

# Socioeconomic inequalities and the equity impact of population-level interventions for adolescent health: An overview of systematic reviews

## ABSTRACT

**Objectives:** Despite robust evidence on health inequalities in adulthood, less attention has been paid to inequalities in adolescence. The aim of this overview was to examine systematic review (SR) evidence on the equity impact of population-level interventions intended to improve health, happiness and wellbeing for adolescents.

**Study Design:** An overview (review of systematic reviews).

**Methods:** Eleven electronic databases were systematically searched to identify SRs of population-level interventions for adolescent health. A secondary data analysis of socioeconomic inequality was conducted to identify whether SRs reported on primary studies in terms of disadvantage, by measures of socioeconomic status (SES) and by differential effects.

**Results:** 35,310 review titles were screened; 566 full texts were retrieved and 140 SRs met the predefined selection criteria. Differential intervention effects were considered in 42/140 (30%) SRs, 18/140 (13%) reported primary studies using an SES measure and 16/140 (11%) explicitly reported differential effects. 15/140 SRs (11%) explicitly focused on socioeconomic inequalities; of these 4/15 reported differential intervention effects in more detail, 7/15 concluded there was insufficient primary evidence to identify the impact of interventions on socioeconomic inequalities and 4/15 planned to examine differential effects by SES, but this was not reported further.

**Conclusions:** Our overview identifies that there is limited SR evidence on the equity impact of population-level interventions for adolescent health. Strengthening the evidence on whether interventions narrow or widen inequalities for adolescents must be a priority for public health research.

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## Introduction

Adolescent health is a contemporary global policy and research priority<sup>1-3</sup>. The transition from adolescence to early adulthood is an important, and yet often overlooked period, with significant implications for physical and mental health across the life course<sup>1,4,5</sup>. Poor physical health in adolescence, such as being overweight or obese, and risk behaviours such as substance misuse<sup>5,6</sup>, are linked to increased risk of chronic disease in adulthood<sup>2,3</sup>. Mental health problems, often first evident in adolescence, can negatively impact later in life<sup>2</sup>. There is also increasing evidence of socioeconomic inequalities in adolescent health<sup>7,8</sup>. Recent studies point to a socioeconomic gradient in adolescent self-reported health and health behaviour<sup>4</sup>, and wider determinants including income inequality, education and employment can impact on health in adolescence<sup>3,8,9</sup>.

Despite increasing recognition of inequalities in adolescence, there is little evidence on what works to address these inequalities<sup>10,11</sup>. Interventions can fail to tackle inequalities, there can be 'intervention generated inequalities'<sup>12,13</sup>, and/or under-provision for those most in need<sup>14</sup>. Differential intervention effects can be defined as "differences in intervention effect between groups of lower and higher socioeconomic status" <sup>12</sup>, p.1 of 4). The Commission on the Social Determinants of Health, and the World Health Organization Knowledge and Measurement Network, have underscored the need for improved evidence on whether and how interventions impact on inequalities and the social determinants of health<sup>15,16</sup>. This is pertinent to adolescent health but is currently underexplored<sup>9</sup>.

Systematic reviews (SRs) are important sources of synthesised evidence for guiding research<sup>17</sup>, practice and policy<sup>18</sup>, but have been criticised for a lack of emphasis on health equity<sup>19</sup>. Overviews are a relatively new methodology which bring together data from systematic reviews and can provide a 'bird's eye view' for policymakers and practitioners<sup>20</sup>. An important overview<sup>11</sup> of interventions on the wider determinants of adult health identified a paucity of SR evidence on differential intervention effects<sup>11,21,22</sup>. Whilst some SRs in youth health focus on health inequalities<sup>23,24</sup>, to the best of our knowledge there is no overview of SRs which considers the equity impact of population-level interventions for adolescent health. We present our findings of a secondary data analysis from a recent overview<sup>25</sup> to address this gap. The aim of this overview was to examine the SR evidence on the equity impact of population-level interventions designed to improve health, happiness and wellbeing for adolescents.

## **Methods**

We conducted a systematic review of systematic reviews (an overview) of population-level (i.e. universal) interventions for adolescent health across a range of outcomes<sup>25</sup>. Here, we present a brief summary of the methods employed in the original overview, primarily focussing on the secondary equity analysis. Further details of the original report, which was conducted in Scotland, are published in full elsewhere <sup>25</sup>.

### **Identification of reviews for inclusion in the overview**

We systematically searched 11 electronic databases (Cochrane Database of Systematic Reviews; Health technology assessments (HTA); Campbell Collaboration; EPPI; Joanna Briggs Library (JBI) ; Database of Reviews of Effects (DARE) MEDLINE, EMBASE, CINAHL, PsycINFO and PubMed) for SRs. Date and language limitations were applied (i.e. SRs published in English between 01 January 2005 and 07 March 2016 were included). The search strategy is shown in Supplementary File 1.

### **Selection criteria**

Selection criteria were predefined and documented in a protocol. Table 1 summarises the eligibility criteria. The focus was population-level (i.e. universal) interventions intended to promote adolescent health, and on evidence relevant to the Scottish/UK context (See Supplementary File 1 for details on how relevance was assessed).

*[Insert Table 1 here]*

### **Study selection**

One reviewer (XX) executed the search strategy and screened titles for any obviously irrelevant studies or duplications. Two reviewers (XX and XX or XX) independently screened abstracts. A random sample of abstracts (10%) was independently checked by a third reviewer (XX). Abstracts assessed as irrelevant were excluded and full text papers for all other papers were retrieved. Two reviewers (XX and XX or XX) independently applied selection criteria to the full texts. Consensus meetings were used to discuss any disagreements with a third reviewer (XX).

### **Quality assessment**

Methodological quality was assessed by two independent reviewers (XX, XX or XX) using the ROBIS tool<sup>26</sup>. Disagreements were resolved through discussion and consensus

meetings. SRs were judged as low, unclear or high risk of bias<sup>26</sup>. SRs assessed as high risk of bias were subsequently excluded.

### **Data collection and management**

Data extraction was conducted in two stages using pre-piloted data extraction forms.

#### ***Stage 1: Data extraction and mapping***

Stage one involved one review author (XX) extracting key data relating to the review focus, aim, participants, interventions, comparisons, outcomes and a brief summary on whether SRs reported on socioeconomic inequalities or equity. This data was then cross-checked by a second review author (XX).

Within systematic reviews it is helpful to have a pre-defined framework under which disparate literature can be organised and presented. The U.S. National Prevention Strategy<sup>27</sup>, was used to map the SR evidence across seven topics: violence and abuse free living; active living; healthy eating; mental health and wellbeing; tobacco free living; sexual and reproductive health; preventing drug abuse and excessive drinking; and two additional topics: obesity and general health. A series of team discussions were held to reach consensus on methods for grouping SRs into the relevant categories.

#### ***Stage 2: Equity lens data extraction and coding***

Stage one identified the need for a more in-depth 'equity lens' analysis, which was subsequently undertaken in stage two. Recent work has extended the PRISMA guidelines to facilitate an 'equity lens'<sup>19,28,29, 30 p.56, 31p.234</sup>. Whilst there is no universally agreed definition, an 'equity lens' involves the assessment of the differential impact of interventions according to "socially stratifying factors"<sup>30 p.62</sup>, including gender, race, and religion<sup>30</sup>. In keeping with health inequalities research in the UK<sup>32</sup>, we focus here on socioeconomic status (SES)<sup>11,12</sup>.

The secondary equity analysis was pre-specified in a protocol (Supplementary File 2). Data was extracted for 6 domains (See Figure 1), including whether the review: described primary studies in terms of disadvantage; reported outcomes for disadvantaged groups; reported by measures of SES; considered differential intervention effects; was focused on socioeconomic inequality<sup>1</sup>; or drew conclusions regarding socioeconomic inequalities. All included reviews were coded for each domain using predefined codes

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<sup>1</sup> SRs were considered focused on socioeconomic inequality if: i) inequality/equity was mentioned in the title or ii) the research questions or objectives mentioned socioeconomic inequality/equity.

(YES/NO/UNCLEAR/NOT APPLICABLE) by one reviewer (XX), and cross-checked by a second reviewer (XX) (Supplementary File 2). Where a review reported on at least one primary study per domain this was coded as 'YES'.

*[Insert Figure 1 here]*

Additional data was extracted for reviews identified as 'equity focused': topic area, number of included studies, number of primary studies reported at the level of the review that described participants according to a measure of SES (e.g. education, income, occupation, deprivation, poverty or another relevant SES measure). We also identified (through title/abstract screening) how many of the primary studies reporting SES measures were explicitly focused on adolescents or young people.

### **Data synthesis**

Data from all included reviews were synthesised within the evidence tables and narrative, categorised according to the U.S. National Prevention Strategy categories.

## **Results**

### **Results of the search**

We identified 35,310 reviews, screened 566 full text papers of which 140 reviews (reported across 148 publications) met the selection criteria. Of the 140 reviews, 15 were identified as 'equity focused'. We present the findings of the secondary analysis in two sections below; firstly for the 140 SRs, and secondly for the subset of 15 SRs considered 'equity focused'. The results of the search are shown in Figure 2.

*[Insert Figure 2 here]*

The evidence included in the SRs involved primary studies with a variety of study designs including randomised controlled trials, quasi-experimental studies, controlled trials, observational studies, interrupted time series studies, and qualitative studies. The majority of reviews employed a narrative synthesis (79/140). Key characteristics of included reviews are shown in Supplementary File 3.

### **Equity analysis mapped to U.S. National Prevention Strategy**

Table 2 provides a summary of the equity analysis for 140 SRs mapped across the 9 topic areas. The majority of reviews (76/140) reported on at least one question related to

inequality or disadvantage; 64/140 did not consider SES, inequality or disadvantage at all<sup>2</sup>. Across topic areas, 58/140 reviews of population-level interventions reported primary studies of interventions delivered with participants considered disadvantaged, or from disadvantaged areas. Disadvantaged groups were variously described as “low socioeconomic”,<sup>33 p.30</sup> “areas of social disadvantage”,<sup>34 p.29</sup>, “children from low socio-economic backgrounds”<sup>35 p.792</sup>, “children from schools in disadvantaged areas”<sup>36 p.e1362</sup> (Table 2). Twenty-four reviews reported on the outcomes specifically for these disadvantaged groups<sup>34,35,37-58</sup>.

Formal quantitative measures of SES were reported in 18/140 SRs (Table 2). When reported, these measures varied widely. For example, “percentage of students eligible for free or reduced price school meals”,<sup>48 p.973</sup>, proportion “living below federal poverty level”<sup>59 p.511</sup>, measures of area deprivation<sup>45</sup>, educational level<sup>37</sup>, or other measures such as the Family Affluence Scale<sup>58</sup>. Differential intervention effects were considered in 42/140 reviews (Table 2). Of these, 16/140 reviews explicitly reported differential intervention effects, with several reviews reporting that they were unable to analyse differential intervention effects due to a lack of data in primary evidence (e.g. <sup>34,40,42,45,46,52-54,57,60-68</sup>). The quality of reported differential effects was inconsistent, precluding firm conclusions about whether interventions addressed or increased inequalities (Table 2).

*[Insert Table 2 here]*

### **Systematic reviews specifically focused on socioeconomic inequality**

Fifteen reviews reporting 1720 primary studies, were judged as explicitly focused on inequalities (identified in title or an objective). Table 3 summarises the key characteristics of the ‘equity focused’ SRs presenting data from individual studies as reported by reviews. Further detail is provided in Supplementary File 4.

One third of these reviews focused on tobacco free living (5/15)<sup>31,58,69-71</sup>, four on general health<sup>54,72-74</sup>, two on active living<sup>45,75</sup>, two on obesity prevention<sup>34,52</sup>, one on mental health<sup>57</sup> and one on violence and abuse free living<sup>76</sup>. Two reviews were ‘empty’ (i.e. they contained no primary studies)<sup>74,75</sup>; one review<sup>57</sup> did not report the number of primary studies.

#### *Reporting on disadvantage and by SES measures*

Over half (8/15) of the ‘equity focused’ SRs described participants as disadvantaged<sup>34,45,52,54,57,58,71,73</sup> and 6/15 reviews reported on the impact of interventions for disadvantaged

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<sup>2</sup> In a small number of instances (n=6 responses) the judgement was considered ‘unclear’ and treated as ‘NO’ in the analysis. In addition 3 SRs were ‘empty’ reviews (i.e. they contained no primary studies) and therefore the judgement was recorded as N/A and treated as ‘NO’ in the analysis.

groups<sup>34,45,52,54,57,58</sup> (Table 3). There was little consistency in the reporting of SES measures across SRs; 3/15 reviews used the PROGRESS reporting guidelines to extract SES data<sup>31,34,71</sup> (Table 3/Supplementary File 4). Parental education, income and other measures of SES (e.g. free school meals) were the most frequently reported outcome measures. Six reviews did not report any specific participant SES measure<sup>57,69,70,74-76</sup>. Of the reviews that did, just over a third (74/211) of included primary studies were explicitly focused on adolescents or young people.

### *Reporting differential intervention effects*

Whilst the majority (11/15) of the 'equity focused' SRs considered differential intervention effects, just less than half (7/15) concluded that there was insufficient primary evidence to identify the impact of interventions on inequalities<sup>34,45,54,57,70,71,73</sup>. Four SRs planned to examine differential effects by SES, but this was not reported further<sup>69,74-76</sup>.

Four reviews reported on differential effects in more detail. One SR on youth smoking found 7 (of 38) studies showed positive impact on inequalities, 16 showed neutral effects, 12 negative impact, 4 mixed and 1 unclear<sup>58</sup>. Taxation/increasing the price of cigarettes had the most evidence for positive equity impact; however overall there was a lack of primary evidence<sup>58</sup>. A second SR looked at tobacco control interventions across the general population (including young people)<sup>31</sup>. For interventions specifically for young people (smoking bans in schools, restrictions on sales to minors) and across studies focused on young people, there was a lack of reporting differential effects by SES measures. For adults price increases had the most robust evidence for addressing socioeconomic inequalities<sup>31</sup>. A third SR evaluating universal school-based interventions found that 4 studies (of 20 studies reporting differential impact) showed positive impact, 6 negative impact, and 10 neutral effects<sup>72</sup>. None of the 'education-only' interventions had any (positive) impact on inequalities, and interventions that reduced inequality typically involved environmental change<sup>72</sup>. Finally a fourth SR, focused on parental support interventions in obesity prevention, identified one primary study which evaluated SES as a moderating variable but found no effects<sup>52</sup>.

*[Insert Table 3 here]*

## **Discussion**

Our secondary analysis revealed a striking lack of consideration of equity in SR evidence on population-level interventions across the field of adolescent health. Whilst 41% of reviews described participants in primary studies as 'disadvantaged'; less than a third considered

differential intervention impact; 13% described participants using a measure of SES; 11% reported differential intervention effects; and 11% were explicitly focused on socioeconomic inequalities.

For 'equity focused' reviews, there was insufficient evidence to identify which interventions were effective for reducing inequalities. Some highly tentative evidence suggests that pricing/taxation may be effective for targeting inequalities in youth smoking<sup>58</sup>, and environmental change in schools may be more likely address inequalities compared to education based strategies<sup>72</sup>. These findings align with evidence which suggests that 'upstream' policy interventions may be more effective at tackling inequalities than those focused at an individual level<sup>12</sup>. However, the limited data available here suggests cautious interpretation.

A key implication is the need to attend to equity in the design of evaluations of population-level interventions for adolescents. Our overview highlights the lack of consistency in measuring SES among adolescents, which has long been recognised as a challenge<sup>77</sup>. Greater clarity is required on which SES measures can be routinely employed in public health evaluations with young people<sup>78</sup>. Furthermore, several reviews indicated the need for adequate sample sizes for subgroup analyses, which necessitates early consideration of equity in the planning and design of public health evaluations.

There is also an urgent need for consideration of equity in SR evidence<sup>79,80</sup>. The PRISMA-E guidelines are an important step towards this aim<sup>29</sup>. Previous analysis suggests policy makers feel existing research does not indicate which interventions are most effective in tackling health inequalities<sup>81,82</sup>, and that evidence is dominated by evaluations of behavioural interventions<sup>13,83,84</sup>. This is significant given the intractable nature of the health inequalities in adolescence and adulthood, particularly in the United Kingdom<sup>85,86</sup>. Our findings identify a crucial gap in the evidence required to inform policies which effectively tackle health inequalities in adolescence.

We applied a rigorous systematic review process which included independent application of eligibility criteria, quality assessment<sup>26</sup>. A further strength is that we only included SRs considered low or unclear risk of bias. We recognise that excluded lower quality SRs may also consider inequalities; however we have no reason to believe that excluded SRs would be more likely to do so to a degree that would alter our key findings. We acknowledge that primary studies may be of varied quality and our analysis may not capture attention to inequalities by primary studies<sup>87</sup>. This is consistent with methodological challenges for overviews, where it can be difficult to distinguish between whether a review undertook a particular analysis, or whether this is due to the quality of reporting<sup>87,88</sup>. We also recognise



that searching to March 2016 does not capture recent reviews, and primary evidence focused on equity may take time to reach SR evidence. Despite these limitations, focusing at the level of SRs permitted a snapshot of the evidence, which can support research efficiency, avoid waste, and inform policy and practice<sup>87,88</sup>.

We recognise that focusing on SES neglects other characteristics<sup>30</sup> and the analysis could be strengthened by consideration of the full range of factors in the PROGRESS-plus framework<sup>18,26,30</sup>. U.S. research and policy may focus on race/ethnicity (rather than socioeconomic disadvantage)<sup>89</sup>, which has not been captured here. As the original overview excluded reviews of interventions for populations at higher risk (See Vojt et al 2018 for an overview focused on interventions for vulnerable groups)<sup>90</sup>, we may underestimate consideration of disadvantage. However, tackling health inequalities requires a focus not just on the most disadvantaged, but consideration of the social gradient in health<sup>10,82</sup>. Furthermore, focusing on adolescents and young people aged 10 to 24 years means that some included SRs had wide age ranges. If a more restricted age range had been applied the consideration of inequalities may have been sparser. We also acknowledge that our criteria for SRs to be considered 'equity focused' did not consider possible synonyms of 'equity' and 'inequalities' (e.g. disadvantage / disparity); however we consider these to be the most relevant terms for the purposes of this overview, informed by the PRISMA-E guidelines<sup>29</sup>. Finally, we recognise the secondary 'equity lens' analysis was applied post-hoc, which may introduce bias<sup>29</sup>. Overviews are a comparatively recent methodological tool in evidence synthesis<sup>88</sup> and there does not yet appear to be clear guidance on how to incorporate a focus on equity.

## **Conclusions**

This overview and additional equity analysis is, to the best of our knowledge, the first overview of SR evidence on the equity impact of public health interventions to improve adolescent health and wellbeing. We demonstrate that this is significantly lacking and highlight that strengthening the evidence on whether population interventions narrow or widen inequalities for adolescents is a priority for public health research and practice.

**Supplementary File 1:** Search Strategy and Coding Relevance to UK/Scotland

**Supplementary File 2:** Protocol for Inequalities Data Extraction

**Supplementary File 3:** Evidence tables of included systematic reviews

**Supplementary File 4:** Evidence tables of equity focused systematic reviews

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