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Anti-tobacco mass media and socially disadvantaged groups: A systematic and methodological review

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Abstract

Issues: Only a limited amount of research has been conducted to explore whether there are socioeconomic status differences in responses to mass media. However, the methodological quality of this evidence has not been assessed, limiting confidence in conclusions that can be drawn regarding study outcomes. A systematic review of the effectiveness of anti-tobacco mass media campaigns with socially disadvantaged groups was conducted, and the methodological quality of included studies was assessed. **Approach:** Medline, The Cochrane Library, PsycInfo, Embase and Web of Science were searched using MeSH and keywords for quantitative studies conducted in Western countries prior to March 2012. A methodological quality assessment and narrative analysis of included studies was undertaken. **Key Findings:** 17 relevant studies (reported in 18 papers) were identified; however weak study designs and selection bias were common characteristics, limiting strong conclusions about effectiveness. Using predominantly non-cessation related outcome measures reviewed papers indicated mixed results for mass media tobacco control campaign effectiveness amongst various social groups. Most studies assessed mass media impact on low socioeconomic status groups rather than highly socially disadvantaged groups. **Implications:** Methodological rigour of evaluations in this field must be improved to aid understanding regarding the effectiveness of mass media campaigns in driving cessation among disadvantaged groups. **Conclusion:** The results of this review indicate a gap in methodologically rigorous research into the effectiveness of mass media campaigns amongst socially disadvantaged groups, particularly the highly disadvantaged.

Key words: Smoking; Disadvantaged; Socioeconomic factors; Social marketing; Mass media

INTRODUCTION

Despite significant falls in general population smoking prevalence rates in Australia, smoking is responsible for 7.8% of the national burden of disease [1, 2]. Smoking-related morbidity and mortality is an acknowledged cause of significant population health disparities [3]. A central aim of comprehensive tobacco control programs is to identify and eliminate tobacco-related disparities among population groups [4-7].

Mass media (e.g. radio, television, billboards and newspapers) is a persuasive tool for communicating messages to the community, shifting attitudes, and in some cases influencing health behaviours [8]. Campaigns are designed to either directly change individual smoking behaviour or to spur a process of change in social norms around smoking [9]. Awareness of tobacco-related health issues [10, 11], negative thoughts about smoking [12], cessation intentions [12], and calls to quitlines [13] have been found to increase with exposure to national advertising campaigns. In Australia, observational studies link increased exposure to ongoing anti-tobacco televised advertising to the reduction in adult population smoking prevalence rates [14].

In order to avoid exacerbating smoking-related health inequalities, mass media campaigns must have equal or greater impact with lower socioeconomic groups than they do for higher socioeconomic groups. Niederdeppe et al. [15] reviewed the literature examining media campaigns to promote cessation amongst low socioeconomic status (SES) populations. While noting a clear lack of investigation in this area, the review concluded that media campaigns are often less effective, sometimes equally effective, and rarely more effective among low SES relative to high SES groups [15]. The authors identified a logic framework specifying variations in access and exposure, motivational response, and opportunities to act following

mass media interventions may lead to SES disparities in campaign effects on sustained smoking cessation [15, 16]. Campaigns successful for low SES smokers were implemented alongside larger tobacco control programs.

The Niederdeppe et al. [15] review, while important and influential did not assess the methodological quality of the evidence used to evaluate effectiveness of cessation campaigns amongst low SES populations. Methodological quality is a key consideration for interpreting empirical evidence and providing practice recommendations [17]. Poor methodological quality may lead to Type I or Type II error [18], limiting confidence in conclusions that can be drawn regarding study outcomes. In addition to examining the methodological quality of this literature, it is important to include the relevant studies published since the Niederdeppe et al. review.

The aim of this paper is to:

- i) Systematically review the published evidence of the effectiveness of mass media campaigns (with the primary purpose of encouraging smokers to quit) with smokers from socially disadvantaged groups in terms of:
 - a. The differential effectiveness of mass media campaigns according to socio-demographic group
 - b. The effectiveness of campaigns targeted towards disadvantaged groups
- ii) Critique the methodological quality of the evidence for the effectiveness of mass media campaigns with disadvantaged groups.

METHOD

Search Strategy

The electronic databases Medline, The Cochrane Library, PsycInfo, Embase and Web of Science were searched for relevant studies published prior to March 2012. ‘Smoking’, ‘disadvantage’ and ‘mass media and social marketing’ related Medical Subject Heading terms and keywords were combined using the AND command (see online supplement for complete list). Previous reviews in the area and reference lists of retrieved articles were manually searched.

Inclusion Criteria

We conducted a search for literature presenting original data assessing the effects of anti-tobacco mass media campaigns and equity with adults aged over 18 years in western countries (Australia, US, UK, Canada and Western Europe). To meet inclusion, studies were required to assess general campaign impacts by some measure of equity or disadvantage, or investigate campaigns targeted towards disadvantaged groups. We restricted the review to quantitative studies published in English. The Cochrane Collaboration definition of mass media was used where mass media are 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. The purpose of the mass media campaign must be primarily to encourage smokers to quit [19].

Defining Socially Disadvantaged Groups

Social disadvantage can be measured many ways [20]. In this review studies were included if they described their sample according to social class, income, education, occupation, ethnic/racial group and/or socioeconomic status (measured as a global construct), or if they

described samples with characteristics associated with high smoking prevalence and socio-economic disadvantage such as: people with a mental illness and homeless people.

Data Extraction

The titles and abstracts of all identified papers were assessed for relevance independently by two reviewers and rejected on initial screening if the study did not meet the inclusion criteria. Studies meeting the inclusion criteria were subject to a full text review, and the reference lists of these studies were searched.

Methodological Quality Assessment

The methodological quality of studies was summarised using the Effective Public Health Practice Project Quality Assessment Tool [21] for quantitative studies (see <http://www.ehpnp.ca/Tools.html>). This tool is recommended for use with public health, health promotion and prevention research [22, 23] and although it has limitations when used with studies describing behavioural outcomes or population-level interventions (e.g. inability to blind, limited validity of self-report), it is the most appropriate tool available. Studies are rated as ‘weak’, ‘moderate’, or ‘strong’ against six components: selection bias (sample representativeness and consent rate); study design; control of confounders; blinding (whether assessors were blind to participant condition and whether participants were blind to the research question); data collection methods (whether data collection tools used were shown to be valid and reliable), and; withdrawals and drop-outs (whether reasons for attrition and final follow-up numbers were reported).

Data Synthesis

Due to variations in outcome measures between studies, a narrative analysis was undertaken. To address Aim (i) studies were defined as either assessing the differential effectiveness of general mass media campaigns or the effectiveness of campaigns targeted to disadvantaged population sub-groups. A campaign was deemed successful if it produced statistically significant differences between groups in 1) campaign exposure, e.g. awareness, recall, Gross Rating Points or Targeted Audience Rating Points, 2) campaign-related perceptions, e.g. perceived effectiveness, 3) motivational responses, e.g. quit interest and intentions, calls to quitlines, quit attempts and/or 4) cessation. To address Aim (ii) studies were rated as ‘weak’, ‘moderate’, or ‘strong’ against the six components of the quality assessment tool with the exception of the ‘blinding’ category which was not applicable for mass media interventions as generally participants cannot be blinded to whether or not they have received a mass media message. Due to this exception, the global rating (weak, moderate or strong) based on the sum of ratings across the six components, was not employed.

RESULTS

Search Results

A total of 529 references were found from the original literature search, with 52 papers identified as potentially eligible. A search of the reference lists of these papers produced an additional ten papers. Following full-text review 17 studies (reported in 18 papers) were included in the review (see Figure 1).

****Figure 1 here****

Description of Included Studies

Of the seventeen studies included, ten were conducted in the US [24-34], five in Australia [35-39], and two in New Zealand [40, 41]. The primary marker of disadvantage was ethnicity, reported in ten papers [24, 25, 27-29, 32-35, 39-41]. Ethnic groups included African Americans, Hispanic Americans, Vietnamese Americans, Australian Aboriginals and New Zealand Māori. Disadvantage was also defined by education in seven papers [25, 29-34, 36], income in two studies [30, 31] and a global measure of SES in two studies [26, 37, 38]. The main outcomes assessed were campaign exposure and perception measures, motivational response and cessation.

Effectiveness of general anti-tobacco campaigns according to socio-demographic group.

The studies assessing comparative effectiveness of general anti-tobacco campaigns amongst socio-demographic groups are summarised in Table 1. Two studies used measures of campaign exposure and were either less likely [29, 30] or equally likely [30] to be recalled by disadvantaged versus more advantaged smokers. Four studies looked at campaign perceptions: three found no differences in the perceived effectiveness of campaigns regardless of socio-demographic group [25, 29, 30], and a fourth found Indigenous Australians perceived a variety of TV ads as more effective than did non-Indigenous Australians, with the exception of two graphic health warning style ads that were perceived equally effective [39]. Motivational responses of smokers were assessed in five studies, with mixed results. Siahpush et al. [37] found low SES smokers were less likely to call a quitline in response to seeing an anti-tobacco campaign, while Durkin et al. [38] reported that although higher emotion narrative ads increased quitline calls, there was no significant difference across SES groups. Niederdeppe et al. [31] reported a campaign that featured 'keep-trying-to-quit' and 'how-to-quit' messages was equally effective in promoting quit

attempts among smokers regardless of income or education, and Stewart et al. [39] reported a variety of TV ads were equally effective in increasing quit intentions amongst Indigenous and non-Indigenous smokers. Pierce et al. [34] also recorded quitline call rates and caller demographics; however no significance testing on effectiveness was conducted. Finally, four studies assessed the effectiveness of campaigns in promoting cessation: three campaigns were equally effective [28, 31, 36], and one campaign was more effective [26, 32, 33] in reducing smoking rates in disadvantaged smokers compared to more advantaged smokers.

****Table 1 here****

Effectiveness of campaigns targeting disadvantaged groups.

Studies evaluating the effectiveness of disadvantaged-targeted campaigns are summarised in Table 2. One of six studies used a general population sample to assess the differential effectiveness of a campaign targeted to low SES smokers of diverse races. Vallone and colleagues [32, 33] found that the nationally broadcast “EX” branded campaign was more likely to be recalled and more effective in promoting cessation cognitions, quit attempts and reducing smoking rates in disadvantaged smokers compared to more advantaged smokers. The five remaining studies [24, 27, 35, 40, 41] evaluated targeted anti-tobacco campaigns with socially disadvantaged samples only; disadvantage was defined by ethnicity in all studies. Two studies used control groups to evaluate the effectiveness of campaigns developed specifically for disadvantaged populations, finding exposure to targeted interventions resulted in positive increases in recall and motivational response [24, 27]. The campaign targeting African American smokers resulted in a significant increase in calls to quitlines in intervention compared to control communities [24], while the campaign targeting American Vietnamese males found the intervention group had lower odds of being a smoker

at follow-up compared to the controls [27]. Two studies compared the effectiveness of disadvantage-targeted campaigns (Australian Aboriginal people [35] and New Zealand Māori [41]) and general population campaigns, finding that general campaigns were more effective than targeted interventions in promoting awareness and motivational response amongst socially disadvantaged samples. A similar study assessing the same Māori-targeted campaign as Wilson et al. [41] found that although between one half to three-quarters of both Maori smokers and their family rated the campaign as effective, there was no change in smokers' motivation to quit across the study period [40].

****Table 2 here****

Methodological Quality Assessment

Table 3 summarises the methodological quality of the included studies. Strong conclusions regarding study quality are difficult to make, as although the tool offers a global study rating, the 'blinding' criterion was not always applicable. Only four [24, 34, 37, 38] of the seventeen studies were rated as 'strong' or 'moderate' for all applicable assessment criteria. Fourteen studies (reported in 15 papers) were observational in nature [25, 26, 29-41], while three studies utilised quasi-experimental designs [24, 27, 28]. Weak study designs and selection bias were common limitations. Most studies reported using an appropriate statistical test, although seven of the 17 studies had a unit of allocation that differed from the unit of analysis. The integrity of interventions evaluated is likely to be moderate as although consistency of intervention implementation was reported in the majority of studies, co-intervention is likely to have occurred in most cases.

****Table 3 here****

DISCUSSION

The primary finding of the paper is that few studies have assessed the effectiveness of anti-tobacco mass media campaigns with socially disadvantaged groups in a methodologically rigorous way. Although the literature suggests mass media may sometimes be effective with disadvantaged groups, and that the relative effectiveness of mass media across SES-groups is variable, it is difficult to make confident conclusions regarding campaign impact on cessation rates. A lack of sound experimental design limits this review from making a general assessment of campaign effectiveness among socially disadvantaged smokers. Only five [26-28, 31, 36] of the seventeen studies included used measures of smoking cessation as their primary outcome.

The only previous similar review, conducted by Niederdeppe et al. [15], included interventions involving elements outside the Cochrane definition of a mass media intervention such as financial incentives (quit-to-win contests) and community health programs. Niederdeppe et al. reported that disadvantage-related disparities in campaign effectiveness may arise through differences in exposure, response, and opportunity to act, but that general population campaigns are most often less or equally effective among low relative to high SES populations. Niederdeppe et al. did not include a methodological critique of their included studies, thus limiting the validity of their results. The results of the current methodological review suggests there is insufficient evidence to confidently state mass media campaigns are effective in promoting cessation for socially disadvantaged groups, or similarly effective for groups of high versus low SES.

Keeping the methodological limitations of this field in mind, while socially disadvantaged smokers may be less likely to recall general population campaigns compared to more advantaged groups, they may be equally likely to perceive these campaigns as effective and to quit in response. The findings in relation to disadvantage-targeted campaigns are mixed. Campaigns developed for, marketed to, and evaluated with disadvantaged groups-only were successful in achieving recall and response. Assessed using a general population sample, the 'EX' branded national campaign targeting low SES smokers of diverse race [32, 33] reached and was more effective with low versus higher SES smokers. However, when general population and targeted campaigns, both airing nationally, were compared in disadvantaged-only samples, disadvantaged smokers were more likely to recall and respond to the general compared to the disadvantage-targeted campaigns. These findings suggest that general population campaigns have the potential to be effective with disadvantaged population sub-groups.

Implications for research, practice and policy

A key observation of this review was literature in this area tends to focus on disadvantage in terms of low SES. Given disadvantage ranges from those who experience low-moderate SES to those who experience multiple forms of socioeconomic disadvantage, assessment of mass media campaign effectiveness for the highly disadvantaged is absent from the literature.

While smoking rates for low SES groups are 24.6% [42], rates are much higher for highly socially disadvantaged groups such as Indigenous populations (38 – 50%) [42-44], homeless people (77 – 93%) [2, 45], and those with substance misuse problems (74 – 100%) [2, 46] and severe mental illness (70 – 88%) [2, 46], many of whom experience multiple forms of disadvantage. Although these groups are viewed as hard-to-reach, a greater onus should be placed on accessing and incorporating population sub-groups in future evaluations of media

campaigns. Currently, the evaluative literature in this area is most often based on population-level telephone or web-based surveys and highly disadvantaged groups are under-represented.

The results of this review support the call made by Lawrence and colleagues [47, 48] for more rigorous methodology to improve evaluation of population-based tobacco control approaches. Quality assessment of the papers included in this review showed most studies in this area are methodologically weak, with the majority using observational designs. Although large and costly, it may be useful to examine the effectiveness of mass media campaigns using rigorous methodology such as community-based cluster randomised trials or multiple baseline design studies in order to first establish high level evidence for their effectiveness before wide-spread dissemination [49, 50]. Examples of this type of research exist in other areas of public health, e.g. randomised control trial to increase HIV testing rates [51], sequential randomised trials to evaluate mammography screening interventions [52], and controlled time series designs to assess the effectiveness of drink driving advertisements [53] and public service announcements to increase condom use [54]. We recognise, as many have argued [55, 56], that it is not always practical or possible to implement such designs, however the minimum level of evaluative evidence needs improvement.

Limitations

Due to the high amount of variability across study designs and outcome measures, a meta-analysis of the results of studies could not be conducted limiting the review to a qualitative synthesis of the data. Grey literature was not pursued and therefore some studies may have been omitted. However, grey literature is not likely to contain large numbers of studies reporting rigorous evaluation designs. While the tool we used for the methodological

assessment is validated [21] and commonly accepted [22, 23], we were unable to apply the global study ratings as not all assessment criteria could be applied across studies. There is clearly a need for a methodological quality assessment tool for studies reporting population-level approaches. In addition, due to the inclusion of disadvantage-related search terms, it is possible that studies assessing differences across socio-demographic variables may have been missed if assessment of disadvantage was not a key aim or outcome of the paper. It should also be acknowledged that ‘real world’ evaluations such as those for mass media are likely to have ecological validity which was not assessed as part of methodological quality in this review.

Conclusion

The results of this paper suggest that the methodological rigour of campaign evaluation studies must be improved before strong conclusions regarding the effectiveness of mass media campaigns in driving cessation among disadvantaged groups can be reached. It is also recommended that future research in this area focus on including highly socially disadvantaged populations, as these individuals are currently under-represented in the literature.

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Table 1. Studies assessing differential effectiveness of mass media campaigns according to socio-demographic group.

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
Davis et al., 2011 US [25]	Observational Cross-sectional online survey; five waves over 2 years.	<u>Ethnicity</u> : W (81.9%), AA (5.3%), H (5.7%), unknown (7.2%). <u>Education</u> : <high school (2.2%), high school (20.4%), some college (41.1%), college graduate + (36.4%)	P's viewed anti-smoking TV ads from each of 4 categories: 1) why to quit – graphic images, 2) why to quit – testimonial, 3) how to quit, and 4) anti- industry.	<i>Campaign perceptions</i> : 4- item perceived effectiveness scale (persuasiveness, believability, processing)	Descriptive and multivariable analyses Ordinary least squares regression models	<i>Campaign perceptions</i> : <u>Ethnicity</u> . (+) <u>Education</u> . (0)
Durkin et al., 2009 US [26]	Observational Longitudinal survey Response rate: 46% 2-year follow- up rate: 56%	<u>SES</u> : low SES (24.6%), mid SES (30.9%), high SES (29.8%). SES defined as composite measure of income and education.	134 anti-smoking ads aired during baseline data collection (1999-2002). Ads categorised as: 1) highly emotional or personal testimonial ads; 2) comparison ads	<i>Cessation</i> : 1- month point prevalence abstinence (measured at 2- year follow-up)	Multivariate logistic regression	<i>Cessation</i> : (+) for emotionally evocative ads only.
Durkin et al.,	Observational	<u>SES</u> : low SES	During the period 10	<i>Motivational</i>	Negative	<i>Motivational response</i> :

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
2011 Australia [38]	Assessment of quitline call volume, anti- smoking ad type, SES and TARPs	(18.6%), mid-low SES (16.19%), mid-high SES (28.53%), high SES (36.68%). SES defined by quitline caller postcode.	December 2006 – 31 December 2008, 13 ads designed to motivate smokers to quit (and included the Quitline number) were aired in the state of Victoria. Ads categorised as: 1) high emotion narrative; 2) high emotion non-narrative; 3) low emotion narrative; 4) low emotion non-narrative	<i>response</i> : number of calls to Quitline during study period by ad type	binomial regression	(0) (non-significant trend for interaction between SES and high emotion narrative TARPs)
Macaskill et al., 1992 Australia [36]	Observational Pre (conducted 1983) and post (conducted 1988) cross- sectional surveys	<u>Education</u> : 1) Up to 9yrs; 2) Intermediate high school; 3) Completed high school; 4) Some university	Mass media-led anti- smoking campaigns conducted in the 1980s in two cities: Sydney and Melbourne.	<i>Cessation</i> : 5 year declines in smoking prevalence	Multiplicative regression models as well as Mantel- Haenszel age- adjusted rate ratios and 95% CI	<i>Cessation</i> : <u>Education</u> : (0) one exception
McAlister et al., 2004	Quasi- experimental	Followed-up sample	<u>Media campaign</u> : combined TV, radio,	<i>Campaign exposure</i> : self-	Chi-square analyses	<i>Campaign exposure</i> : not compared

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
US [28]	pre/post cross-sectional design. Longitudinal sub-sample of smokers followed up at 7 months.	<u>Ethnicity</u> : W (82.9%); AA (8.3%); H/Mexican/ Latino (6%); Asian (0.2%); other (2.6%).	newspaper and billboard ads. <u>Community programs</u> : cessation counselling services and pharmacological therapy. 19 communities assigned to 14 treatment conditions categorised by various levels of media and/or community program activity.	reported frequency of exposure to media messages over last 30 days. <i>Cessation</i> : 7-month decline in daily smoking rates	Logistic regression	<i>Cessation</i> : <u>Ethnicity</u> : (0)
McCausland et al., 2009 US [29]	Observational Three cross-sectional telephone surveys that were geographically separate and each targeted	<u>Ethnicity</u> : W (<i>N</i> = 435); AA (<i>N</i> = 301); H (<i>N</i> = 271) <u>Education</u> . \leq High school: W(40%), AA (54%), H (67%). <i>Some college</i> : W (27%), AA (26%), H (22%).	“EX” is a branded, general population adult smoking cessation campaign 3-month ‘EX’ branded campaign TV ads focused ‘re-learning’ life without cigarettes. Community outreach effort supported the	<i>Campaign exposure</i> : Confirmed and aided awareness <i>Campaign perceptions</i> : receptivity to ‘EX’ campaign (perceived	Chi-square tests	<i>Campaign exposure</i> : <u>Ethnicity</u> : (-) one exception (AA and W no difference) <u>Education</u> : not compared <u>Employment status</u> : not compared <i>Campaign perceptions</i> : <u>Ethnicity</u> : (0)

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
	one ethnicity.	<p>≥<i>College degree</i>: W(33%), AA (20%), H (11%).</p> <p><u>Employment status</u>. <i>Unemployed</i>: W (12%), AA (17%), H (17%). <i>Not in workforce</i>: W (31%), AA (40%), H (38%). <i>Employed</i>: W (57%), AA(42%), H (47%).</p>	campaign.	effectiveness).		<p><u>Education</u> (collapsed across ethnicity): (0) <u>Employment status</u> (collapsed across ethnicity): (0)</p>
Niederdeppe et al., 2011 US [30]	Observational Cross-sectional web-based survey conducted over five waves between 2007 – 2009.	<p><u>Education</u>: average years (measured as continuous variable).</p> <p><u>Income</u>: total household income (midpoint of income categories used to create continuous</p>	P's exposed to 4 – 6 ads via online multimedia within the survey. Ads came from five categories: (1) Why – graphic; (2) Why – testimonial; (3) How to quit; (4) Anti- industry; (5) Secondhand smoke (not included in analysis)	<p><i>Campaign exposure</i>: Aided ad recall</p> <p><i>Campaign perceptions</i>: Perceived effectiveness</p>	<p>Logistic regression (to predict aided ad recall)</p> <p>Ordinary least squares regression (to predict effectiveness)</p>	<p><i>Campaign exposure</i>: <u>Education</u>: (-) <u>Income</u>: (0) (one exception – ‘how to quit’ ads)</p> <p><i>Campaign-related perceptions</i>: <u>Education</u>: (0) (one exception – ‘how to</p>

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
		variable).				quit' ads) <u>Income</u> : (0) (one exception – 'how to quit' ads)
Niederdeppe et al., 2008 US [31]	Observational Longitudinal survey	<u>Education</u> . High school degree or less (47%); Some college education (33%); College degree (20%). <u>Income</u> (household). <\$25,000 (31%); \$25,000 - \$49,999 (36%); ≥\$50,000 (29%); not reported (4%).	TV smoking-cessation media campaign between May 2002 and December 2003; 2 message approaches: 'keep trying to quit' and 'secondhand smoke'. A subset of 'keep trying to quit' ads was targeted to lower-SES and specific racial/ethnic populations.	<i>Campaign exposure</i> : Ad recall <i>Motivational response</i> : Quit attempts <i>Cessation</i> : 1-year declines in smoking prevalence	Multiple logistic regression	<i>Campaign exposure</i> : not compared. <i>Motivational response</i> : <u>Education</u> : mixed (-) for 'keep trying to quit' ads; (0) for secondhand smoke ads. <u>Income</u> : (0) <i>Cessation</i> : <u>Education</u> : (0) <u>Income</u> : (0)
Pierce et al., 1992 US [34]	Observational Assessment of Cancer	<u>Ethnicity</u> . W; AA <u>Education</u> . ≤12 years	Between 1983 and 1987, 12 different anti-smoking public service announcements aired on	<i>Motivational response</i> : number of smoking- related calls to the	No significance testing conducted	<i>Motivational response</i> : % called during TV promotion: <u>Ethnicity</u> : W (87.4%);

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
	Information Service phone line call volume, caller demographics and number of public service announcement s	(high school or less); ≥12 years (some college)	US television.	Cancer Information Service telephone line during periods of television or no television promotion	(number of calls, number of public service announcement spots, demographics presented as percentages)	AA (12.6%) <u>Education</u> : ≤12yrs (54.9%); ≥12yrs (45.0%) % called during periods of no TV promotion: <u>Ethnicity</u> : W (87.4%); AA (12.6%) <u>Education</u> : ≤12yrs (49.5%); ≥12yrs (50.5%)
Siahpush et al., 2007 Australia [37]	Observational Assessment of Quitline call volume, SES and TARPs	<u>SES</u> . Quintiles of SES: first (high disadvantage; 25.8%), second (18.1%), third (14.8%), fourth (17.0%), and fifth (low disadvantage; 24.3%).	Between January 2001 and March 2004 various adverts related to the health risks of smoking (and one anti-industry) that also promoted the Quitline were aired in Victoria, Australia.	<i>Motivational response</i> : number of calls to Quitline during study period	Negative binomial regression	<i>Motivational response</i> : <u>SES</u> : (-)
Stewart et al. (2011) Australia [39]	Observational Cross-sectional survey	<u>Ethnicity</u> : Indigenous (Aboriginal & Torres Strait Islander) Australians (<i>N</i> = 143); Non-Indigenous (<i>N</i> =	P's exposed to 10 anti- smoking advertisements (9 of which had all previously aired in Australia, and one from	<i>Campaign perceptions</i> : 11- item questionnaire assessing message	Logistic regression	<i>Campaign perceptions</i> : <u>Ethnicity</u> : (+) (two exceptions – both graphic ads)

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Study Year Country Ref. #	Study type	Socio-demographic groups compared	Intervention	Exposure & Outcome Measures	Analyses	Results (differences found in compared groups?)
		156).	New Zealand) during a group testing session.	acceptance, personalised effectiveness, new information, uncomfortable, effective, and discuss categories. <i>Motivational response: ad most likely to make P want to quit</i>		<i>Motivational response:</i> <u>Ethnicity</u> : (0) (three exceptions: 2 +; 1 –)

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; P = participants; TARPs = Targeted Audience Rating Points

Table 2. Study assessing effectiveness of mass media campaigns with disadvantaged-only samples.

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
Boyd et al., 1998 US [24]	Randomised pre-post control group Monitoring of calls to Cancer Information Service (CIS)	<u>Ethnicity</u> : AA smokers 14 communities (7 pairs) matched on demographics (AA, income, gender, age, education, below poverty line, dwellings with telephones). 4/19 CIS regional offices consented to involvement (21%).	QuitToday! Campaign developed for and marketed to AA audience program timeslots and channels. Intervention N=7 communities. 10 weeks paid TV and radio advertising across two waves (1. Aug – Sept 1994; 2. April – May 1995). Control N=7 communities. No intervention.	<i>Motivational response</i> : number, proportion and sources of calls to CIS offices from AA smokers.	Ordinary least squares regression model	<i>Motivational response</i> : Intervention period calls from AA smokers: 81.8% (I) vs. 25.9% (C) (p<.008). Intervention only: AA CIS calls/week: baseline (1.9); wave 1 (86) (vs. baseline, p=.0001); wave 2 (40) (vs. baseline, p=.0001). QuitToday! source: radio - AA (53.70%) vs. other (21.5%); TV -AA (41.63%) vs. other (61.68%)
Boyle et al., 2010	Observational	<u>Ethnicity</u> : Aboriginal smokers	“Bubblewrap” ad broadcast over 7 week	<i>Campaign exposure</i> :	Chi-square tests	<i>Campaign exposure</i> : Higher for TV vs. radio

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at p<.05 level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = ‘Every cigarette is doing you damage’ campaign; IAW = ‘It’s About Whānau’ campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
Australia [35]	Personal intercept survey in July 2008 Convenience sampling in various locations across three sites (Perth metropolitan area; non-metropolitan towns Kalgoorlie and Broome)	Aboriginal smokers, $N = 198$, 45% male, 18-50+yo	campaign periods in May – June 2008 as part of state-wide general population ‘Make Smoking History’ campaign. Original 30-sec TV ad and 60-sec radio ad (both aired on metropolitan, regional and indigenous (TV ad only) stations); plus new 60-sec radio ad specifically targeting adult Aboriginal smokers (aired on regional and indigenous stations only).	awareness <i>Campaign perceptions:</i> believability, relevance <i>Motivational response:</i> impact on smoking behaviour		($p < .01$). Unprompted: TV 83.3% vs. radio 29.9%. Prompted: TV 89.9% vs. radio 34%. <i>Campaign-related perceptions:</i> No difference between TV and radio. ‘Believable’ – TV 87.6% vs. radio 82.5%. ‘Relevant’ – TV 83.7% vs. radio 77.4% . <i>Motivational response:</i> As result of seeing ad: 81.1% thought about cutting down amount smoked; 68.1% thought about quitting; 59% discussed quitting with friends/family; 26.5% got more info from health

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = ‘Every cigarette is doing you damage’ campaign; IAW = ‘It’s About Whānau’ campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
						professional
						<u>Smoking behaviour:</u> In 2 months prior to study: 25.1% tried vs. 1.5% succeed to quit; 31.8% tried vs. 30.3% succeed to cut down.
Grigg, et al., 2008 New Zealand [40]	Observational Pre (July 2001) and post (September 2002) cross-sectional surveys: computer-assisted telephone interview questionnaires	<u>Ethnicity:</u> Māori <u>Māori Smokers</u> Baseline: <i>N</i> = 254, Follow-up: <i>N</i> = 404 <u>Family of Māori smokers (Whānau).</u> Baseline: <i>N</i> = 219 Follow-up: <i>N</i> = 251	“It’s About Whānau” television campaign depicting Māori smokers and family of Māori ex- smokers delivering testimonial messages of what it was like to quit smoking. Aired on all free-to-air TV channels in New Zealand and featured the Quitline number. Campaign launched	<i>Campaign exposure:</i> Unprompted and prompted recall <i>Campaign-related perceptions:</i> campaign perceptions at follow-up <i>Motivational response:</i> Change in motivation to quit (stage of	Analysis method not documented; probably chi-square tests	<i>Campaign exposure:</i> Total recall (unprompted and prompted) for ad at follow up: smokers 78% vs. family 73% <i>Campaign perceptions:</i> Thought-provoking: smokers 48% vs. family 54%; Believable: smokers 73% vs. family 75%; Relevant: smokers 67% vs. family 64%; Influence quitting: smokers 54% vs. family 51%

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = ‘Every cigarette is doing you damage’ campaign; IAW = ‘It’s About Whānau’ campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
			nationally in August 2001.	change) between baseline and follow-up; ad prompting discussions about smoking at follow-up		<i>Motivational response:</i> No change in smokers' motivation to quit. Ad prompted discussions about smoking: smokers 79% vs. family 70%
Jenkins et al., 1997 US [27]	Quasi-experimental Cross-sectional telephone surveys	<u>Ethnicity:</u> American Vietnamese males <u>Pretest.</u> (C): <i>N</i> = 1581; (I): <i>N</i> = 1133 <u>Posttest.</u> (C): <i>N</i> = 1209; (I): <i>N</i> = 1202	<u>Intervention area:</u> 1) Vietnamese-language anti-tobacco TV ad; 2) health education materials; activities targeting: 3) physicians, 4) youth, 5) businesses. (Plus usual state tobacco control activities). <u>Control area:</u> Houston, Texas. No intervention implemented, usual state tobacco control activities.	<i>Campaign exposure:</i> Aided recall <i>Cessation:</i> 1) change in proportion of current smokers from pre- to post-test; 2) proportion who had quit smoking during the 2 years prior to either the pretest or posttest interview.	Multiple logistic regression	<i>Campaign exposure:</i> Increased for 4/5 elements of campaign (not newspaper articles) for intervention community vs. control (<i>p</i> <.05). Smokers more likely than non-smokers to recall campaign elements in both intervention (<i>p</i> <.01) and control (<i>p</i> <.01). <i>Cessation:</i> Current smokers: No change in either intervention or control; [post-C (40.9%) vs. post-I

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at *p*<.05 level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = 'Every cigarette is doing you damage' campaign; IAW = 'It's About Whānau' campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
						(33.9%, $p < .01$].
						Quit during prior 2yrs: Increased in intervention, no change in control; [post-C (7.4%) vs. post-I (10.2%), $p = .017$].
<i>One campaign reported in two papers:</i>	Observational Longitudinal survey	<u>Ethnicity</u> . W(74.1%); AA (11.5%); H(7.4%) <u>Education</u> . <High school (19.6%); high school diploma (43%); some college (26.6%); ≥college degree (10.7%).	“EX” campaign: 6-month (March – Sept 2008) national smoking cessation advertisements. Branded mass media campaign aimed to encourage disadvantaged adult smokers to quit.	<i>Campaign exposure:</i> confirmed awareness <i>Motivational response:</i> Changes in cessation-related cognitions index; quit attempts (≥24hrs; between baseline and follow-up).	Multivariate logistic and linear regression analyses	<i>Campaign exposure [33]:</i> <u>Ethnicity</u> : (+) <u>Education</u> : (+) <i>Motivational response [33]:</i> <u>Ethnicity</u> : (+) <u>Education</u> : (+) <i>Cessation [32]:</i> <u>Ethnicity</u> : (+) <u>Education</u> : (0)
Vallone et al., 2011 US [32]	Consent rate: 66% of eligible P’s participated; 73% 6-month follow-up					
Vallone, Niederdeppe et al., 2011 US [33]	response rate; 48% overall response rate.					
				Cessation: 30-day		

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = ‘Every cigarette is doing you damage’ campaign; IAW = ‘It’s About Whānau’ campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Study Country	Study Type	Target Population	Intervention	Exposure & Outcome Measures	Analyses	Results
				point prevalence abstinence at 6-month follow-up.		
Wilson et al., 2005 New Zealand [41]	Observational Assessment of Quitline call data, TARPs, expenditure on TV campaigns, ethnicity	<u>Ethnicity</u> : Māori Quitline calls registered as coming from Māori during years 2002 and 2003	Two campaigns, each advertising Quitline “Every cigarette is doing you damage” (EC) campaign “It’s about whānau” (IAW) campaign	<i>Motivational response</i> : Monthly Quitline call data and calls within one hour of a television commercial	Rate ratios reported – method of analysis not stated; possibly logistic regression.	<i>Motivational response</i> : <u>Monthly calls</u> . During 6 ‘intense’ months (over 480 TARPs/month): 15.2% increase in Māori callers <u>Campaign effectiveness</u> . EC vs. IAW generated more calls to Quitline within one hour of a commercial airing (rate ratio= 1.26; 95% CI = 1.08 to 1.46).

Results section: (0) = no difference, (+) = more effective, (-) = less effective for disadvantaged vs. more advantaged in statistically significant differences at $p < .05$ level.

AA = African American / non-Hispanic Black; W = White; H = Hispanic; SES = socioeconomic status; EC = ‘Every cigarette is doing you damage’ campaign; IAW = ‘It’s About Whānau’ campaign; CIS = Cancer Information Service; TARPs = Targeted Audience Rating Points; C = control group; I = intervention group

Table 3. Assessment of methodological quality.

	Selection Bias	Study Design	Confounders	Blinding	Data Collection	Withdrawals
Boyd et al., 1998 [†] [24]	M	M	S	M	S	N/A
Boyle et al., 2010 [†] [35]	W	W	*	*	W	N/A
Davis et al., 2011 [25]	W	W	S	*	S	N/A
Durkin et al., 2009 [26]	W	W	S	*	W	W
Durkin et al., 2011 [38]	M	M	S	*	S	N/A
Grigg et al., 2008 [†] [40]	W	W	S	*	W	W
Jenkins et al., 1997 [†] [27]	M	W	S	M	W	N/A
Macaskill et al., 1992 [36]	M	W	S	*	S	N/A
McAlister et al., 2004 [28]	W	W	W	M	S	W
McCausland et al., 2009 [29]	M	W	W	*	W	N/A
Niederdeppe et al., 2008 [31]	W	W	S	*	M	W
Niederdeppe et al., 2011 [30]	W	W	W	*	S	W
Pierce et al., 1992 [34]	S	M	S	*	S	N/A
Siahpush et al., 2007 [37]	M	M	S	*	S	N/A
Stewart et al., 2011 [39]	M	W	W	W	M	S

W = Weak; M = Moderate; S = Strong

*The rating category does not apply to the study reviewed (note this is not the same as “N/A” which is a rating tool label).

[†]These studies assessed only socially disadvantaged samples.

Vallone, Duke et al., 2011 [32]	W	M	S	*	S	M
Vallone, Niederdeppe et al., 2011 [33]	W	M	S	*	S	M
Wilson et al., 2005 [†] [41]	W	W	*	*	S	N/A

W = Weak; M = Moderate; S = Strong

*The rating category does not apply to the study reviewed (note this is not the same as “N/A” which is a rating tool label).

[†]These studies assessed only socially disadvantaged samples.

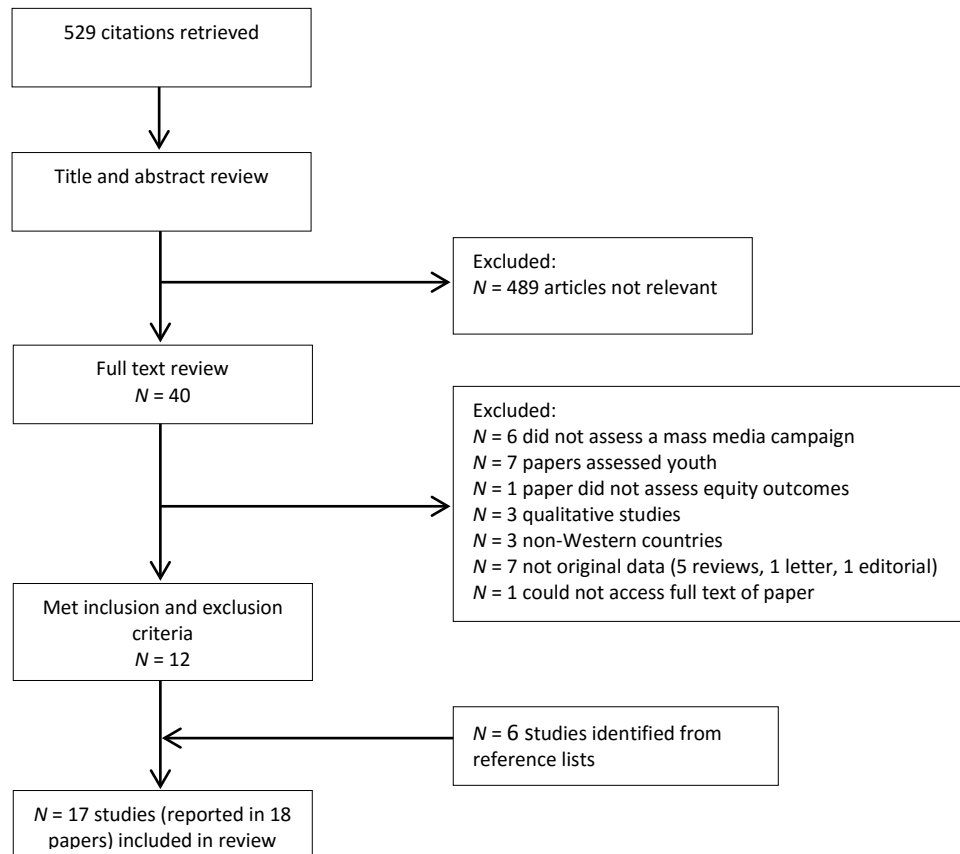


Figure 1. Flow chart of search strategy and study selection.