-up period (postintervention)*: 3 months
Participants	*Country*: USA (Florida) *Language*: English *Target population*: African American smokers *Inclusion criteria*: 18-65 years old, smoked ≥ 5 cigarettes/day, had permanent mailing address, could read English, wanted to quit smoking within 1 year *Exclusion criteria*: currently receiving a quit smoking intervention *Participants*: intervention 1, N =127; intervention 2, N = 128. (The numbers in the participant flow diagram differs from numbers in text: participants randomised to intervention 1, N = 129; intervention 2, N =132) *Sex*: 56% women *Socioeconomic characteristics*: 99% African American (3 Hispanic participants), 61% single, 74% completed high school, 47% household income < USD 10,000 *Other*: mean age: 43 years; mean cigarettes/day: 23, mean years of smoking: 23
Interventions	*Study objective/aim*: to assess extent to which cultural specificity contributes to the efficacy of written self-help materials among African American smokers *Intervention 1 (control)*: 1-2 days after baseline assessment, participants received a non-culturally specific printed smoking cessation guide *Intervention 2*: 1-2 days after baseline assessment, participants received a culturally specific printed smoking cessation guide *Content of the mass media message*: information about smoking and health, tobacco advertising, secondhand smoke, readiness to quit, quitting strategies, and community efforts *Media channel(s) of dissemination*: print material *Theoretical basis, intervention 1*: a non-culturally specific smoking cessation guide was

	developed by replacing all culturally specific aspects of the *Pathways to freedom* smoking cessation guide, while keeping topics and smoking information unchanged. The aim was to create a booklet without attention to any particular ethnic or cultural group. Pictures were changed to cartoons or different ethnicities *Theoretical basis, intervention 2*: the *Pathways to freedom* smoking cessation guide was an established culturally specific guide for African Americans (available from www.cdc.gov/tobacco/quit_smoking/how_to_quit/pathways/pdfs/pathways.pdf). Written at sixth-grade reading level. Culturally specific elements related to African American values, communication patterns, familial roles, history, statistics specific to African Americans and mobilising the community to fight the tobacco industry. Pictures and testimonials from target group. Stereotypical African American names and colours
Outcomes	*Self-reported behavioural change*: quit attempts, smoking reduction, 24-hour point prevalence abstinence, 7-day point prevalence abstinence *Knowledge or attitudes to change*: readiness to quit *Adverse outcomes*: none reported *Reported outcomes not considered relevant for this review*: content evaluation measures
Notes	*Intervention fidelity*: not reported *Sources of funding*: Syracuse University (USA)

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation sequence adequately generated	Unclear risk	Allocation method not presented
Allocation adequately concealed	Unclear risk	Not reported
Baseline outcome measurements similar	Low risk	There was no significant differences on demographics and smoking history
Baseline characteristics similar	Low risk	There was no significant differences on demographics and smoking history
Incomplete outcome data adequately addressed	Unclear risk	Demographics reported as similar in attrition groups, but ITT analyses not mentioned
Knowledge of allocated interventions prevented	Unclear risk	Self-reported smoking behaviours in non-blinded study, but assumed similar conditions in both groups. Blinding of assessors not presented
Adequately protected against contamination	Unclear risk	Not mentioned

Webb 2009 (*Continued*)

Free of selective outcome reporting	Low risk	Main outcome (smoking habits) reported using several different measures
Other bias	Low risk	None considered

BMI: body mass index; **CIS**: Cancer Information Service; **ITT**: intention-to-treat; **LHW**: lay health worker; **PSA**: public service announcement; **RCT**: randomised controlled trial.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Abroms 2014	Individually tailored text messages. No specific targeting to ethnic minorities
Aghi 1984	Individual counselling available as part of the intervention. Not targeted to ethnic minority
Albright 2009	Not considered a mass media intervention
Albright 2012	Not considered a mass media intervention
Alcalay 1999	Before-after assessment without control group
Bermejo 2012	Participants attended a group event before receiving the mass media component
Block 2004	Individually tailored content. Unclear targeting to ethnic minority
Brady 2010	Campaign targeted to a patient group
Bramley 2005	Individually tailored text messages based on initial counselling
Brimblecombe 2013	Protocol for a multi-component store intervention. No relevant outcome measures
Brown 2012	Not considered a mass media intervention
Buis 2013	Retrospective analyses
Buller 2008	Intervention not clearly targeted to ethnic minorities
Burger 2003	Intervention focused on risk communication rather than disease prevention. Study not designed to show effect of a targeted approach
Burns 2010	Assessment of quit line calls from Latino compared to non-Latino population before and after Spanish-language campaign

(*Continued*)

Campbell 2004	Individually tailored newsletters
Campbell 2014	Repeated cross-sectional surveys. No control group
Cantrell 2013	Experimental study of pictorial versus text-only tobacco warning labels in different ethnic groups
Carlini 2008	Personal invitation letters to re-enrol into counselling. Not considered a mass media intervention
Cessnun 2011	The target population is adolescents, secondarily their parents. Not considered a mass media intervention
Chang 2010	Not considered a mass media intervention
Chang 2014	As Chang 2010
Chhichhia 2011	Not considered a mass media intervention
Chung 2014	Before-after assessment without control group
Collins 2014	Individually tailored text messages
Cummins 2015	Report on implementation and impact of tobacco quit line counselling services
Darity 1997	Results presented as repeated cross-sectional surveys. Not relevant study design as analysed
Dedier 2014	Individually tailored automatic telephone coach
Dunton 2008	Individually tailored intervention components
Emmons 2003	Individually tailored intervention components. Not targeted to ethnic minorities
Ferguson 2015	Not any of the specified study designs
Fitzgerald 2009	No impact assessment reported
Foster 2014	Multicomponent store intervention. Mass media components only minor part of intervention. No clear targeting to ethnic minorities
Froelicher 2010	Not considered a mass media intervention
Fukuoka 2011	Individually tailored intervention components
Gans 2016	Multicomponent community intervention. Mass media components only minor part of intervention. No clear targeting to ethnic minorities
Gerber 2009	Not considered a mass media intervention
Gerber 2013	Not considered a mass media intervention

(*Continued*)

Gittelsohn 2012	Multicomponent store intervention. Mass media components only minor part of complex intervention
Gittelsohn 2013	As Gittelsohn 2012
Glover 2013	Protocol. Not considered a mass media intervention. Before-after assessment without control group
Graham 2012	Description of programme development and click-through rates for different online advertisements
Gray 2012	Protocol. Not considered a mass media intervention
Grigg 2008	Interrupted time series study with 2 data points before the intervention and 2 after
Hammerback 2012	Not considered a mass media intervention. Before-after assessment without control group
Hanson 2012	Description of programme development and user's opinion of campaign
Henderson 2012	Individually tailored content. Patient education
Hind 2010	Protocol. Study does not evaluate the effect of the mass media component
Ho 2008	Community intervention with many intervention activities involving several institutions. Mass media component smaller part of complex intervention compared to no intervention
Houry 2010	Written information targeted to problem behaviours or life situations, not to ethnic minority characteristics
Huang 2015	Intervention not targeted to ethnic minorities. Not any of the specified study designs
Irvine 2004	Individually tailored, interactive multimedia programme. Unclear targeting to ethnic minorities
Ivers 2006	Content of intervention not identical in the 3 intervention sites
Jantz 2002	Interactive education programme
Jason 1988	The whole population exposed to the mass media component (not described as targeted). Study designed to evaluate the effect of extended community outreach to ethnic minority group
Jenkins 1997	Controlled before-after study with only 1 intervention site and 1 control site
Joseph 2014	Individually tailored content through interaction and contact with project staff. Mass media component (in control group) not targeted to ethnic minorities
Joseph 2015	Before-after assessment with no control group
Kandula 2014	Not considered a mass media intervention
Kim 2013	Text messages sent with a possibility to reply and receive answers

(*Continued*)

Kreuter 2004	Individually tailored women's magazines based on baseline questionnaire
Kreuter 2005	Individually tailored women's magazines based on baseline questionnaire
LaChausse 2012	Intervention not targeted to ethnic minorities. Individual feedback
Larsen 2014	Individually tailored content and counselling. Before-after without control group
Larson 2009	Community intervention study with many intervention activities on different levels. Time series data with 5 measurement points and gradual implementation of the intervention
Lee 2011	Mass media component (in control group) not targeted to ethnic minorities
Li 1984	Non-randomised controlled trial with 4 arms. 1 site each for 2 of the arms. Alternating 2 interventions every other week in a third site
Linares 2013	Before-after assessment without control group
Lipkus 1999	Not considered a mass media intervention
Ma 2004	Description of programme and campaigns. No impact assessment
Mackey 2015	Individually tailored content and counselling. Adapted to characteristics of college life, not ethnicity
Magoc 2009	Individually tailored, interactive computer programme
Marin 1990	Interrupted time series study with 2 data points before the intervention and 2 after
Marin 1994	Interrupted time series study with 2 data points before the intervention and 1 after
McAlister 1992	Non-randomised controlled trial with 2 intervention sites and 1 control site
McDonnell 2011	Study of a culturally adapted self-help smoking cessation programme delivered either as an interactive web-programme or as booklets
Mead 2013	Community intervention with many intervention activities involving several institutions. Mass media component smaller part of complex intervention compared to no intervention
Mhurchu 2007	Pilot study. Description of recruitment and data collection methods
Mhurchu 2010	Nutrition education material tailored to individual shopping preferences in addition to cultural targeting
Migneault 2012	Individually tailored, interactive automatic telephone counselling. Can be considered as patient education
Moskowitz 2016	Not considered a mass media intervention

(*Continued*)

Muñoz 1997	Study of the effect of adding a mood management programme to a culturally adapted smoking cessation self-help programme
Muñoz 2006	Describes 4 studies, including 2 RCTs. Smoking cessation programme with individual tailoring
Nollen 2007	Not considered a mass media intervention
Orleans 1998	Participants randomised to different formats of individual telephone counselling
Patten 2010	Not considered a mass media intervention
Patten 2012	Description of a research programme. No impact assessment data presented
Pekmezi 2010	Individually tailored feedback delivered via Internet or print
Perez 2009	Not considered a mass media intervention
Reininger 2015	Multicomponent community intervention. Mass media components only minor part of intervention. Not any of the specified study designs
Resnicow 1997	Not considered a mass media intervention
Resnicow 2000	Not considered a mass media intervention
Resnicow 2001	Not considered a mass media intervention
Resnicow 2002	Not considered a mass media intervention
Resnicow 2005	Not considered a mass media intervention
Resnicow 2008	Not considered a mass media intervention
Resnicow 2009	Individually tailored newsletters
Rimmer 2009	Mass media component (in control group) not targeted to ethnic minorities
Romero 2012	Before-after assessment without control group
Schlundt 2009	Community intervention study with many intervention activities on different levels. Time series data with 5 measurement points and gradual implementation of the intervention
Scisney-Matlock 2012	Individually tailored, interactive computer programme with e-mail feedback
Shaikh 2011	Not considered a mass media intervention
Shakeshaft 2014	Community intervention with many components and intervention activities, including social marketing campaigns. Whole population approach, including aboriginal communities. Not specific targeting to and impact assessment in ethnic minority groups

(*Continued*)

Sharma 2010	Description of programme and activities. No impact assessment
Shea 1996	Description of programme and activities. No impact assessment
Skewes 2007	Not considered a mass media intervention
Steinberg 2013	Personal contact with research team through text-messages and email
Stevens 2002	Before-after assessment without control group
Streja 2014	The main aim of the study was to reduce secondhand smoke exposure among children with asthma
Swartz 2006	Individually tailored web-based smoking cessation programme
Taylor 2010	Before-after assessment without control group
Thomas 2010	Evaluation of intervention without control group
Vallone 2011	Before-after assessment without control group
Webb 2010a	Experimental study of health risk communication with different message content and culturally specific framing
Wetter 2007	Mass media used to create awareness of Spanish-language smoking cessation services. Study of different formats of quit line counselling
Whitehead 2007	Individually tailored print material
Wilson 2005	Study compares the number of calls to quit line services after different campaigns, including 1 designed for Māori audience. Not relevant study design
Wilson 2010	Cluster-randomised trial with 3 arms. Only 1 site per arm
Wilson 2014	Individually tailored, interactive computer programme. Feasibility study without control group
Withall 2012	Controlled before-after study with only 1 intervention site and 1 control site. Not targeted to ethnic minority
Wolf 2009	Not considered a mass media intervention
Wright 2013	Individually tailored automated interactive voice response telephone counselling
Zhu 2012	Not considered a mass media intervention

DATA AND ANALYSES

This review has no analyses.

ADDITIONAL TABLES

Table 1. Re-analyses of data from Kennedy 2013

Outcome	Estimated effect (95% CI)[a] July 2009 (start of campaign)	Estimated effect October 2009 (last month of campaign)	Estimated effect November 2009 (first month after campaign)	Estimated effect March 2010 (4 months after campaign)
Total number of calls	42 (−115 to 198)	153 (−8 to 314)	146 (−13 to 304)	32 (−148 to 212)
Calls from pregnant women	14 (4 to 25)	15 (4 to 27)	8 (−3 to 19)	7 (−5 to 20)
Calls from unique pregnant women	8 (1 to 14)	8 (1 to 14)	6 (−1 to 12)	3 (−4 to 10)
Calls from unique previously unknown pregnant women ('first-timers')	6 (1 to 11)	6 (1 to 10)	2 (−3 to 6)	3 (−3 to 8)

[a] Change from pre-campaign call rates.

APPENDICES

Appendix 1. Search strategies

Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present

Search date: 2016-08-23

1 exp communications media/ (266069)
2 consumer health information/ (2624)
3 exp Internet/ (61516)
4 exp marketing/ (32277)
5 (radio or television or "tv" or campaign* or advert* or boards or newspaper* or maga?in* or brochure* or leaflet* or pamphlet* or cinema* or (mass adj (communication or media)) or internet or social media or blog* or facebook or twitter or instagram or podcast* or broadcast* or audiovisual or film* or movie* or ((cell or cellular or mobile) adj (telephone* or phone*))).ti,ab. (320644)
6 (("cd" or "cds" or dvd or dvds or video or videos) adj3 distribut*).ti,ab. (866)
7 or/1-6 [mass media] (611426)
8 exp drinking behavior/ (64839)
9 exp "tobacco use"/ (133790)
10 exp Food Habits/ (28170)
11 Motor Activity/ (89395)

12 exp exercise/ (144411)
13 exp physical fitness/ (24479)
14 exp sports/ (149201)
15 ((alcohol* adj2 (drink* or consumption)) or (drinking adj5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) adj5 (activ* or exercis*)) or physical conditioning or running or jogging or swimming or walking or skiing or cycling or climbing or smok* or tobacco* or cigarette*).ti,ab. (1662747)
16 or/8-15 [behavior] (1895646)
17 Minority Groups/ (11887)
18 Minority Health/ (579)
19 exp Population Groups/ (254763)
20 (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies).ti,ab. (217329)
21 (black or blacks or hispanic* or ((afro or african or asian or latin* or indian) adj1 american*)).ti,ab. (175176)
22 "Emigrants and Immigrants"/ (8064)
23 Refugees/ (7565)
24 cultural diversity/ (10143)
25 exp Human Migration/ (24328)
26 (refugee* or immigrant* or (asyl* adj1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi adj cultural*) or multicultural* or (newly adj arrived) or ((family or families) adj2 reuni*) or resettlement or (cultural adj1 (diversit* or pluralism))).ti,ab. (259123)
27 ((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*)).ti,ab. (40405)
28 or/17-27 [minorities] (779859)
29 7 and 16 and 28 [mass media, behavior, minorities] (4397)
30 clinical trial.mp. (632942)
31 clinical trial.pt. (505164)
32 random*.mp. (1085945)
33 randomised controlled trial.pt. (428912)
34 controlled clinical trial.pt. (91593)
35 multicenter study.pt. (209949)
36 pragmatic clinical trial.pt. (406)
37 (pre-post or "pre test*" or pretest* or posttest* or "post test*" or (pre adj5 post)).ti,ab. (86623)
38 ("quasi-experiment*" or quasiexperiment* or "quasi random*" or quasirandom* or "quasi control*" or quasicontrol* or ((quasi* or experimental) adj3 (method* or study or trial or design* or controlled))).ti,ab,hw. (125460)
39 ("time series" or "time points").ti,ab,hw. (82704)
40 (effect or impact or trial or intervention).ti. (1148249)
41 repeated measure*.ti,ab. (34209)
42 ((before adj5 after) or control group*).ti,ab. (638655)
43 (pretest-posttest study or pretesting or pre-post tests or quasi experimental design or quasi experimental study or quasi experimental study design or repeated measurement or repeated measurements or repeated measures or time series).kw. (483)
44 Controlled Before-After Studies/ (182)
45 Non-Randomized Controlled Trials as Topic/ (77)
46 Interrupted Time Series Analysis/ (206)
47 or/30-46 (3042682)
48 29 and 47 (1249)

Database: Embase 1974 to 2016 August 24
Search date: 2016-08-15

1 exp mass communication/ (429281)
2 consumer health information/ (2891)
3 exp multimedia/ (2863)
4 marketing/ (18599)
5 (radio or television or "tv" or campaign* or advert* or boards or newspaper* or maga?in* or brochure* or leaflet* or pamphlet* or cinema* or (mass adj (communication or media)) or internet or social media or blog* or facebook or twitter or instagram or podcast* or broadcast* or audiovisual or film* or movie* or ((cell or cellular or mobile) adj (telephone* or phone*))).ti,ab. (357025)
6 (("cd" or "cds" or dvd or dvds or video or videos) adj3 distribut*).ti,ab. (1078)

7 or/1-6 (729956)
8 alcohol consumption/ (93490)
9 exp "tobacco use"/ (257714)
10 smoking cessation/ (45485)
11 exp feeding behavior/ (146067)
12 exp physical activity/ (294347)
13 exp exercise/ (259814)
14 fitness/ (33483)
15 exp sport/ (122407)
16 ((alcohol* adj2 (drink* or consumption)) or (drinking adj5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) adj5 (activ* or exercis*)) or physical conditioning or running or jogging or swimming or walking or skiing or cycling or climbing or smok* or tobacco* or cigarette*).ti,ab. (2047701)
17 or/8-16 (2523625)
18 minority health/ (488)
19 exp "ethnic and racial groups"/ (102808)
20 exp "ethnic or racial aspects"/ (194153)
21 exp migration/ (40057)
22 refugee/ (8799)
23 exp population group/ (729630)
24 cultural anthropology/ (50115)
25 (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies).ti,ab. (243376)
26 (black or blacks or hispanic* or ((afro or african or asian or latin* or indian) adj1 american*)).ti,ab. (214006)
27 (refugee* or immigrant* or (asyl* adj1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi adj cultural*) or multicultural* or (newly adj arrived) or ((family or families) adj2 reuni*) or resettlement or (cultural adj1 (diversit* or pluralism))).ti,ab. (312602)
28 ((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*)).ti,ab. (40343)
29 or/18-28 (1408438)
30 7 and 17 and 29 (9946)
31 random:.tw. (1117293)
32 clinical trial:.mp. (1236961)
33 exp health care quality/ (2371751)
34 Randomized controlled trial/ (417044)
35 Quasi Experimental Study/ (3097)
36 Pretest Posttest Control Group Design/ (267)
37 Time Series Analysis/ (17373)
38 Experimental Design/ (12729)
39 Multicenter Study/ (142496)
40 (effect or impact or trial or intervention).ti. (1404932)
41 (pre-post or "pre test*" or pretest* or posttest* or "post test*" or (pre adj5 post)).ti,ab. (134214)
42 ("quasi-experiment*" or quasiexperiment* or "quasi random*" or quasirandom* or "quasi control*" or quasicontrol* or ((quasi* or experimental) adj3 (method* or study or trial or design* or controlled))).ti,ab,hw. (230820)
43 ("time series" or "time points").ti,ab,hw. (122771)
44 repeated measure*.ti,ab. (44685)
45 ((before adj5 after) or control group*).ti,ab. (850188)
46 (pretest-posttest study or pretesting or pre-post tests or quasi experimental design or quasi experimental study or quasi experimental study design or repeated measurement or repeated measurements or repeated measures or time series).kw. (3215)
47 or/31-46 (5818497)
48 30 and 47 (3763)
49 limit 48 to embase (3055)

Database: PsycINFO 1806 to July Week 4 2016

Search date: 2016-08-25

1 exp mass media/ (36387)
2 exp multimedia/ (24893)

3 exp newspapers/ (2199)
4 exp telecommunications media/ (14503)
5 exp internet/ (25571)
6 exp marketing/ (18275)
7 (radio or television or "tv" or campaign* or advert* or boards or newspaper* or maga?in* or brochure* or leaflet* or pamphlet* or cinema* or (mass adj (communication or media)) or internet or social media or blog* or facebook or twitter or instagram or podcast* or broadcast* or audiovisual or film* or movie* or ((cell or cellular or mobile) adj (telephone* or phone*))).ti,ab. (119163)
8 (("cd" or "cds" or dvd or dvds or video or videos) adj3 distribut*).ti,ab. (71)
9 or/1-8 (166518)
10 exp Alcohol Drinking Patterns/ (58564)
11 alcohol drinking attitudes/ (2773)
12 tobacco smoking/ (26156)
13 smoking cessation/ (10743)
14 eating behavior/ (9412)
15 food intake/ (13029)
16 food preferences/ (3941)
17 exp physical activity/ (30922)
18 running/ (1661)
19 swimming/ (1521)
20 walking/ (4306)
21 physical fitness/ (3644)
22 exp sports/ (20762)
23 ((alcohol* adj2 (drink* or consumption)) or (drinking adj5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) adj5 (activ* or exercis*)) or physical conditioning or running or jogging or swimming or walking or skiing or cycling or climbing or smok* or tobacco* or cigarette*).ti,ab. (319950)
24 or/10-23 (388847)
25 minority groups/ (12258)
26 exp "racial and ethnic groups"/ (107691)
27 ethnic identity/ (13316)
28 immigration/ (17746)
29 exp human migration/ (9348)
30 cross cultural differences/ (46625)
31 (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies).ti,ab. (34290)
32 (black or blacks or hispanic* or ((afro or african or asian or latin* or indian) adj1 american*)).ti,ab. (100887)
33 (refugee* or immigrant* or (asyl* adj1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi adj cultural*) or multicultural* or (newly adj arrived) or ((family or families) adj2 reuni*) or resettlement or (cultural adj1 (diversit* or pluralism))).ti,ab. (161507)
34 ((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*)).ti,ab. (41377)
35 or/25-34 (339616)
36 9 and 24 and 35 (2227)
37 control*.tw. (567694)
38 random:.tw. (156723)
39 exp treatment/ (657106)
40 experimental design/ (10227)
41 between groups design/ (106)
42 quantitative methods/ (2821)
43 quasi experimental methods/ (142)
44 repeated measures/ (625)
45 time series/ (1658)
46 ("0400" or "0451" or "1800" or "2000").md. (2019250)
47 (pre-post or "pre test$" or pretest$ or posttest$ or "post test$" or (pre adj5 post)).ti,ab. (43980)
48 ("quasi-experiment$" or quasiexperiment$ or "quasi random$" or quasirandom$ or "quasi control$" or quasicontrol$ or ((quasi$ or experimental) adj3 (method$ or study or trial or design$ or controlled))).ti,ab,hw. (51501)
49 ("time series" or "time points").ti,ab,hw. (16196)

50 (effect or impact or trial or intervention).ti. (186412)
51 repeated measure*.ti,ab. (13022)
52 ((before adj5 after) or control group*).ti,ab. (108768)
53 or/37-52 (2630095)
54 36 and 53 (1811)
Database: CINAHL
Search date: 2016-08-25

#	Query	Results
S54	S6 AND S24 AND S35 AND S52 Limiters - Exclude MEDLINE records	679
S53	S6 AND S24 AND S35 AND S52	2,842
S52	S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49 OR S50 OR S51	1,307,267
S51	TI (effect* or impact* or intervention* or before N5 after or pre N5 post or ((pretest or "pre test") and (posttest or "post test")) or quasiexperiment* or quasi W0 experiment* or evaluat* or "time series" or time W0 point* or repeated W0 measur*) OR AB (effect* or impact* or intervention* or before N5 after or pre N5 post or ((pretest or "pre test") and (posttest or "post test")) or quasiexperiment* or quasi W0 experiment* or evaluat* or "time series" or time W0 point* or repeated W0 measur*)	741,896
S50	TI (randomis* or randomiz* or randomly) OR AB (randomis* or randomiz* or randomly)	113,421
S49	(MH "Health Services Research+")	14,172
S48	(MH "Multicenter Studies")	13,763
S47	(MH "Quasi-Experimental Studies+")	8,629
S46	(MH "Pretest-Posttest Design+")	27,255
S45	(MH "Experimental Studies+")	171,110
S44	(MH "Nonrandomized Trials")	175
S43	(MH "Intervention Trials")	6,040
S42	(MH "Clinical Trials+")	136,322
S41	(MH "Randomized Controlled Trials")	27,706

(*Continued*)

S40	PT research	986,877
S39	PT clinical trial	52,803
S38	PT randomised controlled trial	30,672
S37	(MH "Interrupted Time Series Analysis")	16
S36	(MH "Controlled Before-After Studies")	7
S35	S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34	139,789
S34	TI (((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*))) OR AB (((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*)))	10,727
S33	TI ((black or blacks or hispanic* or ((afro or african or asian or latin* or indian) N1 american*))) OR AB ((black or blacks or hispanic* or ((afro or african or asian or latin* or indian) N1 american*)))	23,157
S32	TI ((indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies)) OR AB ((indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies))	11,923
S31	TI ((refugee* or immigrant* or (asyl* N1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi adj cultural*) or multicultural* or (cultural N1 (diversit* or pluralism)))) OR AB ((refugee* or immigrant* or (asyl* N1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi adj cultural*) or multicultural* or (cultural N1 (diversit* or pluralism))))	52,137
S30	(MH "Cultural Diversity")	7,341
S29	(MH "Refugees")	3,619
S28	(MH "Emigration and Immigration")	3,781
S27	(MH "Immigrants+")	8,117
S26	(MH "Ethnic Groups+")	79,372
S25	(MH "Minority Groups")	6,947

(*Continued*)

S24	S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23	327,166
S23	TI (((alcohol* N2 (drink* or consumption)) or (drinking N5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) N5 (activ* or exercis*)) or physical conditioning or running or jogging or swimming or walking or cycling or climbing or skiing or smok* or tobacco* or cigarette*)) OR AB (((alcohol* N2 (drink* or consumption)) or (drinking N5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) N5 (activ* or exercis*)) or physical conditioning or running or jogging or swimming or walking or cycling or climbing or skiing or smok* or tobacco* or cigarette*))	230,583
S22	(MH "Snow Skiing+")	345
S21	(MH "Cycling")	4,947
S20	(MH "Walking")	11,426
S19	(MH "Running+")	6,847
S18	(MH "Swimming")	2,043
S17	(MH "Physical Activity")	20,692
S16	(MH "Exercise+")	57,782
S15	(MH "Motor Activity")	4,381
S14	(MH "Eating Behavior+")	15,850
S13	(MH "Smoking Cessation Programs")	1,506
S12	(MH "Smoking Cessation")	11,297
S11	(MH "Smoking")	30,806
S10	(MH "Tobacco")	4,366
S9	(MH "Drinking Behavior+")	14,793
S8	(MH "Sports+")	41,721

(*Continued*)

S7	(MH "Physical Fitness+")	8,921
S6	S1 OR S2 OR S3 OR S4 OR S5	370,846
S5	(MH "Marketing+")	16,874
S4	(MH "Consumer Health Information")	8,649
S3	TI ((("cd" or "cds" or dvd or dvds or video or videos) N3 distribut*)) OR AB ((("cd" or "cds" or dvd or dvds or video or videos) N3 distribut*))	72
S2	TI ((radio or television or "tv" or campaign* or advert* or boards or newspaper* or magasin* or magazin* or brochure* or leaflet* or pamphlet* or cinema* or ((mass W0 (communication or media)) or internet or social media or blog* or facebook or twitter or instagram or podcast* broadcast* or audiovisual or film* or movie* or ((cell or cellular or mobile) W0 (telephone* or phone*)))))) OR AB ((radio or television or "tv" or campaign* or advert* or boards or newspaper* or magasin* or magazin* or brochure* or leaflet* or pamphlet* or cinema* or ((mass W0 (communication or media)) or internet or social media or blog* or facebook or twitter or instagram or podcast* broadcast* or audiovisual or film* or movie* or ((cell or cellular or mobile) W0 (telephone* or phone*))))))	56,745
S1	MH "Communications Media+"	327,780

Database: SveMed+
Search date: 2016-08-25

1	exp:"Communications Media"	3955
2	exp:"Consumer Health Information"	72
3	exp:"internet"	859
4	exp:"Marketing"	525
6	exp:"Drinking Behavior"	1214
7	exp:"Tobacco Use"	1262
8	exp:"Food Habits"	1398
9	exp:"Motor Activity"	2449

(*Continued*)

10	exp:"Exercise"	2090
11	exp:"physical fitness"	686
12	exp:"sports"	2477
13	exp:"Minority Groups"	92
14	exp:"Minority Health"	4
15	exp:"Population Groups"	437
16	exp:"Emigrants and Immigrants"	345
17	exp:"refugees"	613
18	exp:"Cultural Diversity"	139
19	exp:"human migration"	857
20	#1 OR #2 OR #3 OR #4	5088
21	#6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12	7219
22	#13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19	1852
23	#20 AND #21 AND #22	5

Database: Cochrane Central Register of Controlled Trials
Search date: 2016-08-25

#1	MeSH descriptor: [Internet] explode all trees	2580
#2	MeSH descriptor: [Communications Media] explode all trees	8714
#3	MeSH descriptor: [Consumer Health Information] explode all trees	280
#4	MeSH descriptor: [Marketing] explode all trees	412
#5	radio or television or "tv" or campaign* or advert* or boards or newspaper* or maga?in* or brochure* or leaflet* or pamphlet* or cinema* or internet or social media or blog* or facebook or twitter or instagram or podcast* broadcast* or audiovisual or film* or movie*	21774

(*Continued*)

#6	mass next (communicaton or media)	549
#7	(cell or cellular or mobile) next (telephone* or phone*)	1263
#8	(("cd" or "cds" or dvd or dvds or video or videos) near/3 distribut*)	18
#9	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8	28663
#10	MeSH descriptor: [Drinking Behavior] explode all trees	2918
#11	MeSH descriptor: [Tobacco Use] explode all trees	188
#12	MeSH descriptor: [Food Habits] explode all trees	2012
#13	MeSH descriptor: [Motor Activity] this term only	3400
#14	MeSH descriptor: [Exercise] explode all trees	16856
#15	MeSH descriptor: [Physical Fitness] explode all trees	2456
#16	MeSH descriptor: [Sports] explode all trees	11809
#17	((alcohol* near/2 (drink* or consumption)) or (drinking near/5 (behavio?r or habit*)) or nutrition* or diet* or food* or feed* or eating or meal or meals or ((physical or motor) near/5 (activ* or exercis*)) or (physical next conditioning) or running or jogging or swimming or walking or skiing or cycling or climbing or smok* or tobacco* or cigarette*)	146514
#18	#10 or #11 or #12 or #13 or #14 or #15 or #16 or #17	153505
#19	MeSH descriptor: [Minority Groups] explode all trees	6
#20	MeSH descriptor: [Population Groups] explode all trees	6601
#21	MeSH descriptor: [Minority Health] this term only	16
#22	MeSH descriptor: [Emigrants and Immigrants] this term only	124
#23	MeSH descriptor: [Refugees] this term only	80
#24	MeSH descriptor: [Cultural Diversity] this term only	79
#25	MeSH descriptor: [Human Migration] explode all trees	76

(*Continued*)

#26	(refugee* or immigrant* or (asyl* near/1 seek*) or foreign* or ethnic* or minorit* or racial* or (multi next cultural*) or multicultural* or (newly next arrived) or ((family or families) near/2 reuni*) or resettlement or (cultural near/1 (diversit* or pluralism)))	13000
#27	indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies	3574
#28	black or blacks or hispanic* or ((afro or african or asian or latin* or indian) near/1 american*)	13802
#29	((cultural* or language*) and (adapt* or accomodat* or approp* or target* or tailor*))	22085
#30	#19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or # 27 or #28 or #29	45204
#31	#9 and #18 and #30 in Trials	523

Database: Eric via ProQuest
Search date: 2016-08-25
(ti((media OR internet OR blog* OR facebook OR twitter OR instagram OR "tv" OR television OR radio OR cinema* OR movie* OR film* OR campaign* OR newspaper* OR magazin* OR magasin* OR phone* OR telephone* OR brochure* OR leaflet* OR pamphlet*) AND (alcohol* OR drinking OR food* OR feed* OR eating OR activity OR exercise OR running OR walking OR jogging OR swimming OR skiing OR cycling OR climbing OR smoking OR tobacco OR cigarette*) AND (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies or black or blacks or hispanic* or afro-american* or african-american* or asian-american* or latin-american* or indian-american* or "newly arrived" or "family reunion" or "family reunions" or resettlement or refugee* OR minorit* OR ethnic* OR immigrant* OR cultural) AND (random* OR control* OR pretest OR "pre test" OR posttest OR "post test" OR experiment* OR trial OR effect OR impact OR intervention* OR "time series" OR "repeated measures" OR "repeated measurements" OR "repeated measurement"))) OR (ab((media OR internet OR blog* OR facebook OR twitter OR instagram OR "tv" OR television OR radio OR cinema* OR movie* OR film* OR campaign* OR newspaper* OR magazin* OR magasin* OR phone* OR telephone* OR brochure* OR leaflet* OR pamphlet*) AND (alcohol* OR drinking OR food* OR feed* OR eating OR activity OR exercise OR running OR walking OR jogging OR swimming OR skiing OR cycling OR climbing OR smoking OR tobacco OR cigarette*) AND (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies or black or blacks or hispanic* or afro-american* or african-american* or asian-american* or latin-american* or indian-american* or "newly arrived" or "family reunion" or "family reunions" or resettlement or refugee* OR minority* OR ethnic* OR immigrant* OR cultural) AND (random* OR control* OR pretest OR "pre test" OR posttest OR "post test" OR experiment* OR trial OR effect OR impact OR intervention* OR "time series" OR "repeated measures" OR "repeated measurements" OR "repeated measurement"))) 1112
Database: Web of Science
Search date: 2016-08-25
("media" OR "internet" OR "blog" OR "facebook" OR "twitter" OR "instagram" OR "tv" OR "television" OR "radio" OR cinema* OR movie* OR film* OR campaign* OR newspaper* OR magazin* OR magasin* OR phone* OR telephone* OR brochure* OR leaflet* OR pamphlet*) AND (alcohol* OR "drinking" OR food* OR feed* OR "eating" OR "activity" OR "exercise" OR "running" OR "walking" OR "jogging" OR "swimming" OR "skiing" OR "cycling" OR "climbing" OR "smoking" OR "tobacco" OR cigarette*) AND (indig* OR aborig* OR native* OR inuit* OR eskimo* OR kalaallit* OR amerind* OR "romany" OR "romanies" OR "gypsies" OR "gipsies" OR "black" OR "blacks" OR hispanic* OR afro-american* OR african-american* OR asian-american* OR latin-american* OR indian-american* OR "newly arrived" OR "family reunion" OR "family reunions" OR "resettlement" OR refugee* OR minorit*

OR ethnic* OR immigrant* OR cultural*) AND (random* OR "control" OR "pretest" OR "pre test" OR "posttest" OR "post test" OR experiment* OR "trial" OR "effect" OR "impact" OR "intervention" OR "time series" OR "repeated measures" OR "repeated measurements" OR "repeated measurement") 4691

Database: PubMed

Search date: 2016-08-25

((((media OR internet OR blog* OR facebook OR twitter OR instagram OR "tv" OR television OR radio OR cinema* OR movie* OR film* OR campaign* OR newspaper* OR magazin* OR magasin* OR phone* OR telephone* OR brochure* OR leaflet* OR pamphlet*) AND (alcohol* OR drinking OR food* OR feed* OR eating OR activity OR exercise OR running OR walking OR jogging OR swimming OR skiing OR cycling OR climbing OR smoking OR tobacco OR cigarette*) AND (indig* or aborig* or native* or inuit* or eskimo* or kalaallit* or amerind* or romany or romanies or gypsies or gipsies or black or blacks or hispanic* or afro-american* or african-american* or asian-american* or latin-american* or indian-american* or "newly arrived" or "family reunion" or "family reunions" or resettlement or refugee* OR minorit* OR ethnic* OR immigrant* OR cultural) AND (random* OR control* OR pretest OR "pre test" OR posttest OR "post test" OR experiment* OR trial OR effect OR impact OR intervention* OR "time series" OR "repeated measures" OR "repeated measurements" OR "repeated measurement")))) AND publisher [sb] 206

Database: WHO International Clinical Trials Search Portal

Search date: 2016-10-19

Title= (media OR internet OR blog* OR facebook OR twitter OR instagram OR tv OR television OR radio OR cinema* OR movie* OR campaign* OR newspaper* OR magazin* OR magasin* OR phone* OR telephone* OR brochure* OR leaflet* OR pamphlet*) AND (indig* OR aborig* OR native* OR inuit* OR eskimo* OR kalaallit* OR amerind* OR romany OR romanies OR gypsies OR gipsies OR black OR blacks OR hispanic* OR afro-american* OR african-american* OR asian-american* OR latin-american* OR indian-american* OR newly arrived OR family reunion OR family reunions OR resettlement OR refugee* OR minorit* OR ethnic* OR immigrant* OR cultural) 15

Database: ClinicalTrials.gov

Search date: 2016-10-19

Mass media 147

Database: OpenGrey

Search date: 2016-10-19

("media" OR "internet" OR "blog*" OR "facebook" OR "twitter" OR "instagram" OR "tv" OR "television" OR "radio" OR "cinema*" OR "movie*" OR "campaign*" OR "newspaper*" OR "magazin*" OR "magasin*" OR "phone*" OR "telephone*" OR "brochure*" OR "leaflet*" OR "pamphlet*") AND ("alcohol*" OR "drinking" OR "food*" OR "feed*" OR "eating" OR "activity" OR "exercise" OR "running" OR "walking" OR "jogging" OR "swimming" OR "skiing" OR "cycling" OR "climbing" OR "smoking" OR "tobacco" OR "cigarette*") AND("indig*"OR "aborig*"OR "native*"OR "inuit*"OR "eskimo*"OR "kalaallit*"OR "amerind*"OR"romany" OR "romanies" OR "gypsies" OR "gipsies" OR "black" OR "blacks" OR "hispanic*" OR "afro-american*" OR "african-american*" OR "asian-american*" OR "latin-american*" OR "indian-american*" OR "newly arrived" OR "family reunion" OR "family reunions" OR "resettlement" OR "refugee*" OR "minorit*" OR "ethnic*" OR "immigrant*" OR "cultural") 192

Database: Grey Literature Report

Search date: 2016-10-19

Mass media 92
Television 45
Radio 44
Newspaper 2
Facebook 2
Twitter 5
Instagram 0
Blog 3
Cinema 0
Magazine 26
Brochure 5
Leaflet 0
Pamphlet 4
Phones 33
Telephones 53

Database: Eldis (via Eldis Google development websearch)

Search date: 2016-10-19
(media OR internet OR blogs OR facebook OR twitter OR instagram OR tv OR television OR radio OR cinema OR movie OR campaign OR newspaper OR magazines OR magasines OR phones OR telephones OR brochures OR leaflets OR pamphlets) AND (minorities) (limited to Eldis documents) First 100 references were screened.

Appendix 2. Unused methods due to the type of studies or data identified

This appendix describes sections from the review protocol with unused methods (Mosdøl 2015). We could not implement these because of characteristics of the included studies or the available data.

Unit of analysis issues
Unit of analysis error can occur if trials based on group allocation to treatment condition (cluster-RCTs, NRCTs and CBA studies) have not accounted for the effect of clustering in the statistical analyses. If possible, we will use an estimate of the intra-cluster correlation coefficient (ICC) derived from the trial and subsequently attempt to re-analyse the data according to the inflating standard errors method (Higgins 2011). If an ICC is not available, we will attempt to find an appropriate value based on the same/similar outcome from other relevant sources of ICC values. If none of these options is possible, we will report only the point estimate.

Dealing with missing data
We will contact the study authors if the study has incomplete or missing data. If missing data cannot be obtained, we will report this in the 'Risk of bias' table. If there are data missing on the primary outcomes, we will only present the study descriptively. We will note the level of attrition. As far as possible, we will conduct our analysis of randomised trials on an intention-to-treat basis.

Assessment of heterogeneity
We will base a first assessment of heterogeneity on the apparent characteristics of the studies regarding the population, intervention, comparison and outcomes. Judgments about whether meta analyses are appropriate will be based on the recommendations in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). If meta-analysis is considered meaningful, we will examine the forest plot to look for heterogeneity between studies and use the I^2 statistic to quantify it. We will advise caution in the interpretation of those results where there are high levels of unexplained heterogeneity, taking into account that the direction and size of the effects may influence the I^2 statistic value.

Assessment of reporting biases
If an outcome is reported in more than 10 studies and a meta analysis has been performed, we will examine the corresponding funnel plot without performing any formal tests. This will guide our assessment of potential small study effects such as publication bias.

Data synthesis
We will sort the included studies according to the intervention, measures and comparisons made. We will assess results for each comparison and collate them separately. If population, study design, intervention and outcome measures are similar enough across studies, we will conduct meta-analyses using RevMan 2014. If outcomes within a comparison are obtained from several study designs, we will present results from non-randomised designs separately. Where there is a sufficient number of studies reporting the same outcome with sufficiently homogeneous populations, interventions and comparisons, we will calculate a pooled risk ratio with 95%CIs for dichotomous data. For continuous outcomes, we will calculate the mean difference at follow-up with 95% CIs, or the standardised mean difference with 95% CIs as appropriate. In the same case for ITS design, we will use the difference between the expected value at one year follow-up based on the pre-intervention trend and the expected value at the same point in time based on the postintervention trend. If the differences are not available, we will attempt to re-analyse using data from graphs or tables through segmented time series regression (Ramsay 2003). We expect that there will be some heterogeneity between populations, interventions and studies, and will therefore use the random effects method in the analyses (Higgins 2011). We will present the meta-analyses results in both text and forest plots. If meta-analysis is not considered meaningful/appropriate, we will present descriptive data in text and tables.

Subgroup analysis and investigation of heterogeneity
If there are sufficient data, we will explore subgroup analysis on the primary research objective. We will analyse the comparison by the following criteria: which health behaviour was targeted (physical activity, dietary pattern, tobacco or alcohol), type of media used, whether only one type of mass media or two or more mass media channels were used, and intervention intensity. We will interpret all subgroup analysis carefully.

Sensitivity analysis
If there is a sufficient number of included studies, we will perform a sensitivity analysis excluding studies at high risk of bias.

CONTRIBUTIONS OF AUTHORS

Annhild Mosdøl (AM), Ingeborg Beate Lidal (IBL), and Gunn Elisabeth Vist (GEV) drafted the protocol. Gyri Hval Straumann (GGS) developed the search strategy. AM, IBL, and GEV screened based title/abstract and full text. AM and GEV did the data extraction, 'Risk of bias' and GRADE assessment. AM wrote most of the review and all authors read and approved last version.

DECLARATIONS OF INTEREST

Mosdøl: none known.

Lidal: none known.

Straumann: none known.

Vist: none known.

SOURCES OF SUPPORT

Internal sources

- Norwegian Knowledge Centre for the Health Services, Norway.
- The Norwegian Institute of Public Health, Norway.

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The study protocol states that review authors should use the Cochrane 'Risk of bias' tool for RCTs (Higgins 2011). However, we used the risk of bias criteria proposed for EPOC reviews for all study designs according to the appropriate study specific criteria (EPOC 2015).

INDEX TERMS

Medical Subject Headings (MeSH)

*Health Behavior; *Mass Media; African Americans; Alcohol Drinking [prevention & control]; Diet; Exercise; Feeding Behavior; Health Promotion [methods]; Hotlines [statistics & numerical data]; Interrupted Time Series Analysis; Minority Groups [*education]; Primary Prevention [*education]; Randomized Controlled Trials as Topic; Smoking Cessation; Smoking Prevention

MeSH check words

Adult; Humans