REVIEW

Why are anti-smoking health-information interventions less effective among low-socioeconomic status groups? A systematic scoping review

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Abstract

Issues. This paper identifies and synthesises explanations proposed in the literature for the (in)effectiveness of institutional anti-smoking health-information interventions (HII) among low-socioeconomic status (SES) adults in high-income countries.

Approach. We searched eight databases for relevant papers from various disciplines: Studies published in English since 2009, on the effectiveness among low-SES adults of anti-smoking HIIs, aimed at changing knowledge/behaviour, and conducted by official institutions, were included. Through a scoping review, we synthesised: study design, SES indicator, intervention type, intervention source, study population, outcomes, low-SES effects, equity effects, proposed explanations and whether these were studied empirically.

Key Findings. Thirty-eight studies were included in this scoping review. Seventeen suggested explanations for the (in)effectiveness of the HIIs in low-SES adults, but only nine assessed them empirically. Thematic analysis yielded six themes: message engagement, material conditions, cognition, risk perception, social environment and self-efficacy.

Implications. Explanations for intervention results are not always present, and empirical evidence for explanations is often not provided. Including such explanations and testing their empirical merits in future research can provide the crucial information needed for developing more effective anti-smoking HIIs for low-SES adults.

Conclusions. To our knowledge, this is the first review to explore the explanations proposed for why anti-smoking HIIs are (in)effective among low-SES adults. It contains insights for future studies aiming to provide empirical evidence on the causes of this (in)effectiveness, and concludes that such research is yet largely missing, but crucial to the quest for more effective and equitable anti-smoking interventions. [van Meurs T, Çoban FR, de Koster W, van der Waal J, Groeniger JO. Why are anti-smoking health-information interventions less effective among low-socioeconomic status groups? A systematic scoping review. Drug Alcohol Rev 2022;41:1195–1205]

Key words: anti-smoking health information, effectiveness, health inequality, scoping review, social inequality.

Introduction

Smoking is a major risk factor for illnesses such as (lung) cancer, coronary heart disease and stroke; in fact, half of those who develop tobacco-related conditions die prematurely [1,2]. Globally, cigarette consumption is the second greatest risk factor for premature death and disability [3]. Despite a declining smoking prevalence in high-income countries, smoking remains a serious public health concern [4]. Indeed, the rates of smoking and unsuccessful cessation remain high, particularly among those with a lower socioeconomic status (SES; commonly measured by income, education or occupation) [5].

Countries have made considerable efforts to implement ‘stop-smoking’ interventions, not only as a way to improve general population health, but to also tackle socioeconomic inequalities in well-being [6]. While
structural interventions (e.g. price increases) have been shown to reduce smoking rates across all SES groups [7,8], the effectiveness of health-information interventions (HII) like mass-media campaigns and health-warning labels often proves to be lower among low-SES groups [7–10]. Some interventions do have a positive effect on low-SES groups, albeit equal or lower compared to high-SES groups, while other interventions are simply ineffective among the former. In these situations, the health gap between SES groups is either maintained or increased. Other interventions do decrease the gap, although these are rare. While aforementioned differences in effectiveness between SES groups are widely acknowledged, the question of why they occur largely remains uncharted territory.

Information provision remains the intervention of choice by various governmental and health institutions in high-income countries, despite the uncertainty of what makes them (not) work as intended. If the equity of anti-smoking HIIs is to be improved, it is crucial to identify why these interventions are especially (in)effective among low-SES groups. There is, however, no comprehensive overview of possible explanations and the empirical evidence supporting them. Moreover, prevailing accounts can differ across disciplines and research fields, making it all the more important to synthesise what is currently known.

In this study, we carried out a systematic scoping review, including a thematic analysis, to uncover: (i) the prevailing explanations for the (in)effectiveness among low-SES adults in high-income countries of anti-smoking HIIs performed by official institutions; and (ii) whether these explanations have been studied empirically. We assessed anti-smoking HIIs aimed at impacting factors regarding knowledge (e.g. risk assessment) or (intended) behaviour (e.g. quit rates or intentions). This echoes calls to provide more in-depth analyses of anti-smoking interventions and go beyond ‘simply recognizing and describing the disparity’ in anti-smoking research to better understand why disadvantaged groups smoke more often [11].

Methods

To answer our research questions, we conducted a systematic scoping review [12,13]. Scoping reviews are commonly used to summarise, rather than evaluate, a particular field, allowing us to ‘examine the extent, range and nature of research activity’ [12] relevant for the research at hand. We conducted the review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist extension for Scoping Reviews [14], in order to conduct the review transparently and systematically [13] (see Appendix S1, Supporting Information). The eligibility criteria and data extraction and analysis methods were specified in a documented protocol in advance, which was not registered.

Identification

Eight electronic databases were searched for relevant papers: (i) Web of Science; (ii) Embase; (iii) Medline Ovid; (iv) Cochrane; (v) Psyc INFO; (vi) Econ Lit; (vii) Abi/inform; and (viii) Google Scholar. These were chosen for their reputation and their multidisciplinary scope. The concepts covered in the search terms were: ‘smoking’, ‘health information intervention’ and ‘socio-economic status’ (see Appendix S2, Supporting Information, for a detailed description of the literature search).

Eligibility criteria

All articles resulting from the literature search were imported and deduplicated in EndNote. We subsequently used EndNote for the screening of abstracts, titles and keywords, which was done independently by the first and second author based on pre-determined selection criteria. Studies were only included if they: (i) focused on one or more HIIs; and (ii) reported on the effectiveness among low-SES adults. The HIIs discussed in the studies needed to: (iii) be aimed at changing knowledge or behaviour; (iv) concern smoking cessation; (v) be directed at adults; (vi) be performed by an official institution; and (vii) be conducted in a high-income country that is a member of the Organization for Economic Cooperation and Development.

Articles that could not unequivocally be excluded based on title, abstract and keywords (e.g. when most criteria were met, but others could not be judged with the information at hand) were still included in this phase. Subsequently, the same authors independently reviewed the full texts of articles included in the previous phase, using the same criteria. In the case of disagreements in these two phases, the reasons for inclusion or exclusion were discussed to come to an agreement. A third coder could be consulted in the case consensus would not be reached, but this did not prove necessary.

We included a wide variation of study designs, ranging from randomised controlled trials to cross-sectional designs to qualitative studies, as long as they included an indication of intervention effectivity. Only studies published in the English language were selected. Our initial focus was on studies published in

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the period January 2009–April 2019, following publication of the landmark report ‘Closing the Gap in a Generation’ by the Commission on Social Determinants of Health [15]. This report emphasised the importance of social determinants of health, causing increased awareness of the differential effects of health interventions across groups in different socioeconomic positions. In October 2021, the literature search was repeated to include the most recent relevant studies.

Data extraction and analysis

We collected the following information to perform our scoping review: (i) study design; (ii) SES indicator; (iii) HII type; (iv) HII source; (v) study population; (vi) outcome variables; (vii) effectiveness in the low-SES study population; (viii) SES disparity in effectiveness; (ix) explanations for the findings among the low-SES study population; and (x) whether these explanations were studied empirically. For studies reporting on an effective intervention, we additionally specified the intervention’s core elements. Regarding the explanations, we performed an inductive thematic analysis in which the relevant text segments were selected from the articles, and subsequently categorised in overarching themes. All explanations were first manually coded through open coding, after which axial and selective coding were applied to get the overarching themes used. The first and second authors coded independently, and the last author aided the process in the case of inconsistencies in the coding. This formed the basis of the thematic analysis, in which the themes are discussed.

The first author conducted a quality assessment of all included studies, and the second and last author independently assessed a (different) random sample of five studies each. Given the large variety of study designs within the included studies, we opted for the Mixed-Methods Appraisal Tool [16], which exists of separate quality questions for: (i) qualitative studies; (ii) randomised controlled trials; (iii) non-randomised studies; (iv) quantitative descriptive studies; and (v) mixed methods studies. As a quality appraisal is not essential for scoping reviews [12] and the exclusion of studies with low methodological quality is discouraged, we analysed all included studies in the thematic analysis, regardless of quality.

Our analysis, thus, provides a systematic scoping review of different explanations currently suggested for the (in)effectiveness of institutional anti-smoking HIIs and their empirical worth. To the best of our knowledge, our paper is the first review focusing on why anti-smoking HIIs are argued to be (in)effective among low-SES adults, instead of focusing on whether they have an impact and to what extent.

Results

Study selection

The initial database search yielded 22,873 papers, of which 12,167 remained after removal of duplicates. Subsequently, 7,766 papers were manually pre-excluded based on the publication date, country criteria and the age of the study population. This left 4,401 papers for screening based on their abstracts, titles and keywords. Of these, 68 were eligible for a full-text review and another 11 were identified by screening the references. The final analysis was applied to 33 publications: 26 primary studies, five reviews and two dissertations. The search update in October 2021 led to an additional six studies, including the replacement of one of the dissertations [17] from the initial inclusion results, by a peer-reviewed article that followed from it [18]. The inter-coder reliability of the full-text reviews between the first and second author was 86.8%. Subsequently, the authors achieved full consensus on including or excluding the remaining studies that initially were considered eligible by one of them. Figure 1 contains a detailed description of the selection process.

Study characteristics

Table 1 summarises the characteristics of the identified studies. The majority of the studies had a (repeated) cross-sectional (n = 12) or experimental (n = 8) design, followed by systematic reviews (n = 6), longitudinal designs (n = 6) and qualitative studies, that is interviews (n = 2) and focus group discussions (n = 2). A field study and a mixed methods approach both appeared once. Most studies focused on multiple outcome measures, with the majority involving behaviour change (n = 25), followed by an intention to change behaviour (n = 15) and knowledge (n = 11).

Most studies used samples of the full population (n = 33), whereas only three focused solely on low-SES smokers. Two reviews evaluated several HIIs targeting smokers from both the population at large as well as disadvantaged populations. It has to be noted, however, that some of the discussed interventions were primarily focused on low-SES individuals. Nevertheless, inclusion of higher-SES individuals in most of these studies made SES comparisons possible regarding the HIIs’ (in)effectiveness. The evaluated HIIs were generally mass-media campaigns or TV advertisements (n = 20), or health-warning labels or graphic
Two studies looked at anti-tobacco information in general, and one study evaluated public service announcements. The indicators of SES were education and income (n = 12), education (n = 9), income (n = 6), the Socioeconomic Index for Areas (n = 3) or were undefined (n = 3). The systematic reviews all used widely varying indicators of SES, including, but not limited to education, income, area indicators and occupation.

Most of the studies were single-country studies, conducted in the USA (n = 20), Australia (n = 5), Canada (n = 2) or the Netherlands (n = 1). Multi-country studies were comparing various Western-European nations (e.g. France, Germany, the Netherlands and the UK; n = 3), or Canada and Australia (n = 1), or reported on reviews with a broad inclusion of countries (n = 6). The HII sources were government institutions (n = 27), the Food and Drug Agency (n = 6), the Center for Disease Control (n = 2), the European Commission (n = 1), or both government ministries and cancer institutions (n = 1). In one systematic review, the source of the discussed mass media campaigns was not made clear.

Study effectiveness and equity
Table 1 shows the varying effectiveness of the interventions among low-SES participants between the studies.

![Flowchart of inclusions and exclusions](prisma-flowchart.png)
<table>
<thead>
<tr>
<th>Ref.</th>
<th>Study design</th>
<th>Outcome measure(s)</th>
<th>Study population</th>
<th>HII type</th>
<th>Effect among low SES?</th>
<th>Equity effect</th>
<th>Explanation theme</th>
<th>Empirically studied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Quasi-experimental</td>
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<td>Full pop.</td>
<td>HWL</td>
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<td>0</td>
<td>No explanation</td>
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<td>Low SES</td>
<td>GHW</td>
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<td>N/A</td>
<td>Material conditions, risk perception</td>
<td>Suggested</td>
</tr>
<tr>
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<td>Full pop.</td>
<td>MMC</td>
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<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
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<td>22</td>
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<td>Full pop.</td>
<td>HWL</td>
<td>Yes</td>
<td>+</td>
<td>Cognition</td>
<td>Tested</td>
</tr>
<tr>
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<td>Full pop.</td>
<td>MMC</td>
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<td>0</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
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<td>Full pop.</td>
<td>TV ads</td>
<td>Mixed</td>
<td>Mixed</td>
<td>Material conditions</td>
<td>Suggested</td>
</tr>
<tr>
<td>25</td>
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<td>Full pop.</td>
<td>TV ads</td>
<td>Yes</td>
<td>+</td>
<td>No explanation</td>
<td>N/A</td>
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<td>Mixed</td>
<td>Mixed</td>
<td>Message engagement, cognition</td>
<td>Suggested</td>
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<td>MMC</td>
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<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
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<td>TV ads</td>
<td>Yes</td>
<td>0</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
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<td>MMC</td>
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<td>No explanation</td>
<td>N/A</td>
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<td>Behavioural, intention, knowledge</td>
<td>Full pop.</td>
<td>HWL, TV ads</td>
<td>No</td>
<td>N/A</td>
<td>Message engagement, risk perception</td>
<td>Tested</td>
</tr>
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<td>Full pop.</td>
<td>TV ads</td>
<td>Mixed</td>
<td>N/A</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
<tr>
<td>32</td>
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<td>MMC</td>
<td>Mixed</td>
<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
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<td>Full pop.</td>
<td>HWL</td>
<td>Yes</td>
<td>+</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
<tr>
<td>34</td>
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<td>Intention, knowledge</td>
<td>Low SES</td>
<td>GHW</td>
<td>Yes</td>
<td>N/A</td>
<td>No explanation</td>
<td>N/A</td>
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<td>RCT</td>
<td>Intention</td>
<td>Full pop.</td>
<td>PSA</td>
<td>No</td>
<td>–</td>
<td>Message engagement</td>
<td>Tested</td>
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<tr>
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<td>Behavioural</td>
<td>Full pop.</td>
<td>HWL, MMC</td>
<td>Mixed</td>
<td>N/A</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
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<td>Intention</td>
<td>Full pop.</td>
<td>GHW</td>
<td>Mixed</td>
<td>N/A</td>
<td>Message engagement, material conditions, risk perception</td>
<td>Tested</td>
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<tr>
<td>38</td>
<td>Focus groups</td>
<td>Behavioural</td>
<td>Full pop.</td>
<td>TV ads</td>
<td>No</td>
<td>N/A</td>
<td>Test ed</td>
<td>N/A</td>
</tr>
<tr>
<td>39</td>
<td>Interviews</td>
<td>Knowledge</td>
<td>Full pop.</td>
<td>GHW</td>
<td>Mixed</td>
<td>N/A</td>
<td>Message engagement, risk perception, self-efficacy</td>
<td>Tested</td>
</tr>
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<td>Full pop.</td>
<td>HWL</td>
<td>Mixed</td>
<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
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<td>Full pop.</td>
<td>MMC</td>
<td>No</td>
<td>–</td>
<td>No explanation</td>
<td>N/A</td>
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<tr>
<td>42</td>
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<td>TV ads</td>
<td>Mixed</td>
<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
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<td>43</td>
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<td>Full pop.</td>
<td>TV ads</td>
<td>Yes</td>
<td>0</td>
<td>No explanation</td>
<td>N/A</td>
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<tr>
<td>44</td>
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<td>Behavioural</td>
<td>Full pop.</td>
<td>GHW</td>
<td>Yes</td>
<td>N/A</td>
<td>Social environment</td>
<td>Tested</td>
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<td>45</td>
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<td>Behavioural, intention</td>
<td>Full pop.</td>
<td>MMC</td>
<td>Yes</td>
<td>–</td>
<td>No explanation</td>
<td>N/A</td>
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<tr>
<td>46</td>
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<td>Intention, knowledge</td>
<td>Full pop.</td>
<td>HWL</td>
<td>No</td>
<td>N/A</td>
<td>Material conditions</td>
<td>Suggested</td>
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<tr>
<td>47</td>
<td>Systematic review</td>
<td>Behavioural, knowledge</td>
<td>Full pop.</td>
<td>MMC</td>
<td>Mixed</td>
<td>Mixed</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
<tr>
<td>48</td>
<td>Repeated cross-sectional</td>
<td>Intention, knowledge</td>
<td>Full pop.</td>
<td>GHW</td>
<td>No</td>
<td>–</td>
<td>Material conditions</td>
<td>Suggested</td>
</tr>
<tr>
<td>49</td>
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<td>Intention</td>
<td>Full pop.</td>
<td>HWL</td>
<td>Yes</td>
<td>+</td>
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<tr>
<td>50</td>
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<td>Full pop.</td>
<td>HWL</td>
<td>No</td>
<td>–</td>
<td>No explanation</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(Continues)
Most studies (n = 14) included multiple outcomes or evaluated multiple intervention elements, observing that some were effective for the low-SES group specifically, whereas others were not (i.e. ‘Mixed’). Another 14 found that the intervention was effective among low-SES participants, while nine found no such effect. One study only discussed the equity results of the intervention, not providing the results for separate SES groups.

Regarding the effectiveness of an intervention among those in low- and high-SES groups (column: ‘Effect among low SES?’): seven found a positive equity effect (’+’), meaning that the intervention reduced the SES disparity in knowledge, behaviour change and/or intention to change; six observed a negative equity effect (‘−’), meaning the intervention increased one or more of these disparities; five identified no differences between its low- and high-SES participants (’0’); and 10 reported mixed findings because multiple outcomes were evaluated. The remaining 10 studies offered no SES comparison (’N/A’).

Studies that discussed effective interventions showed little consensus on the elements of the HII that positively impacted low-SES populations. While 11 studies discussed graphic HIIs (primarily graphic health warnings) [22,28,31,33,35,36,38,39,41–43], another contrarily noted the effectiveness of text-only warnings or narrative interventions [32]. Similarly, many effective interventions were noted to be emotion-based (n = 9), but the types of emotions widely varied, from negative emotions [20,24,42] (e.g. fear-evoking, loss-framed, stigmatising) to an empathetic tone [44,51]. Some consistency was found in the effectiveness of persuasion through similarity (n = 5), for example by using strong narratives [26] or including the experiences of other (former) smokers [23,31,38,44]. Two separate studies [19,49] noted that including cessation resource information on the health warnings (e.g. a quitline number) positively affects quit intentions.

Aside from the inconsistency in the intervention elements, the majority of interventions that showed either positive or mixed effectiveness among low-SES individuals did not provide equity-positive results, and elements found in equity-positive interventions were found in equity-negative or equity-neutral interventions as well. Abovementioned explanations furthermore do not in and of themselves explain potential SES differences in the results of HIIs. A key finding of our review is that more than half of the studies included (n = 21) did not suggest any explanation for why the intervention was found to be (in)effective among low-SES participants. Although the nature of the intervention of some studies made it possible to guess what the relevant factors were in relation to its (column ‘Effect among low SES?’).
effectiveness (or lack thereof), we refrained from making any inferences since these accounts were not explicitly mentioned by the authors. In the following section, we will discuss the studies that did include explanations for low-SES (in)effectiveness.

Thematic analysis

Seventeen studies suggested one or more explanations for the (in)effectiveness of HIIs among low-SES participants (column ‘Explanation theme’). The thematic analysis of these explanations yielded six main themes: message engagement, material conditions, cognition, risk perception, social environment and self-efficacy.

Message engagement. The most occurring theme concerned message engagement, with a focus on how relatable a HII message is to its targeted population [18,26,30,34,37,38,51]. McCullough et al. [37] and Veldheer [18] suggested that their participants’ distrust of the HII source and preference for lay expert knowledge may have reduced the intervention’s effectiveness. Kim et al. [34] proposed that those in low-SES groups might respond counterproductively to stigmatising anti-smoking campaigns, since they already feel socially discriminated against because of their SES. Using a slightly different argument, Guillaumier et al. [30] suggested that their participants may have been unable to identify with health-warning labels, thereby reducing their effectiveness. Similar arguments were made by Mead [38], claiming that the ‘credibility of the characters portrayed on graphic warning labels can have significant implications for label effectiveness’; by Durkin et al. [26], who stated that identification with characters in the advertisements was crucial for the effectiveness of its highly emotional narrative; and by Vallone et al. [51], whose information intervention was ‘carefully tailored in terms of set design and occupation of characters to help the audience identify with the messages’. This theme, therefore, suggests that the generally reduced effectiveness of HIIs among those in low-SES groups can be attributed to limited engagement and a lack of relatability to the HII’s message or the messenger.

Material conditions. Material conditions occurred as a theme in six studies [20,24,37,45,48,53], making it the second most occurring theme. The central element is the notion that the limited effectiveness of HIIs among low-SES groups can be attributed to a lack of financial resources, and stressful living conditions. Skurka et al. [45], for example, suggested that the former is the key factor, being an obstacle to any action required to stop smoking. Something similar was proposed by Swayampakala et al. [48] and Zhu et al. [53]. Also arguing in line with this theme, Durkin et al. [24] suggested that the stress induced by financial constraints meant that a focus on stopping smoking was viewed as irrelevant. McCullough et al. [37] and Bekalu et al. [20] provided a similar explanation, noting that stressful living conditions may thwart any attempts to quit.

Cognition. Cognition [22,26,35,47,52] involves factors related to an individual’s capacity to absorb and understand a HII’s message. Cantrell et al. [22], for example, stated that ‘cognitive processing may be enhanced by visceral graphic pictures designed to clearly illustrate the meaning of text messages by reducing potential variation across groups in interpretation of textual information due to differences in literacy, culture, language or prior health knowledge’. Kuehnle [35] and Durkin et al. [26] employed a similar line of reasoning, with the latter stating: ‘These ads rely on the viewer being convinced by persuasive arguments from experts which may require higher levels of health and numeric literacy, not typically found in lower SES groups’. Springvloet et al. [47] suggested that educational differences may have affected their participants’ awareness and memory of the HII message, which could explain why it was ineffective among those from low-SES groups. Similarly, Van Mourik et al. [52] suggest that more-educated individuals have more experience with health information, and thus understand it better. The central argument of these studies, thus, is that low-SES individuals generally have more difficulties to understand or absorb the HII message.

Risk perception. Risk perception was the fourth most common theme [20,30,37,38] and relates to how people in low-SES groups perceive their susceptibility to, or self-exempting (risk-minimising) beliefs about, the harms of smoking. So, Bekalu et al. [20] suggested that the effectiveness of HIIs on an intention to stop smoking, and any attempts to do so, was reduced because those in these groups ‘may have other issues that they perceive as more health-damaging to them than smoking’. Similarly, Guillaumier et al. [30] proposed that ‘less well-educated smokers are more likely to hold self-exempting beliefs and low SES smokers are known to have poorer awareness of the risks of smoking’, which was also claimed by McCullough et al. [37]. Following this reasoning, Mead [38] argued that interventions are less effective among low-SES groups because ‘the participants live within economically and socially deprived areas in which smoking may be perceived as lower risk relative to other risks in the environment, such
as injection drug use, HIV, and violence'. Central to this theme, then, is the notion that smokers in low-SES groups are less susceptible to anti-smoking HIIs because they perceive the risks of smoking to be lower than those in high-SES groups.

Social environment. The fifth theme was social environment, as found in two studies [43,53]. This theme largely deals with the extent to which (low-SES) smokers are affected by their social surroundings in smoking-related outcomes. Zhu et al. [53] argued that a higher smoking prevalence ‘in one’s social group affects the perception of how normative smoking is, which affects the current smokers’ likelihood of quitting and the non-smokers’ likelihood of taking up cigarettes’. This probably translates into a reduced receptiveness to anti-smoking HIIs among those in low-SES groups. Ramanadhan et al. [43] studied the association between conversations about graphic health warnings and quit attempts, finding that having a social network that facilitates such conversations indeed leads to more quit attempts. The study does not attempt to compare these effects across SES-groups, but through its largely low-SES sample, argues that social networks are an important driver for quit attempts among this group. Both studies, thus, discuss how one’s social environment affects smoking-related behaviour.

Self-efficacy. The final theme was self-efficacy: an individual’s belief in their ability to stop smoking [38]. Mead [38] studied the effects of different anti-smoking messages on self-efficacy beliefs, finding that interventions portraying successful attempts to stop had a positive impact on the self-efficacy of her participants. Thus, the study discussed how an individual’s own or someone else’s experience influences self-efficacy.

Empirical scrutiny of the suggested explanations

Only nine of the studies included in this review attempted to assess empirically whether the explanations they proposed could actually account for the (in) effectiveness of anti-smoking HIIs among low-SES adults [18,22,30,34,35,37,38,43,51]. Of these nine, two studies accounted for the explanation in the design of the intervention beforehand (‘in design’ in the ‘Empirically studied?’ column of Table 1). Kuehnle [35] tested the effect of pictorial warnings as an easier-to-understand form of warning labels, thus implying the diminished need for tobacco-related cognition to be at the basis of the effectiveness. Vallone et al. [51], stating message engagement is at the centre of their intervention’s effectiveness, tested the effect of television ads that were ‘carefully tailored […] to help the audience identify with the messages’.

The other seven studies empirically tested their suggested explanations. Cantrell et al. [22] used a web-based experimental study (n = 3371) to evaluate whether pictorial warning labels (as an attempt to make an intervention less reliant on cognition) had a greater impact than text-only labels on their participants’ intentions to stop smoking and other self-reported (health-knowledge related) outcomes. The study found that the pictorial condition elicited stronger reactions among both lower- and higher-SES groups, but this difference was greater among the former.

Kim et al. [34] conducted an online experiment (n = 136) to compare the impact of an anti-smoking public service announcement (PSA) containing stigmatising content to one without this content. Their expectation was that low-SES groups would be less sensitive to anti-smoking norms for a number of reasons and, as a consequence, would engage less with stigmatising PSAs. They found that the intervention with stigmatising content was more effective among participants with a higher income than among their lower-income counterparts. The authors subsequently tested a moderated mediation model using feelings of shame and income as mediator and moderator variables, respectively. They observed that ‘the stigmatising PSA induced less shame among low-income participants; this low level of shame was then translated into their lesser cessation intention’.

Ramanadhan et al. [43] used a field experiment to uncover whether graphic health warnings inspire conversations about tobacco- or label-related issues (e.g. quit options, smoking risks, mocking labels), and whether these conversations in turn led to more quit attempts in a SES-varied population. They found that individuals with less education are more likely to have smaller health discussion networks, but do not report on SES differences regarding the effect of such social networks on quit attempts. In general, though, they found that negative conversations about the warnings lead to more quit attempts. So, although no equity claims are made by the authors, the study still shows how having a social network to discuss tobacco-related issues may increase the number of quit attempts made in low-SES groups.

Four other studies came to their proposed explanations via research in the form of interviews [18,38] or focus-group discussions [30,37] with low-SES smokers. The participants in these qualitative studies were asked about their perceptions of and engagement with anti-smoking HIIs, with the authors deriving their proposed explanations from the responses they obtained.

Lastly, Richardson et al. [44] tested whether more cessation-related cognition leads to more quit attempts. However, cessation-related cognition is not included as an explanation for potential equity effects in our thematic...
analysis as it strongly overlaps with quit intention, which we only included as an outcome measure in our research question. We, thus, categorised both the mediator and the outcome measure of their study as outcome measures in our analysis.

Quality appraisal

The quality of the included articles was appraised by means of the Mixed-Methods Appraisal Tool. The majority of articles \( n = 22 \) was appraised using criteria for non-randomised studies, followed by randomised controlled trials \( n = 4 \), also including other randomised experimental designs and qualitative studies \( n = 4 \). Quantitative descriptive studies and mixed methods studies were both appraised once. The six studies not included in the quality appraisal were all systematic literature reviews. See Table S1, Supporting Information, for the quality appraisal of each study.

Regardless of study design, many studies did not include the required information to properly ascertain whether all quality criteria were met. The representativeness or comparability of the samples \( 2.2; 3.1; \) and \( 4.2 \) in Table S1) was often not explicitly clear from the data description. In addition, the completeness of outcome data or potential nonresponse biases \( 3.3; 4.4 \) in Table S1) were often not properly elaborated on either. In studies in which it was discussed, there was often incomplete data or nonresponse bias due to a high nonresponse percentage, or a low follow-up rate. For randomised experiments, the way in which the randomisation was performed sometimes remained unexplained, as did a baseline group comparison. The qualitative studies in the sample adhered to the Mixed-Methods Appraisal Tool criteria well.

Discussion

This review identified and mapped studies examining the effect of institutional anti-smoking HII s among low-SES adults in high-income countries. We found that many of these studies did not suggest any explanation for why an anti-smoking intervention was (less) effective among their low-SES participants. Of those that did, we uncovered six main themes: message engagement, material conditions, cognition, risk perception, social environment and self-efficacy. However, most of these studies did not scrutinise empirically whether the explanations they proposed could indeed account for the observed effects.

To the best of our knowledge, instead of examining if institutional anti-smoking HII s have an impact and to what extent, this is the first systematic literature review to explore why they are (less) effective among those in low-SES groups. Our findings revealed that, in the studies that do provide an explanation, why the proposed mechanism is causally related to an individual’s SES is not always well-defined. As an example, the reasons why those in low-SES groups would have lower risk perceptions are rarely clearly outlined. A more explicit line of argument on the hypothesised causal pathways would significantly improve the plausibility of these studies and allow for more rigorous empirical testing of their theorising.

A productive way to proceed with future research on the issue of the (in)effectiveness of anti-smoking HII s among low-SES groups is to expand such intervention studies by including an explanatory element, making the empirical validation of proposed explanations the rule rather than the exception [11]. As such, study designs can be expanded to include some form of causal inference (e.g. causal pathway analysis), in order to properly test whether the explanation is indeed the cause of potential differences in effectiveness. However, as many studies will not be sufficiently powered for such designs, a test for the suggested explanation can, alternatively, be built into the intervention design. For example, testing the role of cognition in SES differences in effectiveness by comparing a standard information treatment with an overtly simplified one. Both designs are currently underused, given the relatively low number of studies in the ‘tested’ or ‘in design’ categories in our sample.

Such additions to intervention studies could help to move the field forward in two key ways: (i) the tenability of explanations that are thus far only theorised could be assessed, which would enable (ii) the development of more effective anti-smoking HII s to aid in the global endeavour to reduce rates of smoking. To that end, it is vital that such interventions are targeted better at those with a relatively high smoking prevalence, such as individuals in low-SES groups. Investigating why interventions are (not) effective among such groups could benefit from looking beyond the dominant individualistic explanations, such as cognition and risk perception.

As a case in point, and taking the findings in the studies that explored the role of message engagement into account, there seems to be a potential to develop explanations for why different social groups respond differently to the same message. Also, elements that are considered effective in one study often do not yield positive results in another (e.g. the inconsistent findings on the use of emotion-based information). Understanding how and why different groups have different perceptions, or why certain elements are only effective in some contexts, is likely to be crucial for developing anti-smoking messages that reduce both smoking rates and SES-disparities in smoking.
Furthermore, the quality appraisal conducted for this study uncovered that very few studies offered sufficient information about their samples and populations, randomisation, and how the authors dealt with nonresponse and attrition. In order to assess the quality of studies fully, future studies are advised to elaborate more on such methodological elements. Information about study samples and the populations they aim to represent is especially salient in studies like the ones discussed in this review, as proper judgement of these elements is needed to assess the empirical worth of a SES comparison.

Our review has some limitations. First, we only included papers written in English, which may have resulted in an overrepresentation of studies from English-speaking nations. However, scientific papers in Organization for Economic Cooperation and Development countries are increasingly written in English and aimed at an international audience, reducing the risk that we may have missed important explanations. Second, we excluded studies conducted in low- and middle-income countries. This means that our results are not generalisable to these contexts, and that important explanations more relevant to these countries may be missing from our review. Nevertheless, there is mitigation in the fact that there is currently limited research available on the effectiveness of HIIs in low- and middle-income countries [34]. Lastly, the review was conducted without registering the research protocol in advance. Nonetheless, we have composed an a priori protocol for use within the research team, which has been adhered to throughout the entire process.

Conclusion

In conclusion, our review reveals that many studies do not provide an explanation for why institutional anti-smoking HIIs are less effective among low-SES groups in high-income countries. Of those that do, it is striking that most explanations are only proposed, rather than studied empirically. This is regrettable, as empirical research into potential contributory reasons for the (reduced) effectiveness of interventions might uncover the root causes of why those in low-SES groups respond to the same message differently compared to individuals in high-SES groups. Conducting this type of research could lead to improved anti-smoking interventions, thereby ensuring their effectiveness among low-SES groups and reducing current inequalities in smoking prevalence.

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Conflict of Interest

The authors have no conflicts of interest.

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