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Archives of Public Health

SYSTEMATIC REVIEW Open Access

Contextual factors in systematic reviews: understanding public health interventions in low socioeconomic status and disadvantaged populations

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Abstract

Background Evaluations of public health interventions require an understanding of the contextual factors that shape their effectiveness. Context (including socioeconomic, cultural, and environmental factors) plays a critical role in establishing how interventions achieve impact, why outcomes can vary and whether the interventions of interest can be translated from one context to another. This overview explores the extent to which systematic reviews of public health interventions for low-income or low socioeconomic status (SES) populations report contextual factors influencing outcomes.

Methods Systematic reviews were identified through a scoping review and updated searches in March 2023. Reviews focused on interventions targeting smoking, unhealthy diet, physical inactivity, and harmful alcohol use in disadvantaged groups. Reviews were screened for eligibility, and data were extracted on contextual factors related to intervention implementation and effectiveness. Data were synthesised using a framework approach, categorising findings by behaviour and level of intervention.

Results Applying a very broad definition of context, 29 of 86 identified reviews provided some degree of contextual data which varied across interventions but was largely restricted to intervention implementation and delivery factors. For example, environmental characteristics, such as crime and perceived personal safety, affected the use of physical activity infrastructure in disadvantaged areas. Food voucher schemes had mixed results, with social and economic factors affecting their use and effectiveness. However, most reviews lacked sufficient reporting on contextual data, limiting conclusions on the role of context in intervention outcomes.

Conclusions Contextual factors are often underreported in systematic reviews of public health interventions targeting disadvantaged populations. Such underreporting is likely to be similar in other areas of public health. This limits policymakers' ability to adapt interventions to specific settings. Improved reporting and consideration of context in systematic reviews are needed to ensure that interventions are appropriately tailored to the needs of low-income and low SES groups.

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Keywords Contextual factors, Systematic reviews, Public health interventions, Disadvantaged populations

Text box 1. Contributions to the literature

- There is a lack of reporting on contextual factors in systematic reviews of public health interventions, limiting their real-world applicability for policymakers and practitioners
- This article emphasises the importance of understanding the settings and circumstances in which public health interventions succeed or fail, particularly for disadvantaged populations and provides practical recommendations to improve the usefulness of systematic reviews by incorporating and reporting contextual information
- This article aims to bridge the gap between systematic review methodology and public health practice, offering insights to make evidence more transferable and relevant across diverse socioeconomic settings

Background

While the success of public health programmes is typically judged on evaluations of their effectiveness, knowing the context in which these programmes have been implemented is equally important. Understanding how interventions relate to context is critical to understanding how they work [1]. Understanding the context in which a programme is delivered may also help to explain variations in impact and predict the effect an intervention might have on health inequalities [1].

Context may refer to any feature of the circumstances in which an intervention is implemented that could interact with the intervention itself to produce variation in outcomes. Domains of context in population health research can include the social, economic, cultural, policy, political, and historical [1]. However, effectiveness-focused research often fails to report sufficient details about these domains. Even for complex interventions that are likely to have highly context-specific effects, reporting of contextual information is often limited to brief descriptions of the study setting (e.g. country, primary care, community clinic, etc.) or is treated merely as a confounding factor or a possible reason for intervention failure [2].

Policy-makers cannot assume that an intervention reported to be effective will work when applied to their specific context nor assume that the intervention *cannot* be successfully transferred between contexts [3]. If a decision-maker is not aware of the interplay between context and intervention they can have only limited confidence in whether the same effect would occur in their own context [4]. It is therefore important that policy-makers have a good understanding of the existing evidence [3] and are aware of the contextual circumstances in which interventions have previously been found to be effective (or ineffective) when considering complex public health interventions [5].

Systematic reviews are ideally placed to provide the necessary information as they aim to bring together, critically appraise and synthesise evidence from primary studies to assess whether interventions or policies are effective. Public health reviews often combine data from similar interventions implemented in a wide range of different contexts, therefore offering opportunities to explore how intervention effects vary with context. Arguably, it is the responsibility of systematic reviewers to ensure that contextual data, where reported, are extracted, synthesised and discussed in a way that help policy-makers to better understand and interpret the effects data. However, review authors often face challenges when attempting to assess context, notably the lack of meaningful data in reports of primary studies [1, 5]. Guidance from the Cochrane Collaboration on public health systematic reviews recommended that reviewers should report whether a range of contextual information, such as aspects of the host organisation and staff, wider system and population characteristics, is available in primary studies [6]. The same guidance highlighted the importance of reporting when these data are not available. More recently, CIHR-NIHR guidance suggests that systematic review authors should be systematically extracting and reporting contextual data on relevant domains of context [1]. Despite such recommendations it is unclear whether reviewers are routinely checking for and extracting data and then assessing the likely impact of context on effectiveness.

An important area of public health where the effectiveness of interventions and policies is highly context-dependent is lifestyle risk behaviours, particularly when targeting low-income or low socioeconomic status (SES) groups. Identifying effective ways to reduce risk behaviours in low-income and low SES populations is essential if health and mortality inequalities are to be reduced and this has become a significant focus for policy development and implementation [7]. To effectively tackle health inequalities, interventions should not only address the behavioural causes (e.g. tobacco use, unhealthy diet, alcohol use, and physical inactivity) but also the broader social determinants of these inequalities [8]. Because health behaviours are deeply influenced by individuals' environments and life circumstances, understanding the context is essential.

The aim of the research reported here was to carry out an overview to explore the extent to which systematic reviews evaluating the effects of public health interventions provide information on the contextual factors that shape whether and how outcomes are generated. This information is important in understanding

how interventions achieve impact, why it can vary and whether interventions can be translated from one context to another. Specifically, we focused on systematic reviews of interventions to reduce lifestyle risk behaviours in low income or low SES groups and among residents of deprived areas. This overview was undertaken to inform policy in the UK and our synthesis therefore emphasised evidence that may be transferable to the UK context.

Full results of this overview, including detailed findings on effectiveness and differential effects of interventions, are reported elsewhere.

Methods

A protocol for the overview was published on Open Science Framework [9] and detailed review methods are reported in Appendix 2.

Searches

Eligible systematic reviews were identified from those included in a previous scoping review of systematic reviews on reducing lifestyle risk behaviours in disadvantaged groups [10]. Update searches of MEDLINE and EMBASE were conducted in March 2023 (see Appendix 1 for search strategy).

Review selection criteria

Records were screened against the eligibility criteria described in Table 1. As well as systematic reviews that evaluated interventions, reviews that reported qualitative data on factors that influence risk behaviours in the relevant population groups were also eligible, as these may capture data on context. Reviews of empirical evidence published between 2009 and October 2020 were eligible. We considered this timeframe appropriate given the extensive literature on this topic and the fact that systematic reviews include earlier primary studies. Reviews published in languages other than English were not eligible for practical reasons. Screening at title and abstract and full text stage was undertaken by one reviewer (ES or MR), with all decisions checked by a second reviewer (ES, MR or AS). Any disagreements were resolved through discussion or consulting a third reviewer.

Review quality assessment

The quality of all systematic reviews of interventions was assessed using items 7 to 16 of the second iteration of the Assessment of Multiple Systematic Reviews (AMSTAR-2) tool [11] by one reviewer (ES), with assessments checked by a second reviewer (MR).

Data extraction strategy

We extracted basic details from all reviews that met our criteria and included them in an interactive online map of reviews. We undertook detailed data extraction on a subset of reviews that were of most relevance and/or reported contextual data and included these reviews in the synthesis. We adopted the definition of context as outlined in UK MRC Guidance: 'factors external to the intervention which may influence its implementation, or whether its mechanisms of impact act as intended' [12]. Further details of the prioritisation process can be found in Appendix 2. Data extraction was undertaken by one

Table 1 Eligibility criteria

	Include	Exclude
Population	Adults with low income (including food bank use, food insecure, receipt of benefits for those with low income), with low SES or living in deprived areas or communities. Eligible reviews may include other populations within their scope.	Reviews focusing on: children or young people (≤ 18 years); clinical populations (e.g. people with diabetes or alcohol dependence); evidence exclusively from low and middle-income countries as defined by the World Bank; homeless or unemployed people.
Targeted behaviours	• Tobacco use • Unhealthy diet • Physical inactivity • Harmful alcohol use	• Disease management • Substance misuse (unless specific to alcohol use)
Intervention type	Any intervention explicitly targeting low income, low SES or deprived areas **OR** population-level interventions (delivered to an entire country, region, city or area) where separate results are reported for low income, low SES or by deprivation of area of residence or differential effects are explored.	Universal individual-, group- or organisation-level interventions with separate results reported for low income, low SES or people living in deprived areas.
Comparator	Any comparator or no comparator	
Outcomes	• Change in at least one of the behaviours targeted • Qualitative data on perceptions of eligible population groups on factors that influence the above risk behaviours	
Study Design	Systematic reviews of primary studies (quantitative or qualitative). Reviews must include a systematic search, inclusion criteria, some form of synthesis (including realist synthesis) and also include studies reporting empirical data.	• Reviews of modelling studies only • Overviews of reviews/ umbrella reviews

SES Socioeconomic status

reviewer (ES or MR) and checked by a second (AS, ES or MR).

Data synthesis and presentation

The synthesis focused on the factors and contexts that may contribute to the effectiveness of interventions or policies for low income or low SES groups and was based on a framework synthesis approach [13]. Framework synthesis uses a pre-existing framework or theoretical model to structure the data extraction and analysis process. We extracted data into a matrix along two dimensions: (1) intervention level and (2) contextual factors. Intervention level was based on Whitehead's "Typology of actions to tackle social inequalities in health" [14] (i.e. Strengthening individuals; Strengthening communities; Creating environments conducive to a healthy lifestyle and/or better access to essential goods and services; Tackling macro-economic forces influencing lifestyle risk behaviours; and multi-level interventions). See Appendix 2 for more detail on frameworks.

Data were narratively synthesised, with separate syntheses undertaken for each behaviour (diet, tobacco use, physical inactivity and harmful alcohol use) and for those reviews that combined data across different behaviours.

Results

An initial scoping of the literature identified 92 systematic reviews from 9336 records, of which 59 were eligible for this overview. Update searches returned a further 3309 records. Title and abstract screening identified 176 records that were potentially eligible. Full text screening identified 27 reviews that met our criteria. After screening the systematic reviews included in our scoping review against eligibility criteria, we identified a further 59 eligible reviews. Figure 1 shows the flow of studies through the selection process. In total we included 86 systematic reviews in our evidence map.

We identified reviews addressing all four behaviours of interest: unhealthy diet ($n=43$), tobacco use ($n=29$), physical inactivity ($n=17$) and harmful alcohol use ($n=1$). Some of these reviews focused on more than one behaviour. A further ten reviews synthesised findings across different behaviours, making it impossible to extract data for individual behaviours.

Nineteen reviews were not assessed for contextual data because they did not separately report data for the populations of interest. Of the remaining 67 reviews, fifty were included in our main report, and 29 reported at least some contextual data (or reported qualitative data on factors that influence risk behaviours). The synthesis reported here focuses on the 29 reviews reporting contextual and/or qualitative data. The remaining reviews were included in the interactive online map only. A brief summary of the quality of the intervention reviews included in the full synthesis is reported in Appendix 3.

Contextual data from included reviews is summarised below by behaviour and level of intervention (see Appendix 2 for information relating to the level of intervention). Although this paper is focused on context, brief findings on effectiveness are summarised in tables for each behaviour. It should be noted that these are based on evidence from the systematic reviews included in the synthesis (those most relevant and/or reporting contextual data) and some reviews presented very limited information.

Tobacco use reviews

We identified 29 systematic reviews focusing on tobacco use, of which 13 were included in the synthesis (see the online map for the other reviews). Conclusions on effectiveness for the interventions identified are summarised in Table 2.

Eight reviews evaluated ***individual- or group-level smoking cessation interventions*** for low income or low SES groups [15–22]. One of these reviews focused specifically on the provision of ***subsidised nicotine replacement therapy*** (NRT) [15].

Three meta-analyses (one reported in two different papers) [16, 19, 20, 23] investigated various factors that could potentially influence the effectiveness of these interventions, but generally did not find any factors that had a statistically significant impact, and did not explicitly consider how effectiveness might be influenced by context [16, 20, 23].

One review of interventions for older smokers living in disadvantaged areas identified broadly positive perceptions of peer support [21] based on peer facilitators sharing personal experiences and strategies. Participants also reported learning helpful coping strategies and techniques from other participants. However, these observations were derived from a single qualitative study included in the review.

The review of subsidised NRT reported data from a single study suggesting that eligible smokers (US Medicaid clients) had limited awareness of the availability of subsidised NRT [15]. Two further studies reported that low income smokers perceived NRT to be ineffective, mainly due to the existence of underlying factors that encourage smoking, such as stress and the acceptability of smoking in their peer groups.

Four reviews evaluated ***anti-tobacco media campaigns*** [18, 24–26], with one of these also including other information giving interventions, such as warning labels on tobacco products.

The review of health information interventions also explored the explanations proposed by primary study authors for why interventions (media campaigns, warning labels etc.) were effective or not among low SES

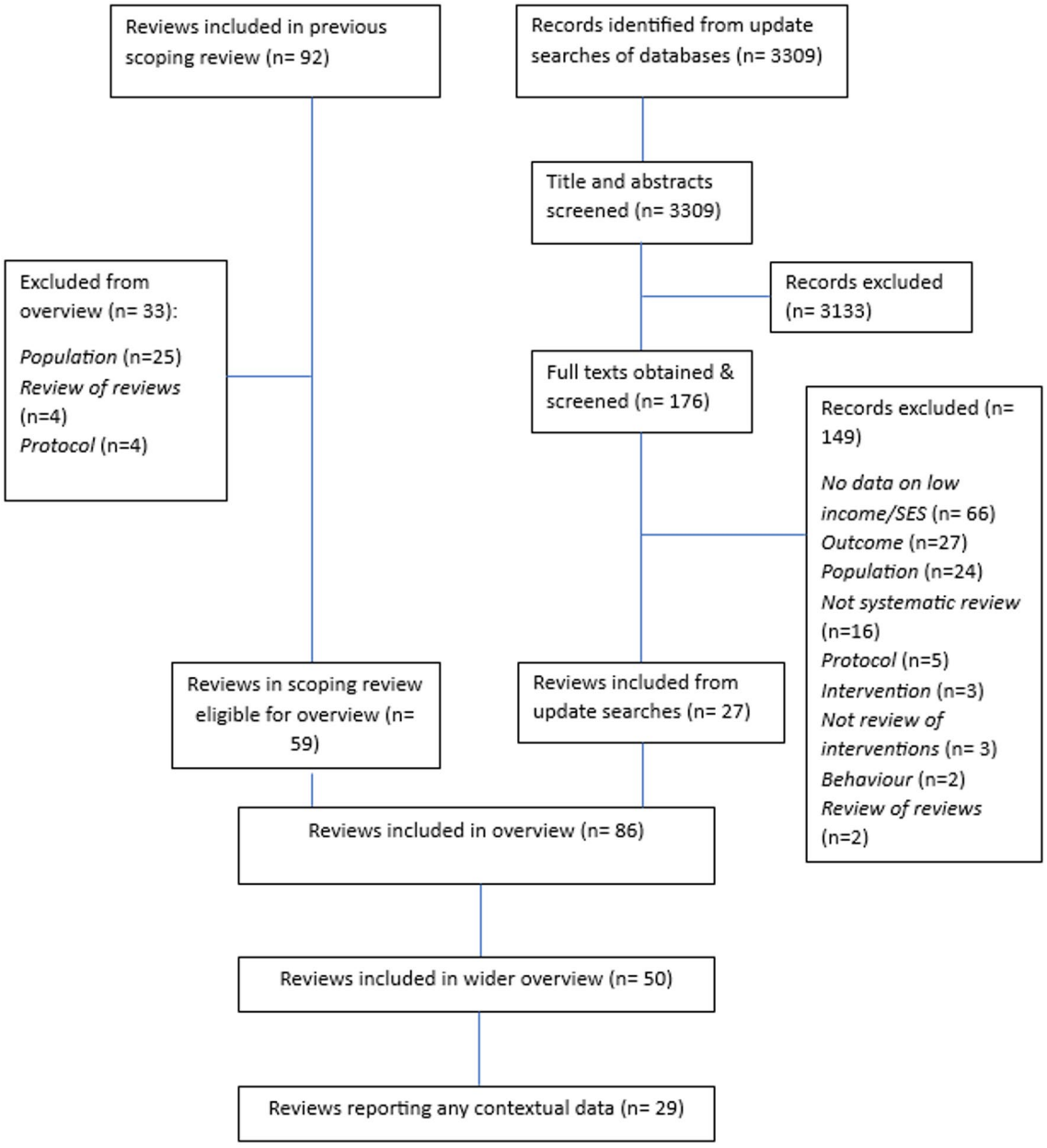

Fig. 1 PRISMA flow diagram

Table 2 Evidence on effectiveness of tobacco interventions in low income or low SES groups or people resident in disadvantaged areas

Intervention type	Effectiveness in low income or low SES groups
Individual or group-level smoking cessation interventions ($n=8$)	Effective in low income or low SES groups.
Anti-tobacco media campaigns ($n=4$)	Inconsistent evidence on differential effects by SES.
Smoking bans and smoke-free policies ($n=3$)	Consistent evidence of overall effectiveness (in general population) of comprehensive smoking bans. Inconsistent evidence on differential effects by SES depending on context. Local/workplace smoke-free policies may increase socioeconomic inequalities.
Tobacco advertising, sales and marketing controls ($n=2$)	Inconsistent evidence on differential effects by SES.
Tobacco price and/or tax increases ($n=4$)	Consistent evidence of overall effectiveness (in general population). More effective in lower than higher SES groups.

participants [26]. Six main themes were identified, with the most frequently mentioned explanation being how relatable the message or messenger (e.g. characters in advertisements) were to low SES groups. The second most common theme was that a lack of financial resources and stressful living conditions contributed to limited effectiveness for low SES groups. Other themes were cognition (some people with low SES may find it more difficult to understand messages), the risk perception of low SES smokers in relation to smoking harms, the extent to which the social environment affects low SES smokers, and self-efficacy. Of these six themes, only social environment related specifically to context. It is also unclear from the review whether these explanations were supported by empirical evidence.

We identified three reviews that evaluated the effects of ***smoking bans and smoke-free policies*** in low SES groups [18, 24, 25]. The policies included ranged from comprehensive national smoke-free policies to regional, partial or non-legislated 'voluntary' bans. Some very limited data reported in these reviews suggested that there could be inequalities in the introduction and implementation of voluntary workplace smoking restrictions. One review reported that a lack of legislation was "associated with more pronounced SES gradients in 'voluntary' (non-legislated) workplace smoking restrictions" [18]. The review authors suggested that this was indirect evidence that introducing comprehensive legislation to ban smoking in all workplaces might therefore reduce inequalities by SES in workplace second-hand smoke exposure. However, this review reported some limited evidence to suggest that smoking bans for hospitality venues were less likely to be enforced in venues in disadvantaged areas and more likely to benefit workers with higher incomes [18]. This review also reported that such restrictions are more likely to be introduced in professional workplaces than in manual workplaces.

Another review speculated (from one study) that the equity impact of smokefree legislation may depend on how long the legislation has been in place (as non-smoking social norms take time to establish) [25]. This same study also suggested that contextual factors such as regional tobacco control policies and population characteristics may impact the effectiveness of local smokefree policies, without further elaboration.

We identified four reviews that evaluated the differential effects of ***tobacco price increases or taxes*** [15, 18, 24, 25]. In one review, availability of black-market tobacco, cheaper tobacco, and single cigarettes were mentioned as barriers to the effectiveness of increasing taxation for low SES groups in the USA and northern Europe [15]. Data from one study showed that low income smokers in a US city responded to higher tobacco prices by purchasing smuggled cigarettes rather than stopping smoking, because smoking was perceived as the cultural norm in their group. One review also suggested that increased tobacco taxation may unfairly burden lower SES groups if they live in contexts with limited smoking cessation support available [15] and as lower SES groups are more likely to have greater dependency on nicotine, they may be more likely to continue to smoke despite increased costs. However, it was unclear if this statement was underpinned by empirical evidence.

Qualitative data on tobacco use

We identified two systematic reviews that synthesised qualitative data on the factors that influence tobacco use in low SES groups [27, 28].

One review [27] focused on the barriers experienced by people in lower SES groups in accessing smoking cessation support. The review found that barriers relating to lower SES smokers' abilities and access to the smoking cessation support services interacted with each other and also with smokers' disadvantaged living conditions. The second review [28] explored the perceptions and experiences of smokers in socioeconomically disadvantaged groups towards non-combustible nicotine products (NRT and e-cigarettes), finding predominantly pessimistic attitudes to using these products for smoking cessation or harm reduction. Some studies reported positive attitudes, mainly relating to e-cigarettes, and there were also some uncertain views. The authors identified three major themes: social, cultural and economic circumstances being conducive (or not) to uptake; the perceived (lack of) relative advantage compared to smoking tobacco; and (lack of) knowledge about relative harms.

Physical activity reviews

We identified 17 systematic reviews focusing on physical activity, of which 10 were included in the synthesis (see the online map for the other reviews). Physical activity reviews often included a heterogenous group of interventions or intervention components; and therefore were grouped by the predominant intervention evaluated in each review. Conclusions on effectiveness from the overview are summarised in Table 3.

One review included studies on both ***individual- and group-based counselling and skills-development interventions*** for adults in socio-economically disadvantaged communities [29]. Some included studies mentioned the need for transportation to venues that were not within walking distance as a potential barrier for participation, but it is unclear if this was based on empirical data.

Two reviews evaluated physical activity ***information and/or education interventions*** for low income or low SES groups, though these did not report specific data on context [30, 31].

Table 3 Evidence on effectiveness of physical activity interventions in low income or low SES groups or residents of disadvantaged areas

Intervention type	Effectiveness in low income or low SES groups
Individual- and group-based counselling and skills development interventions ($n=1$)	Potentially effective for people with low income or low SES if delivered to groups rather than individuals.
Information and/or education interventions (primarily physical activity mass media campaigns) ($n=2$)	No clear difference in effectiveness between higher and lower SES groups.
Multicomponent or poorly described interventions aimed at individuals ($n=3$)	May be effective for low income or low SES groups.
Urban regeneration programmes or changes to the built environment ($n=2$)	No clear effects of isolated changes in disadvantaged areas.
Free or subsidised access to physical activity facilities ($n=1$)	Potentially effective in disadvantaged areas.

A further three reviews included physical activity interventions aimed at individuals that included ***multiple components*** and/or were not clearly described. One review [23] suggested that interventions that provided instruction on performing the behaviour in a community or home setting may be particularly effective, while another reported that interventions delivered to small groups of socio-economically disadvantaged women had a statistically significantly greater effect on physical activity than those delivered in individual-level or 'community' settings [32].

One realist review focused on ***urban regeneration programmes*** in deprived areas (including interventions such as new walking and/or cycling routes) [33] and another review included some studies of ***changes to the built environment*** in disadvantaged areas, including improving park infrastructure [30]. The realist review identified multiple features of deprived neighbourhood environments that can influence walking, such as a lack of appropriate settings, fear of crime, lack of lighting, dense trees or isolated areas, traffic, stray dogs, uneven surfaces, limited relaxation and enjoyment from neglected or dull environments, inconvenient facilities, and a lack of opportunities for social interaction. The authors concluded that there are three well-supported pathways through which regeneration might increase walking in deprived urban areas: through reducing safety problems and fear, through making neighbourhoods more relaxing for walking and through increasing convenience. The authors considered increasing the number of settings for walking, social support and opportunities for social interaction to be pathways that were supported by more limited evidence. Some of the data came from studies evaluating interventions. For example, one study suggested that people avoided a new cycle-walkway even after the instalment of lighting and that overgrown trees increased fear of walking on it. Another study suggested that a new walking route had little use because it was located near a road and estates. The authors concluded from the three evaluation studies that improving certain aspects of the environment is insufficient to encourage walking, as other problems remain unresolved.

One review on the provision of ***free or subsidised physical activity facilities*** in deprived areas [34] focused on a very specific context, and included only UK studies published in the preceding five years (2017–2022) [34]. One qualitative study on participant perceptions of free or subsidised leisure reported that the relationship between cost (free or subsidised) and participation in physical activity was complex and influenced by different factors, such as motivation, value and affordability. Perceptions on provision of subsidised leisure facilities were mainly negative. Findings suggest that subsidised rates can still be too expensive for low-income groups, and that subsidised access was often only provided off-peak, making it inaccessible for those with study, work or childcare commitments. Evidence on free access was inconclusive. It removed a barrier for those who could not afford memberships and could encourage physical activity participation in those who were previously inactive. However, there was also a suggestion that providing free access may reduce its perceived value and discourage participation. For certain groups, such as women from an ethnic minority background or those with a physical disability, knowledge about available activities and the physical environment (e.g. privacy in changing rooms, women-only sessions) were more important than cost in determining attendance.

Three reviews included studies of physical activity interventions that incorporated components from the different types of intervention described above, but did not address the influence of context on outcomes [29, 30, 35].

Qualitative data on physical activity

We identified one meta-ethnographic review on the complex social ecological aspects of physical activity in socio-economically disadvantaged groups in industrialised countries [36]. Physical activity determinants identified from qualitative studies were grouped into six primary themes (urban environment, financial constraints, work-life integration, community engagement, social support, psychosocial factors) that were organised into a social ecological model. The authors report that they were "unable to discover any evidence of the perceived value

Table 4 Evidence on effectiveness of diet interventions in low income or low SES groups or residents of disadvantaged areas

Intervention type	Effectiveness in low income or low SES groups
Healthy eating mass media or social marketing campaigns (*n* = 2)	Inconsistent evidence on differential effects by SES.
Energy content labelling on menus (*n* = 2)	No overall effect or differential effectiveness between lower and higher SES groups.
Counselling/skills development and/or information or education provision. (*n* = 2)	Inconsistent evidence on effectiveness for low income or low SES groups
Interventions delivered in food pantries (*n* = 2)	Inconsistent evidence on effectiveness for low income groups.
Improving access to free or subsidised food (including food banks, food security interventions and food subsidies, vouchers, discounts or other financial incentives) (*n* = 9)	May be effective for low income groups.
Introduction of new food retailers (*n* = 4)	Inconsistent evidence on effectiveness in disadvantaged areas.
Food taxation or price interventions (*n* = 2)	May reduce socioeconomic inequalities.
Salt reformulation intervention (*n* = 1)	No difference in effectiveness between lower and higher SES groups.

of physical activity as a positive social construct in socioeconomically disadvantaged communities". They found that existing literature focused on the barriers to physical activity and not what factors can support socioeconomically disadvantaged groups to engage in physical activity.

Diet reviews

We identified 43 systematic reviews focusing on healthy diet. Twenty-five reviews were included in the synthesis (see the online map for the other reviews). Conclusions on effectiveness of diet interventions from the overview are summarised in Table 4.

We identified five reviews that evaluated interventions involving the provision of diet and nutrition information or education. Two reviews included studies on ***mass media or social marketing campaigns*** [37, 38]. Two reviews also included studies of ***nutrition education sessions*** aimed at SNAP participants (a federal programme in the USA providing benefits to people with low income to purchase food) [30, 38]. No relevant contextual data were reported in relation to media campaigns or nutrition education sessions, meaning we know little from the reviews about the context in which these interventions were implemented.

Two reviews evaluated the impact of ***energy content labelling on menus*** by socioeconomic group [39, 40]. One of these reviews reported a lack of understanding of calories as a barrier to the use of menu labelling for people living in low income neighbourhoods in New York [39]. In one, it was reported that calorie information presented as a range (e.g. when meals could be modified) was perceived to be particularly confusing [39].

Two reviews evaluated groups of interventions that included either ***counselling or skills development and/or information or education provision*** for low income or low SES adults [16, 35]. In one of these reviews, the authors conducted a moderator analysis to evaluate which specific behaviour change techniques and delivery or context components were associated with effectiveness [23]. However, as in most other reviews, the analysed moderators did not include wider contextual factors.

Two reviews focused on interventions aimed at individuals using ***food pantries*** in the USA (roughly equivalent to a UK 'food bank') [41, 42]. Neither review reported data on factors affecting effectiveness or implementation.

One review focused specifically on ***food banks*** in high income countries, including the impact of food parcel provision on food security and/or diet [43]. This review included some qualitative evidence and described five analytical themes on the impact of food bank use: limited variety and quantity of food limiting users' ability to meet their nutritional needs; gratitude of users for any food rather than prioritising healthy eating; pre-packaged food parcels not always meeting health, cultural or social needs; evidence of out-of-date food and use of unacceptable strategies to reduce hunger (e.g. skipping meals) suggesting food insecurity remains; and food parcels improving diet but being insufficient to alleviate hunger. Increasing food variety, adhering to nutritional guidelines, and providing choice of food were all recommended by review authors.

Eight reviews evaluated provision of ***food subsidies, vouchers, discounts or other financial incentives***. Four of these reviews focused on interventions for low income pregnant women or mothers; three reviews exclusively or mainly included studies relating to the US Special Supplemental Nutrition Program for Women, Infants and Children (WIC) [44–46] and one review included evidence on both WIC and vouchers provided through the UK Healthy Start scheme [47]. One review reported several factors that could moderate effectiveness of WIC, but many of these were specific to the WIC programme and therefore unlikely to be transferable to a UK context [44]. Some data showed that recipients in areas with higher fruit and vegetable prices or higher inflation, purchase and consume less fruit and vegetables due to lower purchasing power of WIC [44]. Two reviews noted that

some women had negative experiences when redeeming WIC vouchers [44], such as frustration or embarrassment [45]. One realist review used data from studies focusing on the WIC and Healthy Start programmes to propose three programme theories to explain why only some low income pregnant women experience improved diet from Healthy Start vouchers [47]. One programme theory was that recipients have to prioritise their spending, and may value healthy eating differently. While some women view vouchers as a way to improve their diet through purchasing more healthy foods, others do not increase their consumption but use vouchers to redirect money they would have spent on eligible foods and save elsewhere. The second programme theory was that retailers have discretion when accepting vouchers and so may 'bend the rules' on what they are used for, for example due to pressure from recipients or avoidance of conflict. Lastly, some women who live in households where they lack power to make decisions about resources may not benefit from vouchers if they hand them over to other family members to use.

Four reviews included interventions for SNAP recipients in the USA [30, 38, 48, 49]. In one review, the authors considered various factors to be important in designing incentive programmes for SNAP recipients, including recipient demographics, recruitment and eligibility for schemes (e.g. barriers could be created by enrolment procedures), delivery and timing of incentives, financial value, choice of eligible foods and retail venue [48]. However, the review failed to report empirical data on all of these factors. A single study in one review reported that participants in a SNAP-related incentive programme found the programme confusing and were unsure which purchases qualified [38]. Another of the reviews covered SNAP, WIC and financial incentives to purchase fruit and vegetables for low-income households (including but not limited to those for SNAP recipients); relevant contextual data were mainly reported on financial incentives in general. The authors suggested that fruit and vegetable intake and purchase might increase with the size of the financial incentive provided [49]. Across the review, the authors noted that the implementation of policies and how this varied by US state was rarely examined in studies, even though this may explain why outcomes differed across settings.

Four reviews evaluated the ***introduction of new food retailers*** in disadvantaged areas [30, 35, 49, 50]. One of these reviews, which focused on financial incentives to open supermarkets in 'underserved' areas in the USA, suggested that economic characteristics of the area, baseline shopping habits and distance to the supermarket for the local population may impact outcomes [49]. Another review focused on issues around access, affordability, accommodation of needs and acceptability [50].

One review evaluated socioeconomic inequalities in a group of 'place' interventions, which mainly included environmental interventions in specific settings such as workplaces, but reported no relevant contextual data [37].

We identified two reviews on policies related to ***taxation or prices*** but neither reported contextual data [37, 51].

Four reviews assessed interventions or groups of interventions that combined components from two or more of the interventions described above.(Everson-Hock, Fergus, Olstad 2017, Verghese) These interventions were generally highly heterogenous and no relevant contextual data were reported in the reviews.

Qualitative data on diet

We identified four qualitative systematic reviews that synthesised data on factors that influence diet in low income or low SES groups [52–55].

One meta-ethnographic review identified ten characteristics, organised under four domains, that overlap and intersect to influence the impact of healthy eating interventions for socioeconomically disadvantaged groups [52]. Intervention success was influenced by individual characteristics (participants' personal values and priorities and feelings of pride and autonomy), social characteristics (e.g. social support, cultural beliefs and norms and opportunity for shared benefits among social network), the structural environment, and organisational characteristics (e.g. adaptability and flexibility of interventions). The authors noted that some of the factors they identified apply to the general population, while others appear to be specific to socioeconomically disadvantaged groups, such as the observation that socially disadvantaged participants particularly valued strategies that they perceived to be of benefit to their wider social group.

One qualitative review focused on parents' perspectives of the food environment and how this influences decisions around food in low income families [53]. Environmental factors that influence decisions were organised under three main themes that reflected the stages of decision-making: purchasing (e.g. financial constraints, access to food outlets), planning (e.g. child preferences, time constraints) and preparation (e.g. sources of information on healthy eating).

Another review explored urban poverty as a determinant of access to a healthy diet, in both high and low and middle-income countries [54]. Various barriers to healthy eating for people living in poverty in urban areas were identified, including economic barriers, lack of access to healthy food and lack of social networks. The review also explored evidence on food insecurity in this population, and the coping strategies employed to deal with limited access to food, such as use of food banks.

One review focused on the barriers and enablers of online food shopping as a way of accessing healthy food, and related behaviours, for those with low incomes [55]. Barriers to equitable access included perceived lack of control over food selection, perceived high cost of online shopping compared to physical shops and lack of online services in some rural areas in the USA. Benefits included convenience and less stress when shopping with children.

Harmful alcohol use reviews

One systematic review was identified that evaluated interventions targeting harmful alcohol use [56]. This review did not identify any relevant studies on differential effects across socioeconomic groups for alcohol or report any relevant contextual data.

Multiple risk behaviours

Ten reviews synthesised findings on interventions that targeted different behaviours [35, 57–65]. However, this group of reviews were not considered to add additional insight on context over that reported for each behaviour separately, so are not summarised here.

Discussion

The aim of this overview was to determine the extent to which systematic reviews evaluating lifestyle risk behaviour interventions take context into account and report on its likely impact on effectiveness. Across the included reviews, we found that contextual information was largely absent. Less than half of the reviews (29 out of 67 reviews) included any contextual data, and where context was considered it largely related to intervention implementation and delivery factors. In many cases, the study-level data reported by reviewers were very limited, making it difficult to draw conclusions from this overview on how contextual factors shape the outcomes of risk behaviour interventions for low-income or low SES groups. Consequently, most systematic reviews were not able to explain variations in impact or predict the effect an intervention might have on health inequalities.

While some meta-analyses included 'setting' as a potential moderator of effect, most of the assessed moderators related to intervention content or characteristics. Consequently, these reviews mainly reported differential effects of interventions between lower and higher SES populations without considering the broader social, economic, cultural, policy, political, or historical contexts in which the interventions were implemented.

Some limited data supported the importance of considering broader contextual factors when designing and implementing interventions to alter the living environment. For example, environmental characteristics that affect perceived safety may discourage the use of new physical activity infrastructure in disadvantaged areas. Offering free access to leisure facilities only during off-peak times will limit access for many lower income working people. There may have been inequalities in the implementation of voluntary workplace smoking bans between professional and manual workplaces. Food vouchers can have unintended negative effects, including stigma or frustration experienced by low-income participants. Various mechanisms mean that low-income pregnant women and mothers do not necessarily benefit as intended from vouchers, and various contextual factors may be important in the delivery of food voucher schemes.

Where contextual data were reported in reviews, they often consisted of brief observations from single primary studies. It was sometimes unclear whether these relevant contextual data had been systematically extracted or if they had been subjectively selected by review authors as there was little if any reference in the methods sections of reviews about the approach to extracting contextual data. There were also many instances where it was difficult to determine if a statement relating to context was based on empirical evidence from a primary study or speculation by primary study or review authors. Based on the findings from this overview it appears that contextual data which is likely to impact effectiveness is rarely extracted from primary studies in a systematic way. Importantly, where reviews did not include any contextual information, it was unclear whether this was largely due to the absence of such information in the primary studies or to review authors not extracting these data where reported. This appears to be despite the existence of guidance on handling and reporting context in systematic reviews.

Though this overview was commissioned by UK policymakers, to ensure wide coverage we included evidence from a range of countries. Consequently, much of the evidence focused on US settings, with some reviews exclusively or predominantly including evidence from the USA. While some of this evidence may be generalisable to the UK, some, particularly evidence on retail settings, food subsidy programmes specific to the US, food pantries, and rural settings may be subject to important contextual differences. Some key differences were identified, for example different definitions of socio-economic status and different geographical and demographic characteristics of participants. The extreme remoteness of some rural communities and the poverty of indigenous peoples are important contextual factors for some US interventions and may not be applicable to the UK. The large body of evidence on US food subsidy programmes is evaluated within a very specific welfare system that is not comparable to the UK or many European countries. One highly relevant realist review focused on the UK Healthy Start scheme, but as only a few studies were identified, most of the evidence on similar nutritional voucher programmes

was from the US WIC scheme, raising questions about how outcomes can be generalised across US-UK contexts [47].

The difficulties of generalising across different international contexts could lead to a decision to narrowly restrict systematic reviews to country-specific interventions. Durden-Myers et al. is an example of a review with relevance to UK policymakers as it focuses on the specific context of free or subsidised physical activity in deprived areas of the UK within a recent five-year period [34]. Data are reported on the perceptions of those living in disadvantaged areas towards free or subsidised leisure facilities which is likely to be highly relevant to UK local authorities. However, only five studies were identified and included in the Durden-Myers review, suggesting a tension between undertaking a focused review with a highly relevant context and identifying sufficient evidence to understand when, how and why context might influence effectiveness.

Context changes over time, making the period in which data are collected an important consideration when looking to systematic reviews for evidence. Reviews rely on previously published primary evidence, some of which may no longer be relevant to current contexts, even where reviews themselves are recently published. This is particularly relevant for tobacco interventions, as the policy landscape has changed considerably in recent decades and continues to evolve. This includes the introduction of comprehensive smoking bans in many countries, resulting changes in social norms around smoking, declining overall prevalence of smoking, the emergence and increasing popularity of vaping (and continuing debates over its safety), and the emergence of tobacco endgame strategies (such as the intention to legislate to create a smokefree generation in the UK). Many of the primary studies included in the tobacco reviews we identified predate most of these developments.

Systematic reviews adopt different synthesis approaches, impacting the extent to which they engage with contextual information. As mentioned, using meta-analysis to explore contextual factors limits analysis to categorical variables and relies on consistent reporting across studies. In reality, the context of complex public health interventions is likely to be much more nuanced than this approach allows. Therefore, although the reviews that reported meta-analyses tended to assess a range of factors that could moderate or mediate intervention effectiveness, this may be of limited use when considering context. Non-statistical narrative syntheses that rely on close reading of primary texts may provide deeper insights into available contextual data but forego the benefits of meta-analysis as a tool for estimating the magnitude and variability of intervention effectiveness.

As might be expected, reviews of qualitative data, particularly those using the methods of realist synthesis, provided more useful information about the wider contexts in which lifestyle risk behaviour interventions have been delivered and evaluated. We identified seven eligible reviews of qualitative data exploring factors that might influence risk behaviours in low-income or low SES groups. However, only one meta-ethnographic review attempted to address the impact of wider contextual factors, with other reviews focused more narrowly on attitudes and experiences, without significant reference to context [52]. No review tried to triangulate insights around context derived from qualitative evidence or from process evaluation with effectiveness data from quantitative studies. It was not feasible to undertake such triangulation in this overview due to variations in the scope of reviews and not having access to the underlying primary evidence.

Our findings are based on a robust overview of reviews that was undertaken in response to a specific policy need. Comprehensive searching and systematic selection methods means that we are likely to have identified all the systematic review evidence relevant to our research question. Therefore our finding that intervention reviews broadly lack contextual information is likely to be a true reflection of the current literature. We adopted a generous definition of context, and included any review that referred to any feature of the circumstances in which an intervention was conceived, developed, implemented or evaluated. Inevitably, this meant that a large proportion of included reviews looked at simple categorical moderators of intervention effects, rather than the more complex interactions between intervention effects and implementation environment, that can vary between settings.

We did not undertake a detailed examination of the primary evidence within the systematic reviews, so could not establish if contextual data were missing or simply overlooked by review authors. Our overview was restricted to one specific policy area (lifestyle risk behaviours) and so its findings may not be generalizable to other topics. However, it has been noted that primary studies of complex public health interventions rarely report on context consistently [66] and that systematic reviews either report context in insufficient detail or omit it altogether [5].

This overview explored the extent to which systematic reviews of public health interventions for low-income or low socioeconomic status (SES) populations report contextual factors influencing outcomes, and summarises the very limited information available from these reviews. Future research might be to more closely interrogate the subset of reviews that reported relevant information to establish whether the question of *which* contextual factors affect effectiveness of public health interventions

can be usefully answered. As shown in this overview, the available information is extremely limited. However, the use of implementation science determinant frameworks such as the Consolidated Framework for Implementation Research (CFIR) [67, 68], Exploration, Preparation, Implementation, Sustainment Framework (EPIS) [69], Practical Implementation Sustainability Model (PRISM) [70], or Integrated Promoting Action on Research Implementation in Health Services (i-PARIHS) [71, 72], might be applied to better characterise the important gaps in reporting observed here.

Conclusions

The 2018 CIHR/NIHR report by Craig et al. [1] made several sensible recommendations for incorporating context into population health intervention research. These included systematically incorporating considerations of context at all stages of the development and evaluation of interventions, using a comprehensive categorisation of features of context to develop a theory of change that should be updated in the light of study findings. For systematic reviews of such interventions, they suggested attempting to identify the contextual factors of importance in primary studies, using methods that can capture context-specific change processes, constraints and enablers of implementation and drawing appropriate conclusions about the applicability of findings. However, the current overview of lifestyle risk behaviours suggests that these recommendations have not been widely followed in recent systematic reviews. Therefore more specific guidance, perhaps through reporting standards, may be required to make context a more prominent consideration in systematic reviews, particularly of complex public health interventions. Reviews of population heath interventions might consider incorporating a context criterion alongside the accepted "PICOS" criteria, and where appropriate using this for study selection. Secondly, even where context will not inform the review synthesis, we suggest reviewers consider extracting contextual information from primary studies for the benefit of users who need to make judgements about the applicability of the included evidence to their local situation.

Supplementary Information

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Supplementary Material 1

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MR and ES contributed to the design of the review, selected, coded and checked data, and drafted the manuscript. MH designed and conducted the search strategies. MW contributed to the design of the review, developed the interpretive framework and substantively revised the manuscript. AS contributed to the design of the review, coded and checked data, and substantively revised the manuscript. All authors reviewed and approved the submitted version of the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
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Registration
The protocol for this project was registered via the Open Science Framework and can be accessed using the following link: https://osf.io/t6g5k.

Competing interests
The authors declare no competing interests.

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