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# BMJ Open

## How much evidence is there that political factors are related to population health outcomes? An internationally comparative systematic review

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3 **How much evidence is there that political factors are related to population health**  
4 **outcomes? An internationally comparative systematic review**

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## ABSTRACT

**Objectives:** To provide a seven-year update of the most recent systematic review about the relationships between political features and population health outcomes.

**Setting:** Internationally comparative scholarly literature.

**Data sources:** Ten scholarly bibliographic databases plus supplementary searches in bibliographies and Google Scholar were used to update a previous systematic review

**Primary and secondary outcome measures:** Any population health outcome measure, apart from healthcare spending.

**Results:** 73 unique publications were identified from the previous systematic review. The database searches to update the literature identified 45,356 raw records with 35,207 remaining following deduplication. 55 publications were identified from supplementary searches. In total, 258 publications proceeded to full-text review and 176 were included in narrative synthesis. Eighty-five studies were assessed at low risk of bias, 89 at moderate risk of bias and none at high risk of bias. Assessment could not be conducted for 2 studies with only book chapters. No meta-analysis was conducted. 102 studies assessed welfare state generosity and 79 found a positive association. 17 studies assessed political tradition and 15 found a positive association with left-of-centre tradition. 44 studies assessed democracy and 34 found a positive association. 28 studies assessed globalisation and 14 found a negative association, while 7 were positive and 7 inconclusive.

**Conclusions:** This review concludes that welfare state generosity, left-of-centre democratic political tradition and democracy are largely positively associated with population health. Globalisation may be negatively associated with population health, but the results are less conclusive. The consistency of evidence, large time windows for many studies, and strong ideological plausibility support causal inference. It is important for the academic public health community to engage with politics in its research as well as in advocacy and stakeholder engagement, in order to facilitate positive outcomes for population health.

### Strengths and limitations of this study

- We offer the largest systematic review on the political determinants of population health.
- The use of a systematic review design offers a robust and reproducible method that minimises potential reviewer bias.
- Our review also involved searching ten major scholarly databases in addition to relevant supplementary searches.
- The internationally comparative approach ensures relevance to readers worldwide.
- Resources meant it was unfeasible to conduct a new review from inception rather than an update of a 2010 review.

## INTRODUCTION

### *Historical and structural links*

The link between left-of-centre politics and the public health movement has a very long history.<sup>1</sup> Many pathways to public health impact are political.<sup>2</sup> Policy pathways with relevance to public health can often be broadly subdivided into clinical guidelines and legislative approaches. While the former often incorporates a formal role for evidence at least as a component of the process, the latter is dominated by political ideology,<sup>3</sup> leading in turn to marked evidence-policy gaps.<sup>4</sup> Synergy between the two policy domains can also be created by the return of local public health responsibilities to local authorities in many countries.<sup>5</sup> There are clear structural reasons to believe that the general political landscape of a country will often influence its health policy, and in turn its population health.

### *Ideological links*

The European Public Health Association (EUPHA) public health vision<sup>6</sup> of “improved health and well-being and narrowing health inequalities for all” is clearly more closely aligned to pro-social politics such as social democracy and democratic socialism than pro-market politics such as conservatism, especially since social and economic inequalities are strong predictors of health inequalities and more equal societies have been shown to be more successful.<sup>7-9</sup> Moreover, academics as a community tend to hold more politically progressive views than the general population, as evidenced for example by surveys in the UK<sup>10</sup> and USA.<sup>11</sup> Nevertheless, there has been reluctance both by many individuals and public health professional societies, except specifically political societies such as the Socialist Health Association (UK), to engage with politics and advocate for their populations.<sup>12-13</sup> The current situation contrasts sharply with the period at the onset of modern academic public health when Friedrich Engels brought widespread attention to the plight of the working class for the first time in 1845,<sup>14</sup> being published in English about 40 years later.

### *Existing evidence*

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3 While single-country evidence such as the review by Scott-Samuel et al<sup>15</sup> on the  
4 health effects of Thatcherism, and a recent studies on the effects of Conservative austerity in  
5 England<sup>16-17</sup> can be valuable for empirically assessing how the structural and ideological  
6 links between politics and public health play out in practice, internationally comparative  
7 evidence allows us to transcend the particularities of individual countries and assess  
8 variation in parameters that are static within a given country.<sup>18</sup> The most recent  
9 internationally comparative systematic review that assessed a wide range of political  
10 features was published in 2011 with searches up to April 2010 (the 2010 review).<sup>19</sup> This was  
11 presented as a preliminary rather than confirmatory systematic review and did not include a  
12 risk of bias assessment. It suggested that globalisation was negatively associated with  
13 population health outcomes, while democracy, welfare state and left-of-centre political  
14 tradition were positively associated. The majority of studies had been published in the five  
15 year period up to the search, indicating an active field of research. This suggests that the  
16 2010 review is likely now to be considerably out of date.

### 31 **Aims**

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34 The study of the relationship between politics and population health is timely, in light  
35 of concerns about the effects of Conservative spending cuts in the UK,<sup>16-17</sup> Brexit,<sup>20</sup> and a  
36 general rise in the popularity of right-wing populism.<sup>21</sup> Therefore, we offer an updated  
37 systematic review investigating relationships between four key political features (democracy,  
38 welfare state, political tradition, and globalisation) and population health outcomes. Our aim  
39 was to present the article in a way that would appeal and be accessible to the academic  
40 generalist.

### 48 **METHODS**

#### 51 **Design**

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3 A narrative systematic review design was used following the internationally accepted  
4 PRISMA guidelines.<sup>22</sup> MB was the lead reviewer. Proportionate independent second review  
5 was performed by BH for each stage in the review process.  
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### 8 9 **Data sources**

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11 As this was an updated systematic review, all included studies from the 2010 review  
12 proceeded directly to the full-text review stage. An update search was conducted on ten  
13 scholarly databases from 2010 to April 2017 inclusive (MEDLINE, AMED, EMBASE,  
14 PsycINFO (all Ovid), CINAHL, Philosopher's Index (both Ebsco), Science Citation Index  
15 Expanded, Social Sciences Citation Index, Emerging Sources Citation Index (all Web of  
16 Science) and Sociological Abstracts (ProQuest), following the conceptual search strategy  
17 shown in Table 1, from which search strings for the syntax of each database were  
18 developed. Supplementary searches back to 2006 were conducted on Google Scholar and  
19 in relevant bibliographies. The final search was conducted in November 2017.  
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### 30 31 **Inclusion criteria**

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33 Records were screened initially by title and abstract, and then in full text form for  
34 potential inclusion according to the following criteria:  
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- 36  
37 ➤ Peer-reviewed journal article in a scientific journal or a scholarly book or chapter
- 38  
39 ➤ Study human populations either at the individual or ecological level
- 40  
41 ➤ Present at least one measure of a political exposure, conceptualised in terms of  
42 the welfare state, political tradition, democracy or globalisation
- 43  
44 ➤ Present at least one measure of a population health outcome. Healthcare  
45 spending alone was not considered an eligible outcome
- 46  
47 ➤ Use any quantitative empirical design to link the exposure to the outcome
- 48  
49 ➤ Present a comparison involving at least 2 countries
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### 53 54 **Data extraction**



Results were classified into one of four political themes – welfare state, political tradition, democracy and globalisation. Studies were allowed to contribute to more than one political theme. The following information was extracted for each included study: i) bibliographic details, ii) sampling frame, iii) years of study, iv) design, v) political themes to which the study contributes, vi) measure(s) of political exposures, vii) measure(s) of population health outcome measures, and viii) results classification (positive, negative or inconclusive association between the political exposure and population health outcome measures).

### ***Risk of bias assessment***

Risk of bias assessment was conducted at the study level using the Threats to Validity Tool,<sup>23</sup> using the configuration of Barnish and Barnish,<sup>24</sup> with one modification. Loss-to-follow-up was not considered relevant for the body of studies included in this review. Following Barnish et al,<sup>25</sup> the categories were set as i) low risk of bias (high quality) if  $\geq 70\%$  of eligible items were assessed as at low risk of bias, ii) moderate risk of bias (moderate quality) for 40-69%, and iii) high risk of bias (low quality) for  $\leq 39\%$ . This assessment could not be conducted for studies that only comprised of book chapters, since the tool is not suitable, and format incompatibility could introduce bias into the assessment.

### ***Data synthesis***

In light of differences in political contexts between countries, and in terms of how political exposures and population health outcomes were measured, narrative synthesis was considered more appropriate than meta-analysis. Studies were grouped by political theme.

## **RESULTS**

### ***Search results***

Seventy-three de-duplicated records came from the 2010 review. Update database searches yielded 43, 356 records in total, of which 35,207 remained following deduplication. Supplementary searches on Google Scholar and in bibliographies yielded 55 additional

records. From 35, 333 unique records, 255 proceeded to full-text screening and all were retrieved. 176 studies were included in our review, of which 106 came from our update searches and 70 from the 2010 review. 82 studies were excluded at the full-text review stage (Supplementary file 1). Studies were published in final form a median of 6 years (IQR 4-8) after the year of final data collection and the longest lag was 20 years (Figure 1). The most recent data included in the analyses was collected in 2014. A PRISMA flowchart (Figure 2) and PRISMA checklist (Supplementary file 2) are provided. Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate risk of bias and none at high risk of bias. Risk of bias assessment could not be conducted for two studies (1% of total) whose only included publications came in the form of book chapters. Study-level risk of bias profiles are provided in Supplementary file 3.

### **Welfare state**

Thirty-two studies that were eligible for our review from the 2010 review were allocated to the welfare state theme. Of these 32 studies, 23 (72%)<sup>26-48</sup> were positive, eight (25%)<sup>49-56</sup> inconclusive and one (3%)<sup>57</sup> negative about the association of the welfare state with population health. Following the addition of 70 studies from our update, of which 56 (80%)<sup>58-113</sup> were positive, 12 (17%)<sup>114-125</sup> inconclusive and two (3%)<sup>126-127</sup> negative, our review presents a total of 102 studies allocated to the welfare state theme. Of these, 79 (77%) provided evidence that was favourable about the association of increased welfare state generosity with population health, 20 (20%) were inconclusive, and three (3%) were negative. Most studies either classified welfare state generosity in terms of a welfare regime classification or in terms of expenditure on health and social care. Considering only studies that used a welfare regime classification, 73% were positive about the association of more generous welfare regimes with population health. Welfare regime classifications did vary between studies, but often compared an 'advanced', e.g. Nordic<sup>128</sup> welfare regime with liberal and also market-driven/conservative alternatives. Health outcomes for welfare state studies included self-rated general health, quality of life, prevalence of chronic conditions,

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3 mental health, life expectancy and child and infant mortality. Table 2 provides study-level  
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5 details.

### 6 7 **Political tradition**

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10 Twelve studies that were eligible for our review from the 2010 review were allocated  
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12 to the political tradition theme. All of these studies<sup>31,129-139</sup> presented results that were  
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14 positive about the association of left-of-centre political tradition with positive population  
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16 health outcomes. Following the addition of five studies from our update, of which three  
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18 (60%)<sup>140-142</sup> were positive and two (40%)<sup>118,143</sup> inconclusive, our review presents a total of  
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20 seventeen studies allocated to the political tradition theme. Of these, 15 (88%) were positive  
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22 about the association of left-of-centre political tradition with population health, while two  
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24 (12%) were inconclusive. Ways in which political tradition was measured included political  
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26 tradition classification of ruling government, time in power by different parties, voter  
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28 partisanship, proportion of seats held by left-wing or left-of-centre parties and working class  
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30 power. Population health outcomes included life expectancy, infant and child mortality, life  
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32 expectancy, older adult mortality, general self-rated health and successful implementation of  
33  
34 effective health policies. Table 3 provides study-level details.

### 35 36 **Democracy**

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39 Twenty-seven studies that were eligible for our review from the 2010 review were  
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41 allocated to the democracy theme. Of these 27 studies, 21 (78%)<sup>133-135,144-161</sup> were positive,  
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43 four (15%)<sup>162-165</sup> were inconclusive, and two (7%)<sup>166-167</sup> were negative about the association  
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45 of democracy with positive population health outcomes. Following the addition of 17 studies  
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47 from our update, of which 13 (76%)<sup>88-89,119,143,168-176</sup> were positive and four (24%)<sup>60,177-179</sup> were  
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49 inconclusive, our review presents a total of 44 studies allocated to the democracy theme. Of  
50  
51 these, 34 (77%) were positive, eight (18%) were inconclusive and two (5%) negative. Ways  
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53 in which democracy was measured included political transition to democracy, years of  
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55 democracy since 1900, the presence of elections and standardised indices such as Polity  
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3 IV.<sup>180</sup> Population health outcomes included measures such as general self-rated health, life  
4 expectancy, older adult mortality, and successful implementation of effective health policies,  
5 while there was a particular focus on infant and child mortality and other child health  
6 outcomes. Table 4 provides study-level details.  
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### 10 11 **Globalisation**

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14 Four studies that were eligible for our review from the 2010 were allocated to the  
15 globalisation theme. One of these studies (25%)<sup>181</sup> was positive about the association of  
16 globalisation with population, none were inconclusive, and three (75%)<sup>159,182-183</sup> were  
17 negative. Following the addition of 24 studies from our update, of which six (25%)<sup>184-189</sup> were  
18 positive, seven (29%)<sup>88,119,168, 178,190-192</sup> were inconclusive, and eleven (46%)<sup>193-203</sup> were  
19 negative, our review presents a total of 28 studies allocated to the globalisation theme. Of  
20 these, seven (25%) were positive, seven (25%) were inconclusive, and fourteen (50%) were  
21 negative. Measures of globalisation included world-system role, foreign trade, debt  
22 dependency, imports and exports, as well as membership of organisations such as the  
23 World Trade Organization and standardised indices such as the Maastricht Globalization  
24 Index<sup>204</sup> and the KOF Index.<sup>205</sup> Many studies measured infant and child health outcomes and  
25 mortality, while assessed measures including life expectancy, obesity, water pollution and  
26 tobacco smoking rates. Table 5 provides study-level results.  
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## 40 41 **DISCUSSION**

### 42 43 **Summary of findings**

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46 We present a body of evidence from 176 internationally comparative scholarly  
47 studies that together provides powerful evidence that key political characteristics are  
48 important predictors of a range of population health outcomes. The evidence was favourable  
49 about a positive association with population health for all of increased welfare state  
50 generosity, left-of-centre democratic political tradition and democracy, supported by over  
51 three quarters of eligible studies. Twice as much evidence supported a negative association  
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3 with population health for globalisation than a positive association, although a quarter of  
4 studies were inconclusive. The high degree consistency across a large body of studies, the  
5 large time window of many studies offering an insight into temporal relations, and supporting  
6 structural and ideological evidence all, according to the long-established Bradford Hill  
7 criteria,<sup>206</sup> would strengthen the case for a causative relationship between politics and  
8 population health outcomes.  
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### 14 ***Methodological considerations***

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18 We offer the largest systematic review on the political determinants of population  
19 health, and the first wide ranging internationally comparative systematic review of similar  
20 scope since 2010. The use of a systematic review design offers a robust and reproducible  
21 method that minimises potential reviewer bias in the selection and evaluation of studies for  
22 potential inclusion.<sup>207</sup> Our review also involved searching ten major scholarly databases and  
23 this very thorough coverage of the literature is reflected in a very low proportion of studies  
24 being identified from supplementary searches. All publications identified for full-text  
25 screening were successfully obtained. Conducting searches back to 2006 as part of our  
26 update enabled us to include a further ten eligible studies published before the search date  
27 of the 2010 review. We independently evaluated all studies from the 2010 review and  
28 allowed studies to contribute to multiple themes, allowing further relevant data to be  
29 included. The internationally comparative approach ensures relevance to readers worldwide  
30 and transcends the limitations associated with single-country studies. Unlike the authors of  
31 the 2010 review, we were able to provide a risk of bias assessment.  
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47 Resources precluded a new review from inception, and required us to update an  
48 English-language only review from 2010. Limiting reviews to the English language may not  
49 exert systematic bias in systematic reviews, at least according to evidence from reviews of  
50 healthcare interventions.<sup>208</sup> The diversity of political and health-system contexts as well as  
51 measures of political exposures and population health outcomes precluded meta-analysis.  
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3 The internationally comparative approach increases relevance for an international  
4 readership, yet it introduces complexities in the mapping between political characteristics  
5 and political parties in both systematic and idiosyncratic ways.<sup>209-213</sup> Devolution adds further  
6 complexity to the health policy landscape in terms of defining a country for cross-national  
7 comparison. For example, the devolved centre-left<sup>214</sup> Scottish National Party administration  
8 offers a wide range of health and social care provisions not offered in England, such as the  
9 baby box programme, free prescriptions, free dental checks, and free personal and nursing  
10 care upon assessed need. Moreover, following a protracted legal battle, Scotland is  
11 scheduled in May 2018 to become the first country globally to introduce minimum unit  
12 alcohol pricing, putting it at the vanguard of the fight against alcohol abuse, which is a major  
13 global public health issue.<sup>215</sup> Public health policy evidence is typically observational, which  
14 reflects real-world situations. Although concerns over causality have some merit,  
15 observational studies do not intrinsically overstate effect sizes<sup>216</sup> and can be highly  
16 valuable.<sup>2</sup> Moreover, there are established frameworks for assessing causality, dating back  
17 to Bradford Hill.<sup>206</sup>

### 32 33 ***Comparison with previous reviews***

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36 Our review offers a seven and a half year search advance on the most recent  
37 internationally comparative systematic review to offer an equivalent scope. The 2010 review  
38 by Muntaner et al<sup>19</sup> included 73 studies, of which 70 were eligible for our review. Three were  
39 excluded from our review since they only included healthcare spending as an outcome. We  
40 considered that to be circular, since healthcare spending was also frequently used by  
41 studies as a marker of welfare state generosity. To these 70 studies, we added a further 106  
42 (10 of which were dated prior to the search of the 2010 review), giving a total of 176 studies  
43 in our review. Those added by our update constituted 60% of the total (58% if the 10 studies  
44 we added from prior to 2010 were removed from the numerator and denominator),  
45 demonstrating how the scale of the evidence base for the political determinants of population  
46 health has more than doubled over the past seven and a half years.

The strength of evidence that welfare state generosity is positively associated with population health has increased slightly (77% vs 72% positive), while the number of studies has more than tripled (102 vs 32). The strength of evidence that left-of-centre political tradition is positively associated with population health has increased markedly (88% vs 60% positive), while the number of studies has increased modestly (17 vs 12). Notably, far fewer studies have explicitly studied political tradition than the welfare state, which is one of the key markers of political tradition. The strength of evidence that democracy is positively associated with population health is largely unchanged (77% vs 78%), while the number of studies has increased substantially (44 vs 27). The strength of evidence that globalisation is negatively associated with population health has weakened (50% vs 75% negative), while the number of studies has increased sevenfold (28 vs 4). A prior review in the interim<sup>217</sup> had found that the strength of evidence for the benefits of welfare state generosity was greater for studies assessing spending patterns than welfare regime typologies. We did not find a strong effect – 73% of studies assessing regime typologies were positive compared to 77% of studies irrespective of how the welfare state was measured. The Nordic model found in Scandinavia was presented by most studies as the example of an advanced welfare state. However, classifications used in these typologies are imperfect, and in many ways the Scottish system could be argued to represent a more advanced welfare state, since Norway for example does not offer universal free healthcare at point of use. Our findings on the welfare state and political tradition were also consistent with those of Scott-Samuel et al<sup>15</sup> regarding Thatcherism in the UK, which found a widening of health inequalities resultant from the introduction of reduced state welfare provision and increased privatisation and pro-market policies.

### ***Future research directions***

It is important that health research increasingly focuses on real-world contexts to supplement more idealised studies.<sup>2</sup> Health research that does not consider political and cultural factors may lack relevance and generalisability.<sup>84</sup> Limited exceptions may include



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3 studies into the mechanism of action of a drug or diagnostic accuracy studies, but not  
4 studies regarding their implementation into clinical practice or health policy. Political factors  
5 are especially important when conducting research into the social determinants of health,  
6 and should be more routinely taken into consideration in social health research. Examples of  
7 more specific research priorities arising from this review are to clarify and extend the  
8 apparently contradictory evidence on the health impact of globalisation, and in due course to  
9 study the observed effects of Brexit and the Trump Presidency, potentially including  
10 independent marking of published risk scorecards.<sup>20,218</sup>

### 19 ***Implications for policy and practice***

22 The implications of the evidence base we present are simple, yet the challenges are  
23 substantial in bringing into reality a world where the majority of nations, even in the  
24 developed world, are broadly well aligned in their health policy offerings to a public health  
25 vision such as “improved health and well-being and narrowing health inequalities for all”.<sup>6</sup>  
26 Advances in medical treatment often driven by evidence-based programmes such as NICE  
27 are to be welcomed, but they cannot ultimately address more deep-rooted issues such as  
28 health inequality. Indeed, these largely depend on legislation in which the role, or at least the  
29 direct role, of evidence is often limited.<sup>3-4</sup> In this context, it is important that the academic  
30 public health community is not reluctant to advocate for population health,<sup>12-13</sup> but instead is  
31 part of a wider movement for social change and raise public awareness about key issues, to  
32 seek to bring about the political features supported by this review, especially through  
33 elections. If professional societies would offer a resolute lobby for the interests of public  
34 health, the detrimental effects of the industry lobby,<sup>219-220</sup> and other ideological opponents,  
35 on public health, could potentially be countered, and public opinion could shift thereby  
36 facilitating the election of pro-social parties whose offering is more closely aligned to the  
37 vision and values of public health. Partnership approaches<sup>221</sup> targeting specific policies  
38 would appear to depend greatly on an ideological match with the potential end-user.  
39 However, where this exists to a reasonable extent, successes can occur, such as the input



of data from the Tobacco In PrisonS (TIPS) study<sup>222</sup> in policy seeking to make Scottish prisons smoke-free by the end of 2018.<sup>223</sup>

In conclusion, we present a systematic review of 176 studies that demonstrates that politics is an important determinant of population health outcomes, and one with which the academic population health community should engage more and advocate for the health of our populations.

## FOOTNOTES

**Contributors:** MB was the project director and project manager. The study was conceptualised by MB with input from MT and BH. Searches were conducted by MB. Study selection, data extraction and quality assessment were conducted by MB with proportionate second review from BH. Data interpretation was led by MB with input from MT and BH. MB wrote the first draft of the paper. MT and BH commented on the draft manuscript and thereby contributed important revisions. All tables, figures and supplementary files were made by MB. All authors approved the submission. MB is the guarantor.

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**Competing interests:** The authors have personal views and/or memberships on the political left that we do not consider conflict with the vision of public health. We have no financial conflicts of interest.

**Ethics approval:** No ethics approval was required for this systematic review of published literature.

**Declaration:** All views presented in this article are the authors' own, and not necessarily those of their institutions nor bodies that fund their other research projects.

**Data sharing statement:** No further data are available.

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**TABLES****Table 1. Conceptual search strategy**

((democracy OR autocracy OR welfare regime OR welfare state OR welfare capitalism OR politics OR political tradition OR internationality OR globalization) AND (health OR health services OR population health OR public health OR health economics OR health expenditure))
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**Table 2. Table of study-level characteristics and results for welfare state**

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>							
1	Avendano et al, 2009	2004-2007	Ecological	11 countries from 3 European regions	Welfare regimes	Chronic conditions, self-reported health, depression	Positive
2	Bambra, 2005	1997-1999	Ecological	18 OECD countries	Welfare regimes	Health care index	Positive
3	Bambra, 2006	1980-1998	Ecological	18 OECD countries	Welfare regimes	Infant mortality	Positive
4	Bambra and Eikemo, 2009	2002-2004	Individual	37,499 persons from 21 European countries	Welfare regimes	Self-reported health, long-standing illness	Positive
5	Bambra et al, 2009	1998-2004	Individual	118,245 persons from 13 European countries	Welfare regimes	Self-rated health	Inconclusive
6	Burstrom et al, 2010	1999-2001	Individual	28,485 persons from Italy, Sweden and Britain	Family policy models	Self-rated health, limiting long-standing illness	Positive
7	Chung and Muntaner, 2006	1960-1994	Ecological	19 wealthy OECD countries	Public sector medical care	Infant mortality rate, low birth weight,	Positive

						under-five mortality weight	
8	Chung and Muntaner, 2007	1960-1998	Ecological	18 wealthy countries	Welfare regimes	Infant mortality rate, low birth weight	Positive
9	Conley and Springer, 2001	1960-1992	Ecological	19 OECD countries	Welfare regimes, welfare state spending	Infant mortality	Positive
10	Dahl et al, 2006	1970-2005	Ecological	Up to 11 European countries	Welfare regimes	Absolute and relative health inequalities	Inconclusive
11	Eikemo et al, 2008	2002-2004	Individual	69, 821 persons from 23 European countries	Welfare regimes	Self-reported health, limiting longstanding illness	Inconclusive
12	Eikemo et al, 2008	2002-2004	Individual	65, 065 persons from 21 European countries	Welfare regimes	Subjective poor health, limiting longstanding illness	Positive
13	Elola et al, 1995	1990-1991	Ecological	17 Western European countries	Health care system	Infant mortality, life expectancy	Positive
14	Farfan-Portet et al, 2010	2001	Individual	5,729,859 persons in Belgium and Britain	Welfare regimes	Self-reported health	Inconclusive
15	Fayissa, 2001	1993	Ecological	34 sub-Saharan African countries	Public health expenditure	Infant mortality, child mortality	Positive

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16	Grosse et al, 2010	2004	Individual	38,122 persons from 24 European countries	Welfare regimes	Perception of need for seeking primary health care	Positive
17	Karim, 2010	2003	Ecological	30 countries in Europe, North America, Australia and Asia	Welfare regimes	Infant mortality, life expectancy	Positive
18	Klomp and de Haan, 2008	2000-2005	Ecological	101 low, middle and high income countries	Governance	19 mortality, disease, sickness indicators	Positive
19	Lahelma and Arber, 1994	1985-1987	Individual	Ca. 30,000 persons from Britain, Finland, Norway and Sweden	Welfare regimes	Limiting long-standing illness	Negative
20	Lundberg et al, 2008	1950-2000	Ecological	18 OECD countries	Family policy models	Infant mortality, mortality among those aged 30-59 and over 65	Positive
21	Menon-Johansson, 2005	2002	Ecological	149 countries	Governance	HIV prevalence	Positive
22	Muntaner et al, 2006	1980-1995	Individual	Sweden, Italy, and England and Wales (combined)	Welfare regimes	Mortality level per occupational class, population attributable	Inconclusive



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						risk, index of dissimilarity	
23	Nordenmark et al, 2006	1992-2001	Individual	3442 persons from Sweden, Ireland and Great Britain	Unemployment benefit type	Psychological distress	Positive
24	Ouweneel, 2002	1980-1990	Ecological	42 'first-world, second-world and third-world' countries	Social security system	Self-rated health	Inconclusive
25	Raphael and Bryant, 2004	1999	Ecological	5 countries (Canada, Denmark, Sweden, UK, US)	Welfare state spending	Life expectancy	Positive
26	Rostila, 2007	2002-2003	Individual	36,489 persons in 20 European countries	Welfare regimes	Self-rated health, life expectancy	Positive
27	Sanders et al, 2009	1998-2002	Individual	12,888 persons in 4 countries (UK, Finland, Germany, Australia)	Welfare regimes	Oral health	Positive
28	Sekine et al, 2009	1991-2003	Individual	17,801 persons in Britain, Finland and Japan	Welfare regimes	The Short-Form 36: physical and mental health functioning	Positive
29	Veenhoven and Ouweneel, 1995	1965-1985	Ecological	Up to 97 rich and poor countries	Welfare state expenditure	Life expectancy	Positive



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30	Veenhoven, 2000	1980-1990	Ecological	40 countries	Welfare state expenditure	Life expectancy, self-rated health	Inconclusive
31	Whitehead et al, 2000	1979-1996	Individual	80,792 persons from Britain and Sweden	Social benefit system	Self-perceived health, limiting longstanding illness	Inconclusive
32	Zambon et al, 2006	2001-2002	Individual	160,325 persons from 32 European and North American countries	Welfare regimes	Self-reported health, well-being, health symptom load, health behaviours	Positive
<b>Studies from our update</b>							
33	Ades et al, 2013	2008-2012	Ecological	27 European Union countries	Healthcare spending	Cancer incidence and mortality	Positive
34	Akinci et al, 2014	1990-2010	Ecological	19 Middle Eastern and North African countries	Healthcare spending	Infant, under-5, and maternal mortality	Positive
35	Bambra et al, 2014	2010	Individual	21,705 men and women from 27 European countries	Welfare regime	Self-rated health	Inconclusive
36	Batniji et al, 2014	1980-2011	Ecological	22 Arab countries	Governance	Mortality	Positive
37	Bentley et al, 2016	2001-2008	Ecological	Australia and UK	Housing benefit generosity	Mental health	Positive

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38	Bradley et al, 2011	2009	Ecological	30 OECD countries	Healthcare spending, social care spending	Life expectancy, low birth weight, maternal mortality, potential life years lost	Positive
39	Brandt and Hank, 2014	Up to 2009	Individual	More than 13,000 people from 11 European countries	Welfare regimes	Self-rated health, job loss	Positive
40	Bremberg, 2016	1990-2012	Ecological	28 OECD countries	Family benefit spending, healthcare spending, government expenditure on research and development	Infant mortality	Inconclusive
41	Copeland et al, 2015	1991-2010	Individual	England (n = 217,514) and Sweden (n = 184, 428)	Welfare regimes	Self-rated health, health inequalities	Positive
42	Corsi and Subramanian, 2014	1990-2012	Ecological	35 sub-Saharan African countries	Maternal and child health service coverage	Under-5 mortality	Positive
43	Craveiro, 2017	2010-2011	Individual	53,615 individuals from 15 European countries	Welfare regimes	Composite health measure derived from 3 indicators based on	Positive

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						factor analysis, health inequalities	
44	Dahl and van der Wel, 2013	2005	Individual	Around 245,000 individuals from 18 European countries	National social expenditure	Self-rated health, health inequalities	Positive
45	Deeming and Hayes, 2012	2000-2005	Individual	Just under 30,000 individuals from OECD countries	Welfare regimes	Unhappiness	Positive
46	Devaux, 2015	2006-2009	Individual	Participants from 18 OECD countries	Health care system	Health inequalities	Positive
47	Dragano et al, 2010	2004-2006	Individual	9917 older individuals from 12 European countries	Welfare regimes, indicators from the EU Labour Force Survey	Depression (EURO-D and CES-D)	Positive
48	Dujardin et al, 2011	2001	Individual	5729858 individuals from Belgium and Great Britain	Home care policy system	Health burden of care	Positive
49	Elgar et al, 2011	2006	Individual	48641 adults from 33 rich and middle-income countries	Healthcare spending	Homicide	Inconclusive
50	Engster and Stensöta,	1995-2005	Individual	Participants from 20 OECD	Family policy regime: family	Child poverty and mortality	Positive

	2011			countries	cash and tax benefits, paid parenting leave, public child care support		
51	Esmaeli et al, 2011	1996-2004	Ecological	24 Islamic countries	Healthcare spending	Life expectancy	Inconclusive
52	Esser and Palme, 2010	2002-2005	Individual	13 OECD countries	Pension system	Self-rated health, WHO-5	Positive
53	Foubert et al, 2014	2002-2004	Individual	213764 individuals from 57 countries	Welfare regimes	Self-rated health	Positive
54	Fritzell et al, 2012	2000-2005	Individual	Randomly sampled British, Italian and Swedish mothers	Family policy model	Maternal health	Negative
55	Fritzell et al, 2013	1980-2005	Ecological	Up to 25 countries per wave	Welfare regimes	Mortality	Positive
56	Gesthuizen et al, 2012	2002-2008	Individual	Over 90,000 individuals from 32 European countries	Healthcare spending, modernised labour market	Self-rated health	Positive
57	Gilligan and Skrepnek, 2015	1995-2010	Ecological	21 Eastern Mediterranean countries	Healthcare spending	Life expectancy	Positive
58	Glass et al, 2016	2006-2008	Individual	22 OECD countries	Family policy	Happiness	Positive
59	Granados, 2010	1950-2000	Ecological	8 European countries	Welfare regimes	Life expectancy,	Inconclusive

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						mortality, tobacco consumption	
60	Guarnizo- Herreño et al, 2013	2009	Ecological	31 European countries	Welfare regimes	Oral health	Positive
61	Harding et al, 2013	1971-2006	Ecological	England and Wales, Italy and Finland	Welfare regimes	Elder mortality	Negative
62	Hájek et al, 2012	1995-2008	Ecological	27 European Union countries	Healthcare spending	Life expectancy, standardised death rate	Positive
63	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Healthcare spending	Life expectancy	Inconclusive
64	Heijink et al, 2013	1996-2006	Ecological	14 Western countries	Healthcare spending	Avoidable mortality	Positive
65	Hoffman, 2011	1980-2006	Ecological	USA and Denmark	Welfare system	Old-age mortality	Negative
66	Kuovo and Räsänen, 2015	2010	Individual	10,046 individuals from Finland, Britain, Germany and Greece	Welfare system	Subjective well-being	Positive
67	Levecque et al, 2011	2006-2007	Individual	41686 people from 23 European countries	Welfare regimes, welfare state generosity	Depression (CES-D)	Positive
68	Levecque et al, 2015	2006-2007	Individual	37076 people from 20 European countries	Migrant integration social policy	Depression (CES-D)	Inconclusive
69	Lin et al, 2014	1996-2010	Ecological	149 countries	Governance	Child mortality	Positive

70	López-Casasnovas and Soley-Bori, 2014	1980-2010	Ecological	32 OECD countries	Healthcare and social spending, healthcare system	Health Human Development Index	Positive
71	McKinnon et al, 2016	2006-2012	Individual	Participants from 48 low- and middle-income countries	Maternal health service coverage	Neonatal mortality, health inequality	Positive
72	Maynard, 2016	1985-2005	Ecological	74 developing countries	Healthcare spending	Tuberculosis mortality	Positive
73	Miething et al, 2013	2000	Individual	19353 individuals from Sweden, East and West Germany	Welfare regimes	Self-rated health	Inconclusive
74	Minagawa, 2013	1990-2009	Ecological	23 Eastern European countries	Healthcare spending	Age-specific mortality, self-rated health	Positive
75	Moor et al, 2013	1981-1999	Ecological	47 European countries and regions	Welfare state generosity (Social Policy Indicators Database)	Life satisfaction	Positive
76	Muldoon et al, 2011	2001-2008	Ecological	136 United Nations countries	Healthcare spending	Infant, child and maternal mortality	Positive
77	Muntaner et al, 2017	2003-2010	Household-level ecological	27 European Union countries	Welfare regimes	Self-rated health, chronic conditions	Positive
78	Nelson and Fritzell, 2014	1990-2009	Ecological	18 countries	Minimum income benefits	Mortality (life expectancy and age-	Positive

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						standardised death rates)	
79	Novignon et al, 2012	1995-2010	Ecological	44 Sub-Saharan African countries	Healthcare spending	Life expectancy, death rate, infant mortality	Positive
80	Olafsdottir, 2007	1998	Individual	Participants from USA and Iceland	Welfare regimes, healthcare spending	Self-rated physical health, health inequality	Positive
81	Olsen and Dahl, 2007	2003	Individual	38,472 individuals from 21 European countries	Healthcare spending	Self-rated health	Positive
82	Palència et al, 2014	2010	Individual	23782 men and 28655 women from 26 European countries	Gender equality policies	Health inequality	Positive
83	Pickett and Wilkinson, 2007	1998-2006	Ecological	23 rich countries	Income equality	Child wellbeing	Positive
84	Pinzón-Flórez et al, 2015	2000-2010	Ecological	154 countries	Healthcare spending	Child and maternal mortality	Positive
85	Platts, 2015	2000-2007	Ecological	UK and Russia	Welfare regimes	Self-rated health	Inconclusive
86	Ploubidis et al, 2012	2006-2007	Individual	33528 people from 14 European countries	Welfare regimes, income equality	Health in later life	Positive
87	Popham et al, 2013	2006	Ecological	37 countries	Welfare regimes	Life expectancy	Positive

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88	Reeves et al, 2014	1995-2012	Ecological	21 European countries	Healthcare spending, social spending, pension expenditure	Tuberculosis control	Positive
89	Richter et al, 2012	2006	Individual	141091 adolescents from 32 countries	Welfare regimes	Subjective health, health inequality	Positive
90	Rovny, 2011	1990-1999	Ecological	17 OECD countries	Family social policy	Fertility	Positive
91	Sacker et al, 2011	1995-2001	Ecological	Britain, Germany, Denmark and USA	Welfare regimes	Self-rated health	Positive
92	Sarti et al, 2013	2005	Individual	Participants from European countries	Welfare regimes	Self-rated health, health inequality	Positive
93	Shim, 2015	1980-2010	Ecological	19 OECD countries	Social welfare expenditure	Infant mortality	Inconclusive
94	Stavrova et al, 2011	1999-2009	Individual	Participants from 28 OECD countries	Unemployment benefit policies	Wellbeing among the unemployed	Inconclusive
95	Stuckler et al, 2010	1980-2005	Ecological	Up to 18 European Union countries	Social welfare spending	All-cause mortality, cause-specific mortality	Positive
96	Van der Heuvel et al, 2013	1950-2000	Ecological	Sweden, Netherlands, Canada, USA, Cuba	Welfare regimes, Redistributive welfare policy	Infant mortality, low birth weight, under 5 mortality	Positive



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97	Van der Wel et al, 2011	2005	Ecological	26 European countries	Income equality, spending on active labour market policies, benefit generosity, employment protection	Social inequality in sickness	Positive
98	Van Tuyckom, 2011	Up to 2008	Individual	24,846 people from 27 European Union countries	Healthcare spending	Physical activity	Positive
99	Vahid Shahidi et al, 2016	2012	Individual	22123 individuals from 23 countries with a welfare state	Welfare social policy	Self-rated health of the unemployed	Positive
100	Vöörmann and Helemäe, 2013	2010	Individual	5480 individuals from 4 Eastern European countries	Welfare regimes	Self-rated health, health inequalities	Inconclusive
101	Wu and Chiang, 2007	2002	Ecological	Taiwan and 21 comparison industrialized countries	Income inequality, healthcare spending, public social expenditure	Child mortality, under-five mortality	Positive
102	York and Bell, 2014	2005	Ecological	Countries from the World Bank database with	Healthcare spending, gender equality	Self-reported life satisfaction (0-10)	Positive

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**Table 3. Table of study-level characteristics and results for political tradition**

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>							
1	Borrell et al, 2009	2000	Individual	196,280 persons from 13 European countries	Political tradition classification	Self-rated health	Positive
2	Cereseto and Waitzkin, 1986	1983-1984	Ecological	123 countries, grouped by level of economic development	Political-economic system	Physical quality of life index	Positive
3	Chung and Muntaner, 2006	1960-1964	Ecological	19 OECD countries	Voter partisanship	Low birth weight, infant mortality, under-five mortality	Positive
4	Correa and Namkoong, 1992	1980	Ecological	116 countries with a population over 1 million	Political conditions; political tradition classification	Life expectancy, mortality	Positive
5	Espelt et al, 2008	2004	Individual	16,901 persons in 9 European countries	Political tradition classification	Self-reported health, long-term illness	Positive
6	Lena and London, 1993	1983	Ecological	Up to 84 peripheral and non-core	Political tradition classification	Infant mortality, child mortality, life expectancy	Positive

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				nations			
7	London and Williams, 1990	1965-1970	Ecological	Up to 110 periphery and semi-periphery nations	Political tradition classification	Infant mortality, life expectancy	Positive
8	Moon and Dixon, 1985	1970-1975	Ecological	116 nations	Political ideology (left, right, centre)	Physical Quality of Life Index: life expectancy, infant mortality	Positive
9	Muntaner et al, 2002	1989-1992	Ecological	16 wealthy countries	Working class power, voter partisanship, time in power by different parties	Life expectancy, self-rated health, low birth weight, and age- and cause-specific mortality	Positive
10	Navarro et al, 2003	1950-1998	Ecological	17 OECD countries	Working class power, voter partisanship	Infant mortality, life expectancy, health inequalities	Positive
11	Navarro and Shi, 2001	1960-1996	Ecological	18 OECD countries	Political tradition classification, working class power	Infant mortality, health inequalities	Positive
12	Navarro et al, 2006	1972-1996	Ecological	17 OECD countries	Voter partisanship, time in power by different parties	Infant mortality, life expectancy	Positive
<b>Studies from our update</b>							

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13	Bosdriesz et al, 2015	1996-2010	Ecological	11 European Union countries	Percentage of seats held by social democratic, socialist and other left-wing parties	Tobacco Control Scale	Positive
14	Granados, 2010	1950-2000	Ecological	8 European countries	Political tradition classification	Life expectancy, mortality, tobacco consumption	Inconclusive
15	Huijts et al, 2010	2002-2006	Individual	29 European countries and Israel	Political tradition classification	Self-rated health	Positive
16	Lin et al, 2012	1970-2004	Ecological	119 less developed countries	Political regime score from Polity IV	Life expectancy	Positive
17	Mackenbach and McKee, 2013	1990-2009	Ecological	43 European countries	Left-wing participation in government (share of seats)	Success in implementing effective health policies	Inconclusive

**Table 4. Table of study-level characteristics and results for democracy**

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from 2010 review</b>							
1	Adeyi, 1997	1989-1993	Ecological	10 former Communist countries	Transition from Communism to capitalist democracy	Life expectancy, infant mortality, probability of dying between 15 and 65 years	Negative
2	Alvarez-Dardet, 2006	2000	Ecological	23 former Communist countries	Democratic deficit	Life expectancy, infant mortality, maternal mortality	Positive
3	Baum and Lake, 2003	1967-1997	Ecological	128 poor and non-poor countries	Democracy (Polity III)	Female life expectancy	Positive
4	Besley and Kudamatsu, 2006	1962-2002	Ecological	Up to 160 countries transitioning to democracy	Democracy (Polity IV)	Life expectancy, infant mortality	Positive
5	Franco, 2004	1998	Ecological	170 high, medium and low-income countries	Democracy (Freedom House)	Life expectancy, infant mortality, maternal mortality	Positive
6	Frey and Al-Roumi, 1999	1970-1990	Ecological	87 developed and less-	Democracy (political rights)	Infant mortality, life expectancy	Positive

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				developed countries	index and civil liberties)		
7	Gauri and Khaleghian, 2002	1989-1997	Ecological	208 low and middle-income countries	Democracy (Polity IV)	Vaccine coverage for diphtheria, tetanus, pertussis and measles	Negative
8	Ghobareh et al, 2004	2000	Ecological	179 countries in WHO	Democracy (Polity IV, Freedom House)	Health-adjusted life expectancy	Positive
9	Gizeles, 2009	1982-2000	Ecological	117 developed and developing countries	Democracy (Polity IV), state capacity	AIDS infection rate	Positive
10	Houweling et al, 2005	1999	Ecological	43 developing countries in Asia, Africa and Latin America	Democracy (political rights index)	Under five mortality rate	Inconclusive
11	Kick et al, 1990	1970-1985	Ecological	63 developing countries	Political democracy (political rights index)	Infant mortality	Positive
12	Klomp and de Haan, 2009	2000-2005	Ecological	171 countries with a population greater than 200,000	Decree of democracy, political stability	19 national health indicators	Positive
13	Lake and Baum, 2001	1970-1992	Ecological	Up to 110 developed	Democracy (Polity III)	Life expectancy,	Positive

				countries		infant mortality	
14	Lena and London; 1993	1983	Ecological	Up to 84 peripheral and non-core nations	Level of democracy	Infant mortality, child mortality, life expectancy	Positive
15	London and Williams; 1990	1965-1970	Ecological	Up to 110 periphery and semi-periphery nations	Level of political democracy	Infant mortality, life expectancy	Positive
16	Moon and Dixon, 1985	1970-1975	Ecological	116 nations	Level of political democracy, political stability	Physical Quality of Life Index: life expectancy, infant mortality	Positive
17	Navia and Zweifel, 2003	1990-1997	Ecological	188 democratic or dictatorial countries	Democracy (yes or no, based on presence of elections)	Fertility, child survival	Positive
18	Pillai and Gupta, 2006	2001	Ecological	129 developing countries	Democracy (human rights rating, political rights, and civil liberty, political terror scales)	10 global monitoring indicators of women's reproductive health	Positive
19	Ross, 2006	1970-2000	Ecological	168 countries with a population greater than 200,000	Democracy (Polity IV), years of democracy since 1900	Child mortality, infant mortality	Inconclusive
20	Rudra and Haggard, 2005	1975-1997	Ecological	57 less developed countries	Democracy (Polity IV)	Infant mortality	Positive
21	Safaei, 2006	2003	Ecological	118 autocratic,	Democracy (Polity IV)	Life expectancy,	Positive



				incoherent and democratic countries		mortality rate, child mortality rate	
22	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Level of political democracy	Infant mortality	Positive
23	Shandra et al, 2010	1990-2005	Ecological	74 low income countries	Democracy (Polity IV)	Infant mortality	Positive
24	Stroup, 2007	1980-2000	Ecological	Up to 105 countries	Political Rights Index (Freedom House)	Life expectancy, child mortality	Positive
25	Tsai, 2006	1975-1998	Ecological	119 developing countries	Democracy (majority rule and political contention)	Life expectancy, infant mortality under one year, infant mortality under five	Inconclusive
26	Wejnert, 2008	1970-2005	Ecological	58 core and peripheral countries	Democracy (Polity IV)	Maternal care, fertility rate, maternal mortality, women life expectancy	Inconclusive
27	Zweifel and Navia, 2000	1950-1990	Ecological	138 democratic or dictatorial countries	Democracy (yes or no, defined by presence of elections)	Infant mortality	Positive
	<b>Studies from our update</b>						
28	Batniji et al, 2014	1980-2011	Ecological	22 Arab countries	Extent of democracy	Mortality	Inconclusive
29	Burroway,	1995-	Individual	52	Democracy	Child diarrhoea	Inconclusive

	2016	2008		developing countries	(Polity IV)	and malnutrition	
30	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Democracy (Polity IV)	Infant mortality	Positive
31	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Democracy (Polity IV)	Under-5 mortality	Inconclusive
32	Dietrich and Bernhard, 2015	1980s to 2012	Ecological	88 countries that were not OECD members in 1984	Democracy (Polity IV)	Infant mortality, basic nutrition	Inconclusive
33	Docherty and Kelly, 2010	Not stated	Individual	30,816 individuals from 17 European countries	Satisfaction with democracy on 0-10 scale	Self-reported happiness on 0-10 scales	Positive
34	Fumagalli et al, 2013	1990-2007	Ecological	47 developing countries	Democracy (Polity IV), political competition	BMI	Positive
35	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Democracy (Polity IV)	Life expectancy	Positive
36	Klenk et al, 2016	1950-2010	Ecological	64 countries from WHO mortality database	Democratization	Mortality	Positive
37	Krueger et al, 2015	2002-2004	Individual	313,554 individuals from 67 countries	Democracy variable resulting from factor analysis of 7 indicators	Self-rated health	Positive
38	Kudamatsu,	Up to	Ecological	Sub-Saharan	Democratization	Infant mortality	Positive

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	2012	2004		African countries			
39	Mackenbach, 2013	1900-2008	Ecological	European countries	Democracy (binary)	Life expectancy	Positive
40	Mackenbach et al, 2013	1960-2008	Ecological	European countries	Democratization	Life expectancy	Positive
41	Mackenbach and McKee, 2013	1990-2009	Ecological	43 European countries	Democracy (+10 to -10)	Success in implementing effective health policies	Positive
42	Maynard, 2016	1985-2005	Ecological analysis	74 developing countries	Democracy (Freedom House)	Tuberculosis mortality	Positive
43	Minagawa, 2013	1990-2009	Ecological analysis	23 Eastern European countries	Freedom (Freedom House, Heritage Foundation)	Age-specific mortality, self-rated health	Positive
44	Witvliet et al, 2013	From 2000, end date not reported	Individual	72524 adults from 20 African countries	Transparency and freedom from corruption	Self-rated health	Positive

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**Table 5. Table of study-level characteristics and results for globalisation**

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from 2010 review</b>							
1	Moore et al, 2006	2000	Ecological	128 countries divided into 6 world-system blocks	National trade, world-system role	Infant mortality	Positive
2	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Commodity concentration, multinational corporate penetration, international monetary fund conditionality	Infant mortality	Negative
3	Shen and Williamson, 2001	1965-1991	Ecological	82 less developed countries	Foreign trade, foreign investment, debt increase	Infant mortality	Negative
4	Shen and Williamson, 1997	1960-1991	Ecological	86 less developed countries	Foreign investment, debt dependency	Child survival probability	Negative
<b>Studies from our update</b>							
5	Bergh and Nilsson, 2010	1970-2005	Ecological	92 high-, middle- and low-income	KOF index	Life expectancy	Positive

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				countries			
6	Bozorgmehr and Sebastian, 2014	1990-2010	Ecological	22 high-burden tuberculosis countries	World Trade Organization membership status and duration, trade as a percentage of GDP, Economic Freedom of the World Index, KOF Index	Tuberculosis incidence	Inconclusive
7	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Infant mortality	Inconclusive
8	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Under-5 mortality	Inconclusive
9	Costa Font and Mas, 2016	1989-2005	Ecological	26 countries	KOF Index, CSGR Index	Obesity prevalence, caloric intake	Negative
10	Cross et al, 2009	Not stated	Individual	UK, Spain, Kenya and Uganda	Localised or globalised food supply system	Health-related quality of life	Positive
11	De Vogli et al, 2014	1980-2008	Ecological	127 low-, middle- and high-income countries	KOF Index	BMI	Negative
12	Estimé et al, 2014	2005-2010	Household-level ecological	Pacific nations	Food imports	Obesity	Negative
13	Fan and Faioso Le'au, 2015	Up to 2014	Ecological	Independent and American	Westernisation	Life expectancy, neonatal and	Negative

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				Samoa		child mortality, measles immunisation, diabetes mortality, cancer mortality, cerebrovascular disease mortality, heart disease mortality, pneumonia mortality, overweight and obesity	
14	Gerring and Thacker, 2008	1960- 1999	Ecological	All countries with available data	Open international trade policies, low-inflation macroeconomic environments, market-oriented property rights, GATT and WTO membership	Infant mortality	Positive
15	Goryakin et al, 2015	1991- 2009	Individual	Up to 887,00 women in 56 low- and middle- income countries	KOF Index	Overweight and obesity	Negative
16	Hauck et al, 2012	1990- 2012	Ecological	54 low- income	Terms of international	Life expectancy	Inconclusive

				studies	trade, foreign investment, debt service and relief		
17	Jolly et al, 2013	2002	Ecological	27 Latin American and Caribbean countries	Net food import	Obesity	Negative
18	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment	Water pollution	Negative
19	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment, export intensity	Water pollution	Negative
20	Levine and Rothman, 2006	Up to 1990	Ecological	Up to 130 countries	Economic openness	Infant mortality, under-5 mortality, anthropometric measures of child stunting	Inconclusive
21	Martens et al, 2010	Up to 2008	Ecological	Global, subject to data availability	Maastricht Globalization Index	Infant mortality, under-5 mortality, adult mortality	Positive
22	Maynard, 2015	2000-2010	Ecological	Up to 85 low- and middle-income countries	IGTA membership and status, trade, imports, exports	Youth smoking rates (Global Youth Tobacco Survey)	Negative
23	Maynard, 2016	1985-2005	Ecological	74 developing countries	Debt, trade dependency	Tuberculosis mortality	Inconclusive
24	Milner et al, 2011	1980-2006	Ecological	35 countries	A globalisation index	Suicide rate	Negative

					developed for the study		
25	Mukherjee and Krieckhaus, 2011	1970-2007	Ecological	132 countries	Economic, political and social globalisation	Infant mortality, life expectancy, child mortality	Positive
26	Oberlander et al, 2017	1970-2011	Ecological	70 countries	Social globalisation, trade openness	Nutritional health	Inconclusive
27	Oster, 2010	Up to 2007	Ecological	UN countries with available data	Export activity	HIV	Negative
28	Owen and Wu, 2007	1960-1995	Ecological	219 countries	Openness to trade	Life expectancy, infant mortality	Positive

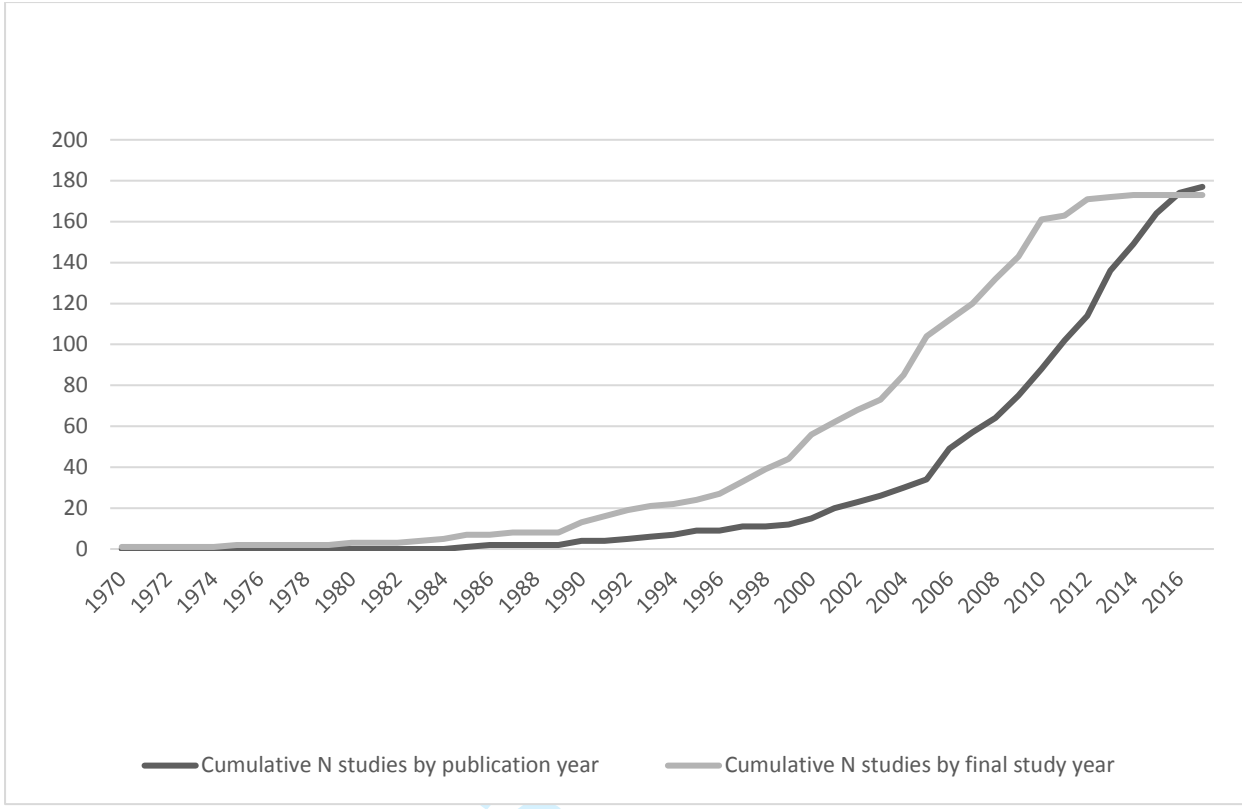
## FIGURE LEGENDS

**Figure 1.** Accumulation of evidence on the political determinants of population health over time.

**Figure 2.** PRISMA 2009 flow diagram.

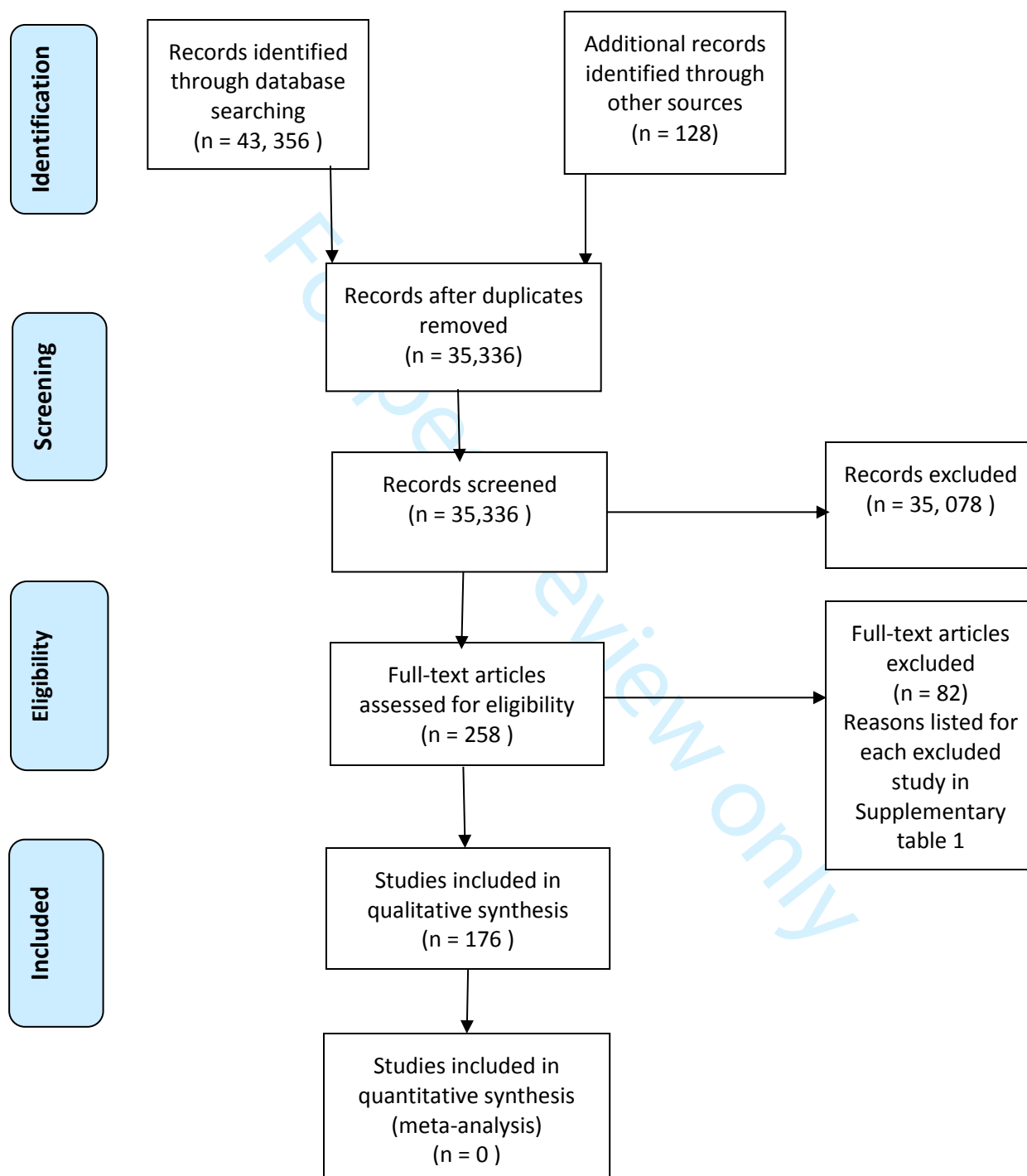


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## PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

For peer review only - <http://bmjopen.bmj.com/site/about/guidelines.xhtml>

**Supplementary file 1. List of all publications excluded at full-text screening, with reasons**

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Supplementary file 3. Study-level risk of bias assessment

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Ades, 2013	Green	Yellow	Green	Green	Green	Green	Green		Green
Adeyi, 1997	Green	Yellow	Green	Green	Green	Green	Green		Green
Akinci, 2014	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Alvarez-Dardet, 2006	Green	Yellow	Green	Green	Green	Green	Green		Green
Avendano, 2009	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Bambra, 2014	Green	Yellow	Green	Green	Green	Green	Green		Green
Bambra, 2009	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Bambra, 2009	Green	Yellow	Green	Green	Green	Green	Green		Green
Bambra, 2006	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Bambra, 2005	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Batniji, 2014	Green	Yellow	Green	Green	Green	Green	Green		Green
Baum, 2003	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow
Bentley, 2016	Yellow	Yellow	Green	Green	Green	Green	Green		Yellow
Bergh, 2010	Green	Yellow	Green	Green	Green	Green	Yellow		Yellow

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Besley, 2006	Green	Yellow	Green	Green	Green	Green	Yellow	White	Green
Bosdriesz, 2015	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Borrell, 2009	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Bozorg mehr, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Bradley, 2011	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Brandt, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Bremberg, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Burroway, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Burstrom, 2010	Yellow	Yellow	Yellow	Green	Green	Green	Green	White	Yellow
Cereseto, 1986	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Chung, 2007	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Chung, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Conley, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Copeland, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Green	White	Yellow
Correa, 1992	Green	Yellow	Green	Green	Green	Green	Yellow	White	Green

Corsi, 2014									
Costa-Font, 2016									
Craveiro, 2017									
Cross, 2009									
De Vogli, 2014									
Dahl, 2013									
Deeming, 2012									
Devaux, 2015									
Dietrich, 2015									
Doherty, 2010									
Dragano, 2010									
Dujardin, 2011									
Eikemo, 2008									
Eikemo, 2008									
Elgar, 2011									
Elola, 1995									
Engster, 2011									
Esmaeli, 2011									
Espelt, 2008									

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Esser, 2010									
Estimé, 2014									
Fan, 2015									
Farfan-Portet, 2010									
Fayissa, 2001									
Foubert, 2014									
Franco, 2004									
Frey, 1999									
Fritzell, 2012									
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Fumagalli, 2013									
Gauri, 2002									
Gerring, 2008									
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Ghobarah, 2004									
Gilligan, 2015									
Gizeles, 2009									
Glass, 2016									

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Krueger, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Kudamatsu, 2012	Green	Yellow	Green	Green	Green	Green	Green	White	Green
Kuovo, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Lahelma, 1994	Yellow	Yellow	Yellow	Green	Green	Green	Green	White	Yellow
Lake, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Lena, 1993	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Levecque, 2011	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Levecque, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Levine, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Lin, 2012	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Lin, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
London, 1990	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
López-Casasnovas, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Lundberg, 2008	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
McKinnon, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Mackenbach, 2013	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
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Mackenbach, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green

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Nelson, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Norden mark, 2006	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Novignon, 2012	Green	Yellow	Green	Green	Green	Green	Green	White	Green
Oberlander, 2017	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Olafsdottir, 2007	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Olsen, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Oster, 2012	Green	Yellow	Green	Green	Green	Green	Yellow	White	Green
Ouweneel, 2002	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Owen, 2007	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Palència, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Pickett, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Pillai, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Pinzón-Flórez, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Platts, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Ploubidis, 2012	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Popham, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green
Raphael, 2004	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	White	Yellow
Reeves, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	White	Green

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Van der Heuvel, 2013	Amber	Amber	Amber	Green	Green	Green	Green	White	Amber
Van der Wel, 2011	Green	Amber	Amber	Green	Green	Green	Green	White	Green
Van Tuyckom, 2011	Green	Amber	Green	Green	Green	Green	Green	White	Green
Vahid Shahidi, 2016	Green	Amber	Amber	Green	Green	Green	Green	White	Green
Veenhoven, 2000	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber
Veenhoven, 1995	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber
Vöörmann, 2013	Amber	Amber	Amber	Green	Green	Green	Amber	White	Amber
Wejnert, 2008	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber
Whitehead, 2000	Amber	Amber	Amber	Green	Green	Green	Green	White	Amber
Witvliet, 2013	Green	Amber	Amber	Green	Green	Green	Green	White	Green
Wu, 2007	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber
York, 2014	Green	Amber	Green	Green	Green	Green	Amber	White	Green
Zambon, 2006	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber
Zweifel, 2000	Green	Amber	Amber	Green	Green	Green	Amber	White	Amber

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)







# PRISMA 2009 Checklist

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# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12





# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org).

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# BMJ Open

## How much evidence is there that political factors are related to population health outcomes? An internationally comparative systematic review

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-020886.R1
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3 **How much evidence is there that political factors are related to population health**  
4 **outcomes? An internationally comparative systematic review**

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## ABSTRACT

**Objectives:** To provide a seven-year update of the most recent systematic review about the relationships between political features and population health outcomes.

**Setting:** Internationally comparative scholarly literature.

**Data sources:** Ten scholarly bibliographic databases plus supplementary searches in bibliographies and Google Scholar were used to update a previous systematic review. The final search was conducted in November 2017.

**Primary and secondary outcome measures:** Any population health outcome measure, apart from healthcare spending.

**Results:** 73 unique publications were identified from the previous systematic review. The database searches to update the literature identified 45,356 raw records with 35,207 remaining following deduplication. 55 publications were identified from supplementary searches. In total, 258 publications proceeded to full-text review and 176 were included in narrative synthesis. Eighty-five studies were assessed at low risk of bias, 89 at moderate risk of bias and none at high risk of bias. Assessment could not be conducted for 2 studies with only book chapters. No meta-analysis was conducted. 102 studies assessed welfare state generosity and 79 found a positive association. 17 studies assessed political tradition and 15 found a positive association with left-of-centre tradition. 44 studies assessed democracy and 34 found a positive association. 28 studies assessed globalisation and 14 found a negative association, while 7 were positive and 7 inconclusive.

**Conclusions:** This review concludes that welfare state generosity, left-of-centre democratic political tradition and democracy are generally positively associated with population health. Globalisation may be negatively associated with population health, but the results are less conclusive. It is important for the academic public health community to engage with politics in its research as well as in advocacy and stakeholder engagement, in order to facilitate positive outcomes for population health.

**Strengths and limitations of this study**

- We offer the largest systematic review on the political determinants of population health.
- The use of a systematic review design offers a robust and reproducible method that minimises potential reviewer bias.
- Our review also involved searching ten major scholarly databases in addition to relevant supplementary searches.
- The internationally comparative approach ensures relevance to readers worldwide.
- Resources meant it was unfeasible to conduct a new review from inception rather than an update of a 2010 review.

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## INTRODUCTION

### *Conceptualising politics*

Politics is an omnipresent feature of modern civilisations worldwide and has been described as the “practice of the art or science of directing and administrating states”.<sup>1</sup> Political views and systems differ substantially globally. However, they can usefully be conceptualised in terms of two axes. The first is democracy vs autocracy, and conceptualises the extent to which the population decides, either directly or indirectly, its government and governance.<sup>2</sup> The second is the left vs right axis, and conceptualises the extent to which a government intervenes in an attempt to secure social goals (progressive, left wing) or focuses on economic freedom and minimal state intervention (conservative, right wing).<sup>3</sup>

### *Opportunities for politics to influence population health*

One of the founding fathers of social medicine Rudolph Virchow said that “Medicine is a social science, and politics nothing but medicine at a larger scale”.<sup>4</sup> Indeed, many pathways to public health impact are political,<sup>5</sup> although the precise structures by which these operate differ between countries. Especially in developed countries, the existence of formal evidence-based systems is common in the licensing of medicines and medical devices (for example the European Medicines Agency and the Food and Drug Administration (United States of America)) and the development of national clinical guidelines and the approval for specific medicines and medical devices to be used in public sector health systems (for example the National Institute of Health and Care Excellence on behalf of the National Health Service in England and Wales).

Nevertheless, as Virchow said, health is about far more than medicine. For example, social and economic inequalities are strong predictors of health inequalities and more equal societies have been shown to be more successful.<sup>6-8</sup> Commonly, with regard to these social determinants of health, there is no formal evidence-based process and ideology dominates evidence in Parliamentary business,<sup>9</sup> leading to marked evidence-policy gaps.<sup>10</sup> Political

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3 influences can operate at a variety of levels, including national governments, devolved  
4 governments (see supplementary file 1 for an example), and local authorities, which have  
5 taken a greater role in public health in recent years in many countries.<sup>11</sup>  
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### 8 9 ***Existing evidence about the relationship between politics and population health***

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11 While single-country evidence such as the review by Scott-Samuel et al<sup>12</sup> on the  
12 health effects of Thatcherism, and a recent studies on the effects of Conservative Party  
13 austerity in England<sup>13-14</sup> can be valuable, internationally comparative evidence allows us to  
14 transcend the particularities of individual countries and assess variation in parameters that  
15 are static within a given country.<sup>15</sup> The most recent internationally comparative systematic  
16 review that assessed a wide range of political features was published in 2011 with searches  
17 up to April 2010 (the 2010 review).<sup>16</sup> It did not include a risk of bias assessment. It assessed  
18 four key political features: democracy, welfare state, left-of-centre political tradition and  
19 globalisation.  
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30 The 'contestability'<sup>17</sup> inherent in democracy may be health-promoting due to the  
31 potential electoral consequences of unpopular policies. Left-of-centre political tradition, and  
32 an advanced welfare state which is a key marker thereof,<sup>3</sup> may be health-promoting due to a  
33 greater focus on active state intervention to address social, economic and health  
34 inequalities,<sup>6-8</sup> and consequent greater alignment to public health mission statements, such  
35 as that of the European Public Health Association.<sup>18</sup> Globalisation is a multi-faceted concept,  
36 but may include trade liberalisation and free-markets, which are more favoured by the  
37 political right than the left.<sup>3</sup> The 2010 review suggested that globalisation was negatively  
38 associated with population health outcomes, while democracy, welfare state and left-of-  
39 centre political tradition were positively associated. The majority of studies had been  
40 published in the five year period up to the search, indicating an active field of research. This  
41 suggests that the 2010 review is likely now to be considerably out of date.  
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### 54 55 ***Aims***

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We offer an updated systematic review investigating relationships between four key political features (democracy, welfare state, political tradition, and globalisation) and population health outcomes. This represents the largest systematic review to date of evidence in this field.

## **METHODS**

### ***Design***

A narrative systematic review design was used following the internationally accepted PRISMA guidelines.<sup>19</sup> MB was the lead reviewer. Proportionate independent second review was performed by BH for each stage in the review process, whereby this author independently appraised 20% of records for each stage. There were few disagreements, and where there arose, they were resolved by discussion.

### ***Data sources***

As this was an updated systematic review, all included studies from the 2010 review proceeded directly to the full-text review stage. An update search was conducted on ten scholarly databases from 2010 to April 2017 inclusive (MEDLINE, AMED, EMBASE, PsycINFO (all Ovid), CINAHL, Philosopher's Index (both Ebsco), Science Citation Index Expanded, Social Sciences Citation Index, Emerging Sources Citation Index (all Web of Science) and Sociological Abstracts (ProQuest), following the conceptual search strategy shown in Table 1, from which search strings for the syntax of each database were developed. The full MEDLINE search strategy is shown in Supplementary file 2. Supplementary searches back to 2006 were conducted on Google Scholar and in relevant bibliographies. The final search was conducted in November 2017.

### ***Inclusion criteria***

Records were screened initially by title and abstract, and then in full text form for potential inclusion according to the following criteria:



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- Peer-reviewed journal article in a scientific journal or a scholarly book or chapter
- Study human populations either at the individual or ecological level
- Present at least one measure of a political exposure, conceptualised in terms of the welfare state, political tradition, democracy or globalisation. These political features were defined exactly following Muntaner et al.<sup>16</sup>
- Present at least one measure of a population health outcome. Healthcare spending alone was not considered an eligible outcome
- Use any quantitative empirical design to link the exposure to the outcome
- Present a comparison involving at least 2 countries

### **Data extraction**

Results were classified into one of four political themes – welfare state, political tradition, democracy and globalisation. Studies were allowed to contribute to more than one political theme. The following information was extracted for each included study: i) bibliographic details, ii) sampling frame, iii) years of study, iv) design, v) political themes to which the study contributes, vi) measure(s) of political exposures, vii) measure(s) of population health outcome measures, and viii) results classification (positive, negative or inconclusive association between the political exposure and population health outcome measures).

### **Risk of bias assessment**

Risk of bias assessment was conducted at the study level using the Threats to Validity Tool,<sup>20</sup> using the configuration of Barnish and Barnish,<sup>21</sup> with one modification. Loss-to-follow-up was not considered relevant for the body of studies included in this review. Following Barnish et al,<sup>22</sup> the categories were set as i) low risk of bias (high quality) if  $\geq 70\%$  of eligible items were assessed as at low risk of bias, ii) moderate risk of bias (moderate quality) for 40-69%, and iii) high risk of bias (low quality) for  $\leq 39\%$ . This assessment could not be conducted for studies that only comprised of book chapters, since the tool is not suitable, and format incompatibility could introduce bias into the assessment.

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## Data synthesis

In light of differences in political contexts between countries, and in terms of how political exposures and population health outcomes were measured, narrative synthesis was considered more appropriate than meta-analysis. Studies were grouped by political theme. In addition to our base case analysis, certain scenario analyses were conducted to further explore the data:

1. Studies that take economic factors into consideration, for each of the four themes except globalisation
2. Studies that include developing countries, for each of the four themes
3. Studies looking at general health or quality of life, for each of the four themes
4. Studies using a welfare regime classification scheme, for the welfare state theme
5. Studies using a political tradition classification scheme, for the political tradition theme

The scenario analysis on economic factors was not conducted for the globalisation theme because globalisation itself has a dominant economic component, so this is already measured. A formal test of economic mediation was not required – it was sufficient that studies took economic factors into consideration.

## Patient and public involvement

- ***How was the development of the research question and outcome measures informed by patients' priorities, experience, and preferences?***

This is a systematic review of population health outcomes generally, and is not focused on one medical condition. Our understanding of the field was shaped by public debates on health policy, including on TV and in the newspapers, as well as scholarly sources. Our author team includes one person Becky Horne, who while very skilled at reviewing and analysis, is not a full-time university academic. This allowed us a wider perspective on the relevance of our work. We were mindful,

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3 however, not to focus the article excessively on our own countries, which do form the  
4 majority of our personal experience and insight.

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7 **▪ *How did you involve patients in the design of this study?***

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9 As a systematic review on population health outcomes in general, rather than one  
10 specific medical condition, there was no one defined patient group relevant to inform  
11 the design of this study. Becky Horne contributed to the study design as our lay  
12 member of the research team.

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17 **▪ *Were patients involved in the recruitment to and conduct of the study?***

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19 As a systematic review, there was no recruitment to this study. Our lay member of  
20 the team Becky Horne contributed fully to the conduct of the study.

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23 **▪ *How will the results be disseminated to study participants?***

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25 As a systematic review, there were no participants. We will respond to any reputable  
26 requests for interview from the media, and may initiate communication with certain  
27 media outlets. However, we do note that in our countries, there have been already  
28 been many articles and features in the media about politics and health. Therefore, we  
29 do not consider that a mass media release would offer substantive added value.

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35 **▪ *For randomised controlled trials, was the burden of the intervention assessed  
36 by patients themselves?***

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38 Our work is not a randomised controlled trial.

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42 **▪ *Patient advisers should also be thanked in the contributorship  
43 statement/acknowledgements.***

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45 There are no such persons who do not fulfil the authorship criteria. Becky Horne  
46 fulfils the authorship criteria and is named as an author accordingly.

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49 **RESULTS**

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52 ***Search results***

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54 Seventy-three de-duplicated records came from the 2010 review. Update database  
55 searches yielded 43, 356 records in total, of which 35,207 remained following deduplication.

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3 Supplementary searches on Google Scholar and in bibliographies yielded 55 additional  
4 records. From 35, 333 unique records, 255 proceeded to full-text screening and all were  
5 retrieved. 176 studies were included in our review (Supplementary file 3), of which 106 came  
6 from our update searches and 70 from the 2010 review. 82 studies were excluded at the full-  
7 text review stage (Supplementary file 4). Studies were published in final form a median of 6  
8 years (IQR 4-8) after the year of final data collection and the longest lag was 20 years  
9 (Figure 1). The most recent data included in the analyses was collected in 2014. A PRISMA  
10 flowchart (Figure 2) and PRISMA checklist (Supplementary file 5) are provided. Eighty-five  
11 studies (49%) were assessed at low risk of bias, 89 (51%) at moderate risk of bias and none  
12 at high risk of bias. Risk of bias assessment could not be conducted for two studies (1% of  
13 total) whose only included publications came in the form of book chapters. Study-level risk of  
14 bias profiles are provided in Supplementary file 6.

### 26 27 **Welfare state**

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30 A total of 102 studies addressed the welfare state theme. Of these, 79 (77%)  
31 provided evidence that was favourable about the association of increased welfare state  
32 generosity with population health, 20 (20%) were inconclusive, and three (3%) were  
33 negative. Most studies either classified welfare state generosity in terms of a welfare regime  
34 classification or in terms of expenditure on health and social care. Welfare regime  
35 classifications did vary between studies, but often compared an 'advanced', e.g. Nordic<sup>23</sup>  
36 welfare regime with liberal and also market-driven/conservative alternatives. Health  
37 outcomes for welfare state studies included self-rated general health, quality of life,  
38 prevalence of chronic conditions, mental health, life expectancy and child and infant  
39 mortality. Supplementary file 7 provides study-level details.

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42 Among studies that took economic factors into consideration (n=83), 82% found a  
43 more generous welfare state to be positively associated with population health. Among  
44 studies including developing countries (n=23), 83% found this association. Among studies  
45 that used a general health or quality of life outcome (n=32), 69% found this association.

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3 Considering only studies that used a welfare regime classification, 73% found this  
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5 association.

### 6 7 ***Political tradition*** 8

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10 A total of seventeen studies addressed the political tradition theme. Of these, 15  
11 (88%) were positive about the association of left-of-centre political tradition with population  
12 health, while two (12%) were inconclusive. Ways in which political tradition was measured  
13 included political tradition classification of ruling government, time in power by different  
14 parties, voter partisanship, proportion of seats held by left-wing or left-of-centre parties and  
15 working class power. Population health outcomes included life expectancy, infant and child  
16 mortality, life expectancy, older adult mortality, general self-rated health and successful  
17 implementation of effective health policies. Supplementary file 8 provides study-level details.  
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21 All studies in the political tradition theme considered economic factors, so no  
22 scenario analysis was conducted on this factor. Among studies including developing  
23 countries, all (n=6) found left-of-centre political tradition to be positively associated with  
24 population health outcomes. Among studies that used a general health or quality of life  
25 outcome, all (n=6) found this association. Among studies that used a political tradition  
26 classification scheme (n=8), 88% found this association.  
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### 29 30 31 32 33 34 35 36 37 38 ***Democracy*** 39

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41 A total of 44 studies addressed the democracy theme. Of these, 34 (77%) were  
42 positive, eight (18%) were inconclusive and two (5%) negative. Ways in which democracy  
43 was measured included political transition to democracy, years of democracy since 1900,  
44 the presence of elections and standardised indices such as Polity IV.<sup>24</sup> Population health  
45 outcomes included measures such as general self-rated health, life expectancy, older adult  
46 mortality, and successful implementation of effective health policies, while there was a  
47 particular focus on infant and child mortality and other child health outcomes. Supplementary  
48 file 9 provides study-level details.  
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3 Among studies taking economic factors into consideration (n=39), 77% found  
4 democracy to be positively associated with population health outcomes. Among studies  
5 including developing countries (n=25), 76% found this association. Among studies that used  
6 a general health or quality of life outcome, all (n=3) found this association.  
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### 10 11 **Globalisation**

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14 A total of 28 studies addressed the globalisation theme. Of these, seven (25%) were  
15 positive, seven (25%) were inconclusive, and fourteen (50%) were negative. Measures of  
16 globalisation included world-system role, foreign trade, debt dependency, imports and  
17 exports, as well as membership of organisations such as the World Trade Organization and  
18 standardised indices such as the Maastricht Globalization Index<sup>25</sup> and the KOF Index.<sup>26</sup>  
19 Many studies measured infant and child health outcomes and mortality, while assessed  
20 measures including life expectancy, obesity, water pollution and tobacco smoking rates.  
21 Supplementary file 10 provides study-level results.  
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31 All globalisation studies included data from developing countries, so no scenario  
32 analysis was performed on this factor. Only one study in this theme assessed general health  
33 or quality of life, and found a positive association between globalisation and health-related  
34 quality of life.  
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## 39 **DISCUSSION**

### 40 41 42 **Summary of findings**

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45 We present a body of evidence from 176 internationally comparative scholarly  
46 studies that together provides powerful evidence that key political characteristics are  
47 important predictors of a range of population health outcomes. The evidence was favourable  
48 about a positive association with population health for all of increased welfare state  
49 generosity, left-of-centre democratic political tradition and democracy, supported by over  
50 three quarters of eligible studies. Twice as much evidence supported a negative association  
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3 with population health for globalisation than a positive association, although a quarter of  
4 studies were inconclusive. Scenario analyses showed that i) most studies considered  
5 economic factors and excluding those that did not made little difference to the results, ii)  
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7 apart from in the globalisation theme a minority of studies included developing countries but  
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9 the results of those that did were generally consistent with those that did not, iii)  
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11 classification schemes for welfare state and political tradition made little difference to the  
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13 results, and iv) the proportion of studies using general health or quality of life outcome  
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15 measures was relatively low, but the results were directionally consistent with the wider set  
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17 of studies.  
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### 21 ***Risk of bias assessment***

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24 Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate  
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26 risk of bias and none at high risk of bias. However, low risk of bias of individual studies does  
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28 not mean that there is necessarily low risk of bias across studies, especially when grouping  
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30 so many heterogeneous studies. The three types of potential bias that were found quite  
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32 often were chance, group equivalence and potential conflict of interest. Most studies were  
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34 very large, however they tended not to provide a rationale for their sample size or provide  
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36 information to let us assess whether there may have been under- or indeed overpowered to  
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38 detect associations. Group equivalence is very hard to achieve in studies such as the ones  
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40 eligible for our review, since it would entail countries being similar in most other ways except  
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42 the political variable of interest. Substantive conflicts of interest were rare, but more of an  
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44 issue was an absence of funding statements or declarations as to whether there were any  
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46 conflicts of interest. This absence was particularly notable among studies published in social  
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48 science journals. No studies declared any party political members among the authors, yet it  
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50 seems incongruous to believe that no author among 176 health policy studies was a  
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52 member of a political party. Rather, it seems that political conflicts of interest are seldom  
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54 declared, when potentially they should.  
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### **Strengths**

We offer the largest systematic review on the political determinants of population health, and the first wide ranging internationally comparative systematic review of similar scope since 2010. The use of a systematic review design offers a robust and reproducible method that minimises potential reviewer bias in the selection and evaluation of studies for potential inclusion.<sup>27</sup> Our review also involved searching ten major scholarly databases and this very thorough coverage of the literature is reflected in a very low proportion of studies being identified from supplementary searches. All publications identified for full-text screening were successfully obtained. Conducting searches back to 2006 as part of our update enabled us to include a further ten eligible studies published before the search date of the 2010 review. We independently evaluated all studies from the 2010 review and allowed studies to contribute to multiple themes, allowing further relevant data to be included. The internationally comparative approach ensures relevance to readers worldwide and transcends the limitations associated with single-country studies. Unlike the authors of the 2010 review, we were able to provide a risk of bias assessment.

### **Limitations**

Resources precluded a new review from inception, and required us to update an English-language only review from 2010. Moreover, conducting an update required us to maintain consistency with the 2010 review in terms of inclusion criteria, and precluded us from considering a wider range of grey literature sources, such as Organisation for Economic Co-operation and Development (OECD) reports, which may have relevant data. Moreover, the categorical form of data extraction in terms of positive, inconclusive or negative results followed this previous review and was necessitated by its scope and scale. Limiting reviews to the English language may not exert systematic bias in systematic reviews, at least according to evidence from reviews of healthcare interventions.<sup>28</sup> The diversity of political and health-system contexts as well as measures of political exposures



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3 and population health outcomes precluded meta-analysis. The internationally comparative  
4 approach increases relevance for an international readership, yet it introduces complexities  
5 in the mapping between political characteristics and political parties in both systematic and  
6 idiosyncratic ways.<sup>29-33</sup> Public health policy evidence is typically observational, which reflects  
7 real-world situations. Observational studies do not intrinsically overstate effect sizes<sup>34</sup> and  
8 can be highly valuable.<sup>5</sup> Causative inference can be made more complicated by different  
9 causal pathways, different confounders, and different covariates, although systems such as  
10 Bradford Hill<sup>35</sup> may be used as a starting point. Studies did not regularly report their study  
11 design thoroughly or consistently in terms of recognised design labels beyond the basics  
12 such as ecological vs individual studies, which limited the level of detail in which information  
13 on study design could be extracted.  
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### 24 ***Comparison with previous reviews***

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28 Our review offers a seven and a half year search advance on the most recent  
29 internationally comparative systematic review to offer an equivalent scope. The 2010 review  
30 by Muntaner et al<sup>16</sup> included 73 studies, of which 70 were eligible for our review. Three were  
31 excluded from our review since they only included healthcare spending as an outcome. We  
32 considered that to be circular, since healthcare spending was also frequently used by  
33 studies as a marker of welfare state generosity. To these 70 studies, we added a further 106  
34 (10 of which were dated prior to the search of the 2010 review), giving a total of 176 studies  
35 in our review. Those added by our update constituted 60% of the total (58% if the 10 studies  
36 we added from prior to 2010 were removed from the numerator and denominator),  
37 demonstrating how the scale of the evidence base for the political determinants of population  
38 health has more than doubled over the past seven and a half years.  
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51 The strength of evidence that welfare state generosity is positively associated with  
52 population health has increased slightly (77% vs 72% positive), while the number of studies  
53 has more than tripled (102 vs 32). The strength of evidence that left-of-centre political  
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3 tradition is positively associated with population health has increased markedly (88% vs 60%  
4 positive), while the number of studies has increased modestly (17 vs 12). Notably, far fewer  
5 studies have explicitly studied political tradition than the welfare state, which is one of the  
6 key markers of political tradition. The strength of evidence that democracy is positively  
7 associated with population health is largely unchanged (77% vs 78%), while the number of  
8 studies has increased substantially (44 vs 27). The strength of evidence that globalisation is  
9 negatively associated with population health has weakened (50% vs 75% negative), while  
10 the number of studies has increased sevenfold (28 vs 4).

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19 A prior review in the interim<sup>36</sup> had found that the strength of evidence for the benefits  
20 of welfare state generosity was greater for studies assessing spending patterns than welfare  
21 regime typologies. We did not find a strong effect – 73% of studies assessing regime  
22 typologies were positive compared to 77% of studies irrespective of how the welfare state  
23 was measured. The Nordic model found in Scandinavia was presented by most studies as  
24 the example of an advanced welfare state. However, classifications used in these typologies  
25 are imperfect, and in many ways the Scottish system (see supplementary file 1) could be  
26 argued to represent a more advanced welfare state, since Norway for example does not  
27 offer universal free healthcare at point of use. Our findings on the welfare state and political  
28 tradition were also consistent with those of Scott-Samuel et al<sup>12</sup> regarding Thatcherism in the  
29 United Kingdom, which found a widening of health inequalities resultant from the introduction  
30 of reduced state welfare provision and increased privatisation and pro-market policies.  
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#### 44 ***Recommendations for research and academic practice***

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47 It is important that health research increasingly focuses on real-world contexts to  
48 supplement more idealised studies.<sup>5</sup> Health research that does not consider political and  
49 cultural factors may lack relevance and generalisability,<sup>37</sup> especially research into the social  
50 determinants of health. Academic public health has a long pro-social political history,<sup>38</sup> but  
51 recently there has been reluctance to advocate both at the individual<sup>4</sup> and organisational  
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3 level.<sup>39</sup> Developing advocacy as a fundamental part of public health academia is important to  
4 combat industry lobbyists,<sup>40-41</sup> and inform the public of the consequences of electoral  
5 choices. Kapilashrami et al<sup>42</sup> provide interesting insight into an example of an advocacy  
6 programme. Meanwhile, a recent debate in the BMJ about the relative priority of action and  
7 research in public health<sup>43</sup> and an article on the extent to which academic advocacy is a  
8 disciplinary duty in public health<sup>44</sup> may interest the reader. Moreover, partnership  
9 approaches<sup>45</sup> to knowledge translation can be successful, but depend on an ideological  
10 match with the potential end user.

### 11 12 13 ***Implications for policy and practice***

14  
15 Clinicians and decision makers should be aware of the context in which they work,  
16 and the political influences on medicine and health outcomes. They should seek to find ways  
17 to increase the use of evidence in decisions impacting on health. Ideas such as ‘health in all  
18 policies’<sup>46</sup> are worthwhile, but only if they are genuinely put into action and not seen as a ‘tick  
19 box’ exercise.

### 20 21 22 ***Conclusion***

23  
24 In conclusion, we present a systematic review of 176 studies that demonstrates that  
25 politics is an important determinant of population health outcomes, and one with which the  
26 academic and clinical population health community should engage more and advocate for  
27 the health of our populations.

### 28 29 30 **FOOTNOTES**

31  
32  
33 **Contributors:** MB was the project director and project manager. The study was  
34 conceptualised by MB with input from MT and BH. Searches were conducted by MB. Study  
35 selection, data extraction and quality assessment were conducted by MB with proportionate  
36 second review from BH. Data interpretation was led by MB with input from MT and BH. MB  
37 wrote the first draft of the paper. MT and BH commented on the draft manuscript and  
38 thereby contributed important revisions. All tables, figures and supplementary files were  
39 made by MB. All authors approved the submission. MB is the guarantor.

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**Competing interests:** The authors have personal views and/or memberships on the political left that we do not consider conflict with the vision of public health. MB is a member of the Labour Party (United Kingdom), MT is a member of the Scottish National Party (SNP, a centre-left pro-independence party that forms the devolved government of Scotland) and BH is not a member of any party. This work was not done on behalf of any political party and is not endorsed, influenced or supported in any way by the parties of which authors are members. MB is a social democrat/liberal socialist. MT is a democratic socialist and supports Scottish independence. BH is a democratic socialist. The authors engage in appropriate activities to promote public health and social justice. We have no financial conflicts of interest.

**Ethics approval:** No ethics approval was required for this systematic review of published literature.

**Declaration:** All views presented in this article are the authors' own, and not necessarily those of their institutions nor bodies that fund their other research projects.

**Data sharing statement:** No further data are available.

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21

**TABLES****Table 1. Conceptual search strategy**

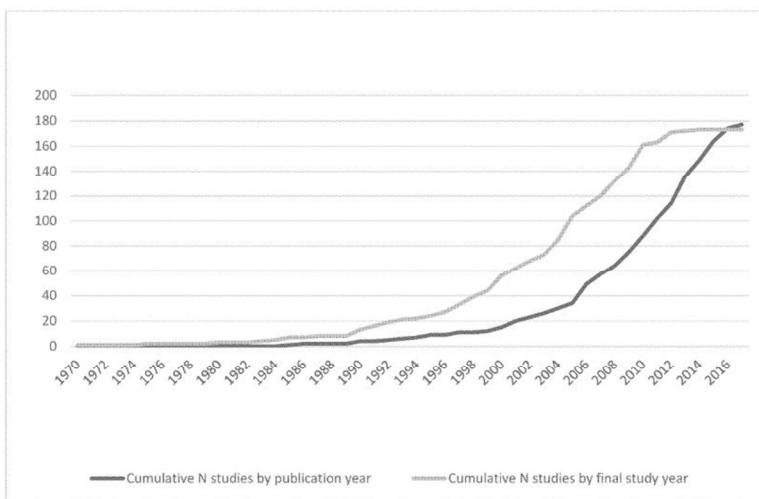
((democracy OR autocracy OR welfare regime OR welfare state OR welfare capitalism OR politics OR political tradition OR internationality OR globalization) AND (health OR health services OR population health OR public health OR health economics OR health expenditure))
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**FIGURE LEGENDS**

**Figure 1.** Accumulation of evidence on the political determinants of population health over time.

**Figure 2.** PRISMA 2009 flow diagram.

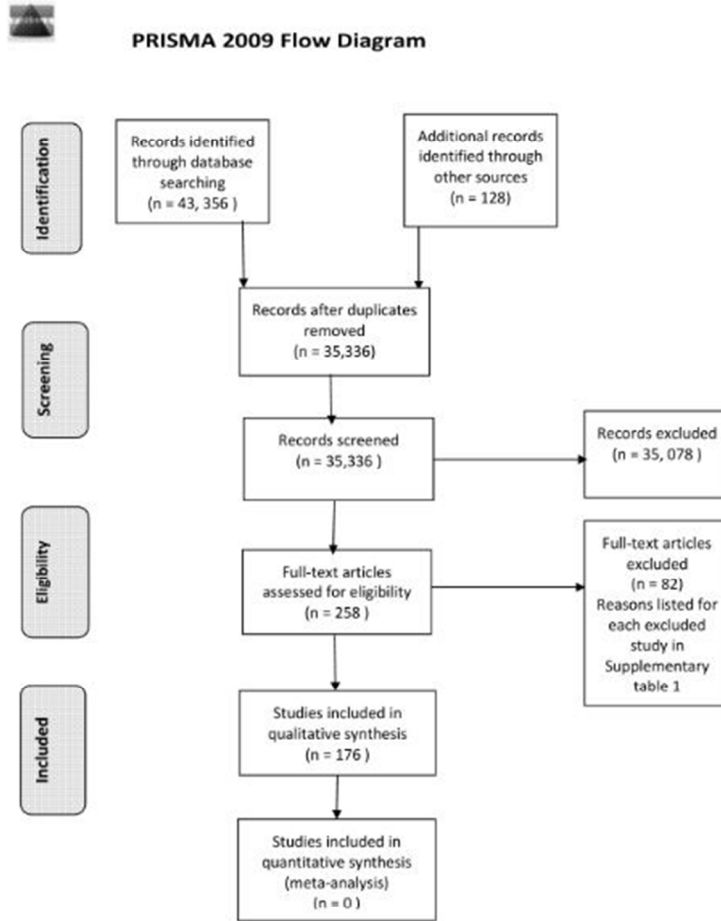




Accumulation of evidence on the political determinants of population health over time.

89x51mm (300 x 300 DPI)





From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

PRISMA 2009 flow diagram.

48x63mm (300 x 300 DPI)

**Supplementary file 1. Devolution and health systems: examples of the differences in health provision between Scotland and England**

<b>Scotland</b>	<b>England</b>
<b>Free dental checks at 6-monthly intervals (although there is a charge for treatment)</b>	<b>Dental check costs £20.60</b>
<b>Free NHS prescriptions</b>	<b>Prescription costs £8.60</b>
<b>Free NHS eye tests</b>	<b>Commercial eye tests</b>
<b>Free personal and nursing care upon assessed need</b>	<b>Commercial care</b>
<b>Public health is NHS-run</b>	<b>Public health is local authority-run</b>
<b>Offers a free baby box scheme, supplying parents of newborn children with around 40 different essential items</b>	<b>No baby box scheme</b>
<b>Minimum alcohol unit pricing (implementation date 1 May 2018)</b>	<b>No minimum alcohol unit pricing</b>

All information correct at time of writing. Certain services that are chargeable in England are offered free of charge to those on certain state benefits, but are not universally free.

Table adapted from a slide from the following conference presentation by the lead author of this manuscript Dr Max Barnish: "Barnish M. Health policy and the politics of being an early career researcher. Invited oral presentation, Early Career Researchers Workshop, Society for Social Medicine Annual Scientific Meeting, Manchester, UK, 2017". The copyright to this slide is held by Dr Barnish.

## Supplementary file 2. Full MEDLINE search strategy

Platform: OVID

Version: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present

Notes:

1. .mp indicates a keyword
2. In capitals followed by / indicates a MeSH term
3. exp indicates a MeSH term is exploded to encompass all subcategories, this was done by default

Search string:

(democracy.mp OR democratic.mp OR exp DEMOCRACY/ OR autocracy.mp OR autocratic.mp OR “welfare regime”.mp OR exp SOCIAL WELFARE/ OR “welfare state”.mp OR “welfare capitalism”.mp OR politics.mp OR political.mp OR exp POLITICS/ OR “political tradition”.mp OR globalisation.mp OR globalization.mp OR internationality.mp OR exp INTERNATIONALITY/)

AND

(health.mp OR exp HEALTH/ OR “health services”.mp OR exp HEALTH SERVICES/ OR “population health”.mp OR exp POPULATION HEALTH/ OR “public health”.mp OR exp PUBLIC HEALTH/ OR “health economic”.mp OR “health economics.mp” OR “health expenditure”.mp OR “health expenditures.mp” OR exp HEALTH EXPENDITURES/ )

Limits: English language

**Supplementary file 3. List of all publications included in the review**

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#### Supplementary file 4. List of all publications excluded at full-text screening, with reasons

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# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12



# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org).

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**Supplementary file 6. Study-level risk of bias assessment**

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Ades, 2013	Green	Amber	Green	Green	Green	Green	Green		Green
Adeyi, 1997	Green	Amber	Green	Green	Green	Green	Green		Green
Akinci, 2014	Green	Amber	Green	Green	Green	Green	Amber		Amber
Alvarez-Dardet, 2006	Green	Amber	Green	Green	Green	Green	Green		Green
Avendano, 2009	Green	Amber	Green	Green	Green	Green	Amber		Amber
Bambra, 2014	Green	Amber	Green	Green	Green	Green	Green		Green
Bambra, 2009	Green	Amber	Green	Green	Green	Green	Amber		Amber
Bambra, 2009	Green	Amber	Green	Green	Green	Green	Green		Green
Bambra, 2006	Green	Amber	Green	Green	Green	Green	Amber		Amber
Bambra, 2005	Green	Amber	Green	Green	Green	Green	Amber		Amber
Batniji, 2014	Green	Amber	Green	Green	Green	Green	Green		Green
Baum, 2003	Green	Amber	Green	Green	Green	Green	Amber		Amber

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Bergh, 2010	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Besley, 2006	Green	Yellow	Green	Green	Green	Green	Yellow		Green
Bosdriesz, 2015	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Borrell, 2009	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Bozorgmehr, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Bradley, 2011	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Brandt, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Bremberg, 2016	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Burroway, 2016	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Burstrom, 2010	Yellow	Yellow	Yellow	Green	Green	Green	Green		Yellow
Cereseto, 1986	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green		Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Chung, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Conley, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Copeland, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Green		Yellow
Correa, 1992	Green	Yellow	Green	Green	Green	Green	Yellow		Green
Corsi, 2014	Green	Yellow	Green	Green	Green	Green	Green		Green
Costa-Font, 2016	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Craveiro, 2017	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Cross, 2009	Yellow	Yellow	Yellow	Green	Green	Green	Green		Yellow
De Vogli, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Dahl, 2013	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Deeming, 2012	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Devaux, 2015	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Dietrich, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Doherty, 2010	Green	Yellow	Yellow	Green	Green	Green	Green		Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Dujardin, 2011									
Eikemo, 2008									
Eikemo, 2008									
Elgar, 2011									
Elola, 1995									
Engster, 2011									
Esmaeli, 2011									
Espelt, 2008									
Esser, 2010									
Estimé, 2014									
Fan, 2015									
Farfan-Portet, 2010									
Fayissa, 2001									
Foubert, 2014									

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Frey, 1999									
Fritzell, 2012									
Fritzell, 2013									
Fumagalli, 2013									
Gauri, 2002									
Gerring, 2008									
Gesthuizen, 2012									
Ghobarah, 2004									
Gilligan, 2015									
Gizeles, 2009									
Glass, 2016									
Goryakin, 2015									
Granados, 2010									

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	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Guarnizo-Herreño, 2013									
Harding, 2013									
Hájek, 2012									
Hauck, 2016									
Heijink, 2013									
Hoffman, 2011									
Houweling, 2005									
Huijts, 2010									
Jolly, 2013									
Jorgenson, 2009									
Jorgenson, 2009									
Karim, 2010									
Kick, 1990									
Klenk, 2016									
Klomp, 2008									

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Krueger, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Kudamatsu, 2012	Green	Yellow	Green	Green	Green	Green	Green		Green
Kuovo, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Lahelma, 1994	Yellow	Yellow	Yellow	Green	Green	Green	Green		Yellow
Lake, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Lena, 1993	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Levecque, 2011	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Levecque, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Levine, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Lin, 2012	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Lin, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
London, 1990	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
López-Casasnovas, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Lundberg, 2008	Green	Yellow	Yellow	Green	Green	Green	Green		Green

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	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Mackenbach, 2013									
Mackenbach, 2013									
Mackenbach, 2013									
Martens, 2010									
Maynard, 2015									
Maynard, 2016									
Miething, 2013									
Menon-Johansson, 2005									
Milner, 2011									
Minagawa, 2013									
Moon, 1985									
Moor, 2013									
Moore, 2006									

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Muldoon, 2011	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Muntaner, 2017	Green	Yellow	Green	Green	Green	Green	Green		Green
Muntaner, 2002	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Navarro, 2006	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Navarro, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Navarro, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Navia, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Nelson, 2014	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Norden mark, 2006	Yellow	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Novignon, 2012	Green	Yellow	Green	Green	Green	Green	Green		Green
Oberlander, 2017	Green	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Olafsdottir, 2007	Yellow	Yellow	Yellow	Green	Green	Green	Yellow		Yellow
Olsen, 2007	Green	Yellow	Yellow	Green	Green	Green	Green		Green
Oster, 2012	Green	Yellow	Green	Green	Green	Green	Yellow		Green

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Owen, 2007									
Palència, 2013									
Pickett, 2007									
Pillai, 2006									
Pinzón-Flórez, 2015									
Platts, 2015									
Ploubidis, 2012									
Popham, 2013									
Raphael, 2004									
Reeves, 2014									
Richter, 2012									
Ross, 2006									
Rostila, 2007									
Rovny, 2011									

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Sacker, 2011									
Safaei, 2006									
Sanders, 2009									
Sarti, 2013									
Sekine, 2009									
Shandra, 2010									
Shandra, 2004									
Shen, 2001									
Shen, 1997									
Shim, 2015									
Stavrova, 2011									
Stroup, 2007									
Stuckler, 2010									
Tsai, 2006									
Van der Heuvel, 2013									

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias		Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest		
Van Tuyckom, 2011	Green	Amber	Green	Green	Green	Green	Green		Green
Vahid Shahidi, 2016	Green	Amber	Amber	Green	Green	Green	Green		Green
Veenhoven, 2000	Green	Amber	Amber	Green	Green	Green	Amber		Amber
Veenhoven, 1995	Green	Amber	Amber	Green	Green	Green	Amber		Amber
Vöörmann, 2013	Amber	Amber	Amber	Green	Green	Green	Amber		Amber
Wejnert, 2008	Green	Amber	Amber	Green	Green	Green	Amber		Amber
Whitehead, 2000	Amber	Amber	Amber	Green	Green	Green	Green		Amber
Witvliet, 2013	Green	Amber	Amber	Green	Green	Green	Green		Green
Wu, 2007	Green	Amber	Amber	Green	Green	Green	Amber		Amber
York, 2014	Green	Amber	Green	Green	Green	Green	Amber		Green
Zambon, 2006	Green	Amber	Amber	Green	Green	Green	Amber		Amber
Zweifel, 2000	Green	Amber	Amber	Green	Green	Green	Amber		Amber

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

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Supplementary file 7. Table of study-level characteristics and results for welfare state

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Avendano et al, 2009	2004-2007	Ecological	Yes	11 countries from 3 European regions	Welfare regimes	Chronic conditions, self-reported health, depression	Positive
2	Bambra, 2005	1997-1999	Ecological	No	18 OECD countries	Welfare regimes	Health care index	Positive
3	Bambra, 2006	1980-1998	Ecological	No	18 OECD countries	Welfare regimes	Infant mortality	Positive
4	Bambra and Eikemo, 2009	2002-2004	Individual	No	37,499 persons from 21 European countries	Welfare regimes	Self-reported health, long-standing illness	Positive
5	Bambra et al, 2009	1998-2004	Individual	No	118,245 persons from 13 European countries	Welfare regimes	Self-rated health	Inconclusive
6	Burstrom et al, 2010	1999-2001	Individual	Yes	28,485 persons from	Family policy models	Self-rated health, limiting long-	Positive

					Italy, Sweden and Britain		standing illness	
7	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 wealthy OECD countries	Public sector medical care	Infant mortality rate, low birth weight, under-five mortality weight	Positive
8	Chung and Muntaner, 2007	1960-1998	Ecological	Yes	18 wealthy countries	Welfare regimes	Infant mortality rate, low birth weight	Positive
9	Conley and Springer, 2001	1960-1992	Ecological	Yes	19 OECD countries	Welfare regimes, welfare state spending	Infant mortality	Positive
10	Dahl et al, 2006	1970-2005	Ecological	Yes	Up to 11 European countries	Welfare regimes	Absolute and relative health inequalities	Inconclusive
11	Eikemo et al, 2008	2002-2004	Individual	No	69, 821 persons from 23 European countries	Welfare regimes	Self-reported health, limiting longstanding illness	Inconclusive
12	Eikemo et al, 2008	2002-2004	Individual	No	65, 065 persons from 21 European countries	Welfare regimes	Subjective poor health, limiting longstanding illness	Positive
13	Elola et al, 1995	1990-1991	Ecological	Yes	17 Western European countries	Health care system	Infant mortality, life expectancy	Positive

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14	Farfan-Portet et al, 2010	2001	Individual	No	5,729,859 persons in Belgium and Britain	Welfare regimes	Self-reported health	Inconclusive
15	Fayissa, 2001	1993	Ecological	Yes	34 sub-Saharan African countries	Public health expenditure	Infant mortality, child mortality	Positive
16	Grosse et al, 2010	2004	Individual	No	38,122 persons from 24 European countries	Welfare regimes	Perception of need for seeking primary health care	Positive
17	Karim, 2010	2003	Ecological	Yes	30 countries in Europe, North America, Australia and Asia	Welfare regimes	Infant mortality, life expectancy	Positive
18	Klomp and de Haan, 2008	2000-2005	Ecological	Yes	101 low, middle and high income countries	Governance	19 mortality, disease, sickness indicators	Positive
19	Lahelma and Arber, 1994	1985-1987	Individual	No	Ca. 30,000 persons from Britain, Finland, Norway and Sweden	Welfare regimes	Limiting long-standing illness	Negative
20	Lundberg et al, 2008	1950-2000	Ecological	Yes	18 OECD countries	Family policy models	Infant mortality, mortality among those aged 30-59 and over 65	Positive

21	Menon-Johansson, 2005	2002	Ecological	Yes	149 countries	Governance	HIV prevalence	Positive
22	Muntaner et al, 2006	1980-1995	Individual	Yes	Sweden, Italy, and England and Wales (combined)	Welfare regimes	Mortality level per occupational class, population attributable risk, index of dissimilarity	Inconclusive
23	Nordenmark et al, 2006	1992-2001	Individual	Yes	3442 persons from Sweden, Ireland and Great Britain	Unemployment benefit type	Psychological distress	Positive
24	Ouweneel, 2002	1980-1990	Ecological	Yes	42 'first-world, second-world and third-world' countries	Social security system	Self-rated health	Inconclusive
25	Raphael and Bryant, 2004	1999	Ecological	Yes	5 countries (Canada, Denmark, Sweden, UK, US)	Welfare state spending	Life expectancy	Positive
26	Rostila, 2007	2002-2003	Individual	Yes	36,489 persons in 20 European countries	Welfare regimes	Self-rated health, life expectancy	Positive
27	Sanders et al, 2009	1998-2002	Individual	Yes	12,888 persons in 4 countries (UK, Finland, Germany, Australia)	Welfare regimes	Oral health	Positive

28	Sekine et al, 2009	1991-2003	Individual	No	17,801 persons in Britain, Finland and Japan	Welfare regimes	The Short-Form 36: physical and mental health functioning	Positive
29	Veenhoven and Ouweneel, 1995	1965-1985	Ecological	Yes	Up to 97 rich and poor countries	Welfare state expenditure	Life expectancy	Positive
30	Veenhoven, 2000	1980-1990	Ecological	Yes	40 countries	Welfare state expenditure	Life expectancy, self-rated health	Inconclusive
31	Whitehead et al, 2000	1979-1996	Individual	No	80,792 persons from Britain and Sweden	Social benefit system	Self-perceived health, limiting longstanding illness	Inconclusive
32	Zambon et al, 2006	2001-2002	Individual	Yes	160, 325 persons from 32 European and North American countries	Welfare regimes	Self-reported health, well-being, health symptom load, health behaviours	Positive
<b>Studies from our update</b>								
33	Ades et al, 2013	2008-2012	Ecological	Yes	27 European Union countries	Healthcare spending	Cancer incidence and mortality	Positive
34	Akinci et al, 2014	1990-2010	Ecological	Yes	19 Middle Eastern and North African countries	Healthcare spending	Infant, under-5, and maternal mortality	Positive

35	Bambra et al, 2014	2010	Individual	Yes	21,705 men and women from 27 European countries	Welfare regime	Self-rated health	Inconclusive
36	Batniji et al, 2014	1980-2011	Ecological	Yes	22 Arab countries	Governance	Mortality	Positive
37	Bentley et al, 2016	2001-2008	Ecological	Yes	Australia and UK	Housing benefit generosity	Mental health	Positive
38	Bradley et al, 2011	2009	Ecological	Yes	30 OECD countries	Healthcare spending, social care spending	Life expectancy, low birth weight, maternal mortality, potential life years lost	Positive
39	Brandt and Hank, 2014	Up to 2009	Individual	No	More than 13,000 people from 11 European countries	Welfare regimes	Self-rated health, job loss	Positive
40	Bremberg, 2016	1990-2012	Ecological	Yes	28 OECD countries	Family benefit spending, healthcare spending, government expenditure on research and development	Infant mortality	Inconclusive
41	Copeland et al, 2015	1991-2010	Individual	Yes	England (n = 217,514) and Sweden (n = 184,428)	Welfare regimes	Self-rated health, health inequalities	Positive

42	Corsi and Subramanian, 2014	1990-2012	Ecological	Yes	35 sub-Saharan African countries	Maternal and child health service coverage	Under-5 mortality	Positive
43	Craveiro, 2017	2010-2011	Individual	Yes	53,615 individuals from 15 European countries	Welfare regimes	Composite health measure derived from 3 indicators based on factor analysis, health inequalities	Positive
44	Dahl and van der Wel, 2013	2005	Individual	Yes	Around 245,000 individuals from 18 European countries	National social expenditure	Self-rated health, health inequalities	Positive
45	Deeming and Hayes, 2012	2000-2005	Individual	Yes	Just under 30,000 individuals from OECD countries	Welfare regimes	Unhappiness	Positive
46	Devaux, 2015	2006-2009	Individual	Yes	Participants from 18 OECD countries	Health care system	Health inequalities	Positive
47	Dragano et al, 2010	2004-2006	Individual	Yes	9917 older individuals from 12 European countries	Welfare regimes, indicators from the EU Labour Force Survey	Depression (EURO-D and CES-D)	Positive

48	Dujardin et al, 2011	2001	Individual	Yes	5729858 individuals from Belgium and Great Britain	Home care policy system	Health burden of care	Positive
49	Elgar et al, 2011	2006	Individual	Yes	48641 adults from 33 rich and middle-income countries	Healthcare spending	Homicide	Inconclusive
50	Engster and Stensöta, 2011	1995-2005	Individual	Yes	Participants from 20 OECD countries	Family policy regime: family cash and tax benefits, paid parenting leave, public child care support	Child poverty and mortality	Positive
51	Esmaeli et al, 2011	1996-2004	Ecological	Yes	24 Islamic countries	Healthcare spending	Life expectancy	Inconclusive
52	Esser and Palme, 2010	2002-2005	Individual	Yes	13 OECD countries	Pension system	Self-rated health, WHO-5	Positive
53	Foubert et al, 2014	2002-2004	Individual	Yes	213764 individuals from 57 countries	Welfare regimes	Self-rated health	Positive
54	Fritzell et al, 2012	2000-2005	Individual	No	Randomly sampled British, Italian and Swedish mothers	Family policy model	Maternal health	Negative
55	Fritzell et al, 2013	1980-2005	Ecological	Yes	Up to 25 countries per wave	Welfare regimes	Mortality	Positive



56	Gesthuizen et al, 2012	2002-2008	Individual	Yes	Over 90,000 individuals from 32 European countries	Healthcare spending, modernised labour market	Self-rated health	Positive
57	Gilligan and Skrepnek, 2015	1995-2010	Ecological	Yes	21 Eastern Mediterranean countries	Healthcare spending	Life expectancy	Positive
58	Glass et al, 2016	2006-2008	Individual	Yes	22 OECD countries	Family policy	Happiness	Positive
59	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Welfare regimes	Life expectancy, mortality, tobacco consumption	Inconclusive
60	Guarnizo-Herreño et al, 2013	2009	Ecological	No	31 European countries	Welfare regimes	Oral health	Positive
61	Harding et al, 2013	1971-2006	Ecological	No	England and Wales, Italy and Finland	Welfare regimes	Elder mortality	Negative
62	Hájek et al, 2012	1995-2008	Ecological	Yes	27 European Union countries	Healthcare spending	Life expectancy, standardised death rate	Positive
63	Hauck et al, 2016	1990-2012	Ecological	Yes	54 low-income studies	Healthcare spending	Life expectancy	Inconclusive
64	Heijink et al, 2013	1996-2006	Ecological	Yes	14 Western countries	Healthcare spending	Avoidable mortality	Positive
65	Hoffman, 2011	1980-2006	Ecological	Yes	USA and Denmark	Welfare system	Old-age mortality	Negative
66	Kuovo and Räsänen, 2015	2010	Individual	No	10,046 individuals from Finland, Britain,	Welfare system	Subjective well-being	Positive

					Germany and Greece			
67	Levecque et al, 2011	2006-2007	Individual	Yes	41686 people from 23 European countries	Welfare regimes, welfare state generosity	Depression (CES-D)	Positive
68	Levecque et al, 2015	2006-2007	Individual	No	37076 people from 20 European countries	Migrant integration social policy	Depression (CES-D)	Inconclusive
69	Lin et al, 2014	1996-2010	Ecological	Yes	149 countries	Governance	Child mortality	Positive
70	López-Casasnovas and Soley-Bori, 2014	1980-2010	Ecological	Yes	32 OECD countries	Healthcare and social spending, healthcare system	Health Human Development Index	Positive
71	McKinnon et al, 2016	2006-2012	Individual	Yes	Participants from 48 low- and middle-income countries	Maternal health service coverage	Neonatal mortality, health inequality	Positive
72	Maynard, 2016	1985-2005	Ecological	Yes	74 developing countries	Healthcare spending	Tuberculosis mortality	Positive
73	Miething et al, 2013	2000	Individual	Yes	19353 individuals from Sweden, East and West Germany	Welfare regimes	Self-rated health	Inconclusive
74	Minagawa, 2013	1990-2009	Ecological	Yes	23 Eastern European countries	Healthcare spending	Age-specific mortality, self-rated health	Positive

75	Moor et al, 2013	1981-1999	Ecological	Yes	47 European countries and regions	Welfare state generosity (Social Policy Indicators Database)	Life satisfaction	Positive
76	Muldoon et al, 2011	2001-2008	Ecological	No	136 United Nations countries	Healthcare spending	Infant, child and maternal mortality	Positive
77	Muntaner et al, 2017	2003-2010	Household-level ecological	Yes	27 European Union countries	Welfare regimes	Self-rated health, chronic conditions	Positive
78	Nelson and Fritzell, 2014	1990-2009	Ecological	Yes	18 countries	Minimum income benefits	Mortality (life expectancy and age-standardised death rates)	Positive
79	Novignon et al, 2012	1995-2010	Ecological	Yes	44 Sub-Saharan African countries	Healthcare spending	Life expectancy, death rate, infant mortality	Positive
80	Olafsdottir, 2007	1998	Individual	Yes	Participants from USA and Iceland	Welfare regimes, healthcare spending	Self-rated physical health, health inequality	Positive
81	Olsen and Dahl, 2007	2003	Individual	Yes	38,472 individuals from 21 European countries	Healthcare spending	Self-rated health	Positive
82	Palència et al, 2014	2010	Individual	Yes	23782 men and 28655 women from	Gender equality policies	Health inequality	Positive

					26 European countries			
83	Pickett and Wilkinson, 2007	1998-2006	Ecological	Yes	23 rich countries	Income equality	Child wellbeing	Positive
84	Pinzón-Flórez et al, 2015	2000-2010	Ecological	Yes	154 countries	Healthcare spending	Child and maternal mortality	Positive
85	Platts, 2015	2000-2007	Ecological	Yes	UK and Russia	Welfare regimes	Self-rated health	Inconclusive
86	Ploubidis et al, 2012	2006-2007	Individual	Yes	33528 people from 14 European countries	Welfare regimes, income equality	Health in later life	Positive
87	Popham et al, 2013	2006	Ecological	No	37 countries	Welfare regimes	Life expectancy	Positive
88	Reeves et al, 2014	1995-2012	Ecological	Yes	21 European countries	Healthcare spending, social spending, pension expenditure	Tuberculosis control	Positive
89	Richter et al, 2012	2006	Individual	Yes	141091 adolescents from 32 countries	Welfare regimes	Subjective health, health inequality	Positive
90	Rovny, 2011	1990-1999	Ecological	Yes	17 OECD countries	Family social policy	Fertility	Positive
91	Sacker et al, 2011	1995-2001	Ecological	Yes	Britain, Germany, Denmark and USA	Welfare regimes	Self-rated health	Positive
92	Sarti et al, 2013	2005	Individual	Yes	Participants from	Welfare regimes	Self-rated health, health inequality	Positive

					European countries			
93	Shim, 2015	1980-2010	Ecological	Yes	19 OECD countries	Social welfare expenditure	Infant mortality	Inconclusive
94	Stavrova et al, 2011	1999-2009	Individual	Yes	Participants from 28 OECD countries	Unemployment benefit policies	Wellbeing among the unemployed	Inconclusive
95	Stuckler et al, 2010	1980-2005	Ecological	Yes	Up to 18 European Union countries	Social welfare spending	All-cause mortality, cause-specific mortality	Positive
96	Van der Heuvel et al, 2013	1950-2000	Ecological	Yes	Sweden, Netherlands, Canada, USA, Cuba	Welfare regimes, Redistributive welfare policy	Infant mortality, low birth weight, under 5 mortality	Positive
97	Van der Wel et al, 2011	2005	Ecological	Yes	26 European countries	Income equality, spending on active labour market policies, benefit generosity, employment protection	Social inequality in sickness	Positive
98	Van Tuyckom, 2011	Up to 2008	Individual	Yes	24,846 people from 27 European Union countries	Healthcare spending	Physical activity	Positive

99	Vahid Shahidi et al, 2016	2012	Individual	Yes	22123 individuals from 23 countries with a welfare state	Welfare social policy	Self-rated health of the unemployed	Positive
100	Vöörmann and Helemäe, 2013	2010	Individual	Yes	5480 individuals from 4 Eastern European countries	Welfare regimes	Self-rated health, health inequalities	Inconclusive
101	Wu and Chiang,2007	2002	Ecological	Yes	Taiwan and 21 comparison industrialized countries	Income inequality, healthcare spending, public social expenditure	Child mortality, under-five mortality	Positive
102	York and Bell, 2014	2005	Ecological	Yes	Countries from the World Bank database with relevant data	Healthcare spending, gender equality policies	Self-reported life satisfaction (0-10)	Positive

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**Supplementary file 8. Table of study-level characteristics and results for political tradition**

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Borrell et al, 2009	2000	Individual	Yes	196,280 persons from 13 European countries	Political tradition classification	Self-rated health	Positive
2	Cereseto and Waitzkin, 1986	1983-1984	Ecological	Yes	123 countries, grouped by level of economic development	Political-economic system	Physical quality of life index	Positive
3	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 OECD countries	Voter partisanship	Low birth weight, infant mortality, under-five mortality	Positive
4	Correa and Namkoong, 1992	1980	Ecological	Yes	116 countries with a population over 1 million	Political conditions; political tradition classification	Life expectancy, mortality	Positive

5	Espelt et al, 2008	2004	Individual	Yes	16,901 persons in 9 European countries	Political tradition classification	Self-reported health, long-term illness	Positive
6	Lena and London, 1993	1983	Ecological	Yes	Up to 84 peripheral and non-core nations	Political tradition classification	Infant mortality, child mortality, life expectancy	Positive
7	London and Williams, 1990	1965-1970	Ecological	Yes	Up to 110 periphery and semi-periphery nations	Political tradition classification	Infant mortality, life expectancy	Positive
8	Moon and Dixon, 1985	1970-1975	Ecological	Yes	116 nations	Political ideology (left, right, centre)	Physical Quality of Life Index: life expectancy, infant mortality	Positive
9	Muntaner et al, 2002	1989-1992	Ecological	Yes	16 wealthy countries	Working class power, voter partisanship, time in power by different parties	Life expectancy, self-rated health, low birth weight, and age- and cause-specific mortality	Positive
10	Navarro et al, 2003	1950-1998	Ecological	Yes	17 OECD countries	Working class power, voter partisanship	Infant mortality, life expectancy, health inequalities	Positive
11	Navarro and Shi, 2001	1960-1996	Ecological	Yes	18 OECD countries	Political tradition classification,	Infant mortality,	Positive



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						working class power	health inequalities	
12	Navarro et al, 2006	1972-1996	Ecological	Yes	17 OECD countries	Voter partisanship, time in power by different parties	Infant mortality, life expectancy	Positive
<b>Studies from our update</b>								
13	Bosdriesz et al, 2015	1996-2010	Ecological	Yes	11 European Union countries	Percentage of seats held by social democratic, socialist and other left-wing parties	Tobacco Control Scale	Positive
14	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Political tradition classification	Life expectancy, mortality, tobacco consumption	Inconclusive
15	Huijts et al, 2010	2002-2006	Individual	Yes	29 European countries and Israel	Political tradition classification	Self-rated health	Positive
16	Lin et al, 2012	1970-2004	Ecological	Yes	119 less developed countries	Political regime score from Polity IV	Life expectancy	Positive
17	Mackenbach and McKee, 2013	1990-2009	Ecological	Yes	43 European countries	Left-wing participation in government (share of seats)	Success in implementing effective health policies	Inconclusive

Supplementary file 9. Table of study-level characteristics and results for democracy

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Assessment of economic factors	Political exposures	Population health outcomes	Result category
<b>Studies from 2010 review</b>								
1	Adeyi, 1997	1989-1993	Ecological	10 former Communist countries	No	Transition from Communism to capitalist democracy	Life expectancy, infant mortality, probability of dying between 15 and 65 years	Negative
2	Alvarez-Dardet, 2006	2000	Ecological	23 former Communist countries	Yes	Democratic deficit	Life expectancy, infant mortality, maternal mortality	Positive
3	Baum and Lake, 2003	1967-1997	Ecological	128 poor and non-poor countries	Yes	Democracy (Polity III)	Female life expectancy	Positive
4	Besley and Kudamatsu, 2006	1962-2002	Ecological	Up to 160 countries transitioning to democracy	Yes	Democracy (Polity IV)	Life expectancy, infant mortality	Positive

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5	Franco, 2004	1998	Ecological	170 high, medium and low-income countries	Yes	Democracy (Freedom House)	Life expectancy, infant mortality, maternal mortality	Positive
6	Frey and Al-Roumi, 1999	1970-1990	Ecological	87 developed and less-developed countries	No	Democracy (political rights index and civil liberties)	Infant mortality, life expectancy	Positive
7	Gauri and Khaleghian, 2002	1989-1997	Ecological	208 low and middle-income countries	Yes	Democracy (Polity IV)	Vaccine coverage for diphtheria, tetanus, pertussis and measles	Negative
8	Ghobareh et al, 2004	2000	Ecological	179 countries in WHO	Yes	Democracy (Polity IV, Freedom House)	Health-adjusted life expectancy	Positive
9	Gizeles, 2009	1982-2000	Ecological	117 developed and developing countries	Yes	Democracy (Polity IV), state capacity	AIDS infection rate	Positive
10	Houweling et al, 2005	1999	Ecological	43 developing countries in Asia, Africa and Latin America	Yes	Democracy (political rights index)	Under five mortality rate	Inconclusive
11	Kick et al, 1990	1970-1985	Ecological	63 developing countries	Yes	Political democracy (political rights index)	Infant mortality	Positive

12	Klomp and de Haan, 2009	2000-2005	Ecological	171 countries with a population greater than 200,000	Yes	Decree of democracy, political stability	19 national health indicators	Positive
13	Lake and Baum, 2001	1970-1992	Ecological	Up to 110 developed countries	No	Democracy (Polity III)	Life expectancy, infant mortality	Positive
14	Lena and London; 1993	1983	Ecological	Up to 84 peripheral and non-core nations	Yes	Level of democracy	Infant mortality, child mortality, life expectancy	Positive
15	London and Williams; 1990	1965-1970	Ecological	Up to 110 periphery and semi-periphery nations	Yes	Level of political democracy	Infant mortality, life expectancy	Positive
16	Moon and Dixon, 1985	1970-1975	Ecological	116 nations	Yes	Level of political democracy, political stability	Physical Quality of Life Index: life expectancy, infant mortality	Positive
17	Navia and Zweifel, 2003	1990-1997	Ecological	188 democratic or dictatorial countries	Yes	Democracy (yes or no, based on presence of elections)	Fertility, child survival	Positive
18	Pillai and Gupta, 2006	2001	Ecological	129 developing countries	No	Democracy (human rights rating, political rights, and civil liberty, political terror scales)	10 global monitoring indicators of women's reproductive health	Positive
19	Ross, 2006	1970-2000	Ecological	168 countries with a population	Yes	Democracy (Polity IV), years of	Child mortality, infant mortality	Inconclusive

				greater than 200,000		democracy since 1900		
20	Rudra and Haggard, 2005	1975-1997	Ecological	57 less developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
21	Safaei, 2006	2003	Ecological	118 autocratic, incoherent and democratic countries	Yes	Democracy (Polity IV)	Life expectancy, mortality rate, child mortality rate	Positive
22	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Yes	Level of political democracy	Infant mortality	Positive
23	Shandra et al, 2010	1990-2005	Ecological	74 low income countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
24	Stroup, 2007	1980-2000	Ecological	Up to 105 countries	Yes	Political Rights Index (Freedom House)	Life expectancy, child mortality	Positive
25	Tsai, 2006	1975-1998	Ecological	119 developing countries	Yes	Democracy (majority rule and political contention)	Life expectancy, infant mortality under one year, infant mortality under five	Inconclusive
26	Wejnert, 2008	1970-2005	Ecological	58 core and peripheral countries	Yes	Democracy (Polity IV)	Maternal care, fertility rate, maternal mortality, women life expectancy	Inconclusive
27	Zweifel and Navia, 2000	1950-1990	Ecological	138 democratic or	Yes	Democracy (yes or no, defined)	Infant mortality	Positive

				dictatorial countries		by presence of elections)		
<b>Studies from our update</b>								
28	Batniji et al, 2014	1980-2011	Ecological	22 Arab countries	Yes	Extent of democracy	Mortality	Inconclusive
29	Burroway, 2016	1995-2008	Individual	52 developing countries	Yes	Democracy (Polity IV)	Child diarrhoea and malnutrition	Inconclusive
30	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
31	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Under-5 mortality	Inconclusive
32	Dietrich and Bernhard, 2015	1980s to 2012	Ecological	88 countries that were not OECD members in 1984	Yes	Democracy (Polity IV)	Infant mortality, basic nutrition	Inconclusive
33	Doherty and Kelly, 2010	Not stated	Individual	30,816 individuals from 17 European countries	Yes	Satisfaction with democracy on 0-10 scale	Self-reported happiness on 0-10 scales	Positive
34	Fumagalli et al, 2013	1990-2007	Ecological	47 developing countries	Yes	Democracy (Polity IV), political competition	BMI	Positive
35	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Yes	Democracy (Polity IV)	Life expectancy	Positive
36	Klenk et al, 2016	1950-2010	Ecological	64 countries from WHO	Yes	Democratization	Mortality	Positive

				mortality database				
37	Krueger et al, 2015	2002-2004	Individual	313,554 individuals from 67 countries	Yes	Democracy variable resulting from factor analysis of 7 indicators	Self-rated health	Positive
38	Kudamatsu, 2012	Up to 2004	Ecological	Sub-Saharan African countries	Yes	Democratization	Infant mortality	Positive
39	Mackenbach, 2013	1900-2008	Ecological	European countries	No	Democracy (binary)	Life expectancy	Positive
40	Mackenbach et al, 2013	1960-2008	Ecological	European countries	Yes	Democratization	Life expectancy	Positive
41	Mackenbach and McKee, 2013	1990-2009	Ecological	43 European countries	Yes	Democracy (+10 to -10)	Success in implementing effective health policies	Positive
42	Maynard, 2016	1985-2005	Ecological analysis	74 developing countries	Yes	Democracy (Freedom House)	Tuberculosis mortality	Positive
43	Minagawa, 2013	1990-2009	Ecological analysis	23 Eastern European countries	Yes	Freedom (Freedom House, Heritage Foundation)	Age-specific mortality, self-rated health	Positive
44	Witvliet et al, 2013	From 2000, end date not reported	Individual	72524 adults from 20 African countries	Yes	Transparency and freedom from corruption	Self-rated health	Positive

## Supplementary file 10. Table of study-level characteristics and results for globalisation

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
1	Moore et al, 2006	2000	Ecological	128 countries divided into 6 world-system blocks	National trade, world-system role	Infant mortality	Positive
2	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Commodity concentration, multinational corporate penetration, international monetary fund conditionality	Infant mortality	Negative
3	Shen and Williamson, 2001	1965-1991	Ecological	82 less developed countries	Foreign trade, foreign investment, debt increase	Infant mortality	Negative
4	Shen and Williamson, 1997	1960-1991	Ecological	86 less developed countries	Foreign investment, debt dependency	Child survival probability	Negative



Studies from our update							
5	Bergh and Nilsson, 2010	1970-2005	Ecological	92 high-, middle- and low-income countries	KOF index	Life expectancy	Positive
6	Bozorgmehr and Sebastian, 2014	1990-2010	Ecological	22 high-burden tuberculosis countries	World Trade Organization membership status and duration, trade as a percentage of GDP, Economic Freedom of the World Index, KOF Index	Tuberculosis incidence	Inconclusive
7	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Infant mortality	Inconclusive
8	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Under-5 mortality	Inconclusive
9	Costa Font and Mas, 2016	1989-2005	Ecological	26 countries	KOF Index, CSGR Index	Obesity prevalence, caloric intake	Negative
10	Cross et al, 2009	Not stated	Individual	UK, Spain, Kenya and Uganda	Localised or globalised food supply system	Health-related quality of life	Positive
11	De Vogli et al, 2014	1980-2008	Ecological	127 low-, middle- and high-income countries	KOF Index	BMI	Negative

12	Estimé et al, 2014	2005-2010	Household-level ecological	Pacific nations	Food imports	Obesity	Negative
13	Fan and Faioso Le'au, 2015	Up to 2014	Ecological	Independent and American Samoa	Westernisation	Life expectancy, neonatal and child mortality, measles immunisation, diabetes mortality, cancer mortality, cerebrovascular disease mortality, heart disease mortality, pneumonia mortality, overweight and obesity	Negative
14	Gerring and Thacker, 2008	1960-1999	Ecological	All countries with available data	Open international trade policies, low-inflation macroeconomic environments, market-oriented property rights, GATT and WTO membership	Infant mortality	Positive
15	Goryakin et al, 2015	1991-2009	Individual	Up to 887,00 women in 56	KOF Index	Overweight and obesity	Negative

				low- and middle-income countries			
16	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Terms of international trade, foreign investment, debt service and relief	Life expectancy	Inconclusive
17	Jolly et al, 2013	2002	Ecological	27 Latin American and Caribbean countries	Net food import	Obesity	Negative
18	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment	Water pollution	Negative
19	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment, export intensity	Water pollution	Negative
20	Levine and Rothman, 2006	Up to 1990	Ecological	Up to 130 countries	Economic openness	Infant mortality, under-5 mortality, anthropometric measures of child stunting	Inconclusive
21	Martens et al, 2010	Up to 2008	Ecological	Global, subject to data availability	Maastricht Globalization Index	Infant mortality, under-5 mortality, adult mortality	Positive
22	Maynard, 2015	2000-2010	Ecological	Up to 85 low- and middle-	IGTA membership and status,	Youth smoking rates (Global Youth Tobacco Survey)	Negative

				income countries	trade, imports, exports		
23	Maynard, 2016	1985-2005	Ecological	74 developing countries	Debt, trade dependency	Tuberculosis mortality	Inconclusive
24	Milner et al, 2011	1980-2006	Ecological	35 countries	A globalisation index developed for the study	Suicide rate	Negative
25	Mukherjee and Kriekhaus, 2011	1970-2007	Ecological	132 countries	Economic, political and social globalisation	Infant mortality, life expectancy, child mortality	Positive
26	Oberlander et al, 2017	1970-2011	Ecological	70 countries	Social globalisation, trade openness	Nutritional health	Inconclusive
27	Oster, 2010	Up to 2007	Ecological	UN countries with available data	Export activity	HIV	Negative
28	Owen and Wu, 2007	1960-1995	Ecological	219 countries	Openness to trade	Life expectancy, infant mortality	Positive



# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I <sup>2</sup> ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12

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# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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# BMJ Open

## How much evidence is there that political factors are related to population health outcomes? An internationally comparative systematic review

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<b>Primary Subject Heading</b>:	Health policy
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Political determinants of health, SOCIAL MEDICINE

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3 **How much evidence is there that political factors are related to population health**  
4 **outcomes? An internationally comparative systematic review**

5 Max Barnish,<sup>1</sup> Michelle Tørnes,<sup>2</sup> and Becky Horne<sup>3</sup>

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## ABSTRACT

**Objectives:** To provide a seven-year update of the most recent systematic review about the relationships between political features and population health outcomes.

**Setting:** Internationally comparative scholarly literature.

**Data sources:** Ten scholarly bibliographic databases plus supplementary searches in bibliographies and Google Scholar were used to update a previous systematic review. The final search was conducted in November 2017.

**Primary and secondary outcome measures:** Any population health outcome measure, apart from healthcare spending.

**Results:** 73 unique publications were identified from the previous systematic review. The database searches to update the literature identified 45,356 raw records with 35,207 remaining following deduplication. 55 publications were identified from supplementary searches. In total, 258 publications proceeded to full-text review and 176 were included in narrative synthesis. Eighty-five studies were assessed at low risk of bias, 89 at moderate risk of bias and none at high risk of bias. Assessment could not be conducted for 2 studies with only book chapters. No meta-analysis was conducted. 102 studies assessed welfare state generosity and 79 found a positive association. 17 studies assessed political tradition and 15 found a positive association with left-of-centre tradition. 44 studies assessed democracy and 34 found a positive association. 28 studies assessed globalisation and 14 found a negative association, while 7 were positive and 7 inconclusive.

**Conclusions:** This review concludes that welfare state generosity, left-of-centre democratic political tradition and democracy are generally positively associated with population health. Globalisation may be negatively associated with population health, but the results are less conclusive. It is important for the academic public health community to engage with the political evidence base in its research as well as in stakeholder engagement, in order to facilitate positive outcomes for population health.

### Strengths and limitations of this study

- We offer the largest systematic review on the political determinants of population health.
- The use of a systematic review design offers a robust and reproducible method that minimises potential reviewer bias.
- Our review also involved searching ten major scholarly databases in addition to relevant supplementary searches.
- The internationally comparative approach ensures relevance to readers worldwide.
- Resources meant it was unfeasible to conduct a new review from inception rather than an update of a 2010 review.

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## INTRODUCTION

### *Conceptualising politics*

Politics is an omnipresent feature of modern civilisations worldwide and has been described as the “practice of the art or science of directing and administrating states”.<sup>1</sup> Political views and systems differ substantially globally. However, they can usefully be conceptualised in terms of two axes. The first is democracy vs autocracy, and conceptualises the extent to which the population decides, either directly or indirectly, its government and governance.<sup>2</sup> The second is the left vs right axis, and conceptualises the extent to which a government intervenes in an attempt to secure social goals (progressive, left wing) or focuses on economic freedom and minimal state intervention (conservative, right wing).<sup>3</sup>

### *Opportunities for politics to influence population health*

One of the founding fathers of social medicine Rudolph Virchow said that “Medicine is a social science, and politics nothing but medicine at a larger scale”.<sup>4</sup> Indeed, many pathways to public health impact are political,<sup>5</sup> although the precise structures by which these operate differ between countries. Especially in developed countries, the existence of formal evidence-based systems is common in the licensing of medicines and medical devices (for example the European Medicines Agency and the Food and Drug Administration (United States of America)) and the development of national clinical guidelines and the approval for specific medicines and medical devices to be used in public sector health systems (for example the National Institute of Health and Care Excellence on behalf of the National Health Service in England and Wales).

Nevertheless, as Virchow said, health is about far more than medicine. For example, social and economic inequalities are strong predictors of health inequalities<sup>6-7</sup> and increased income inequality at a societal level has been shown to be strongly associated with worse health outcomes including life expectancy, infant mortality, obesity and mental health, as well as social outcomes such as trust, education level and social mobility.<sup>8</sup> However, there is

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evidence that political ideology and personal interests can exert substantial influences on policy-making processes relevant to health, leading to marked evidence-policy gaps.<sup>9</sup>

Political influences can operate at a variety of levels, including national governments, devolved governments (see supplementary file 1 for an example), and local authorities, which have taken a greater role in public health in recent years in many countries.<sup>10</sup>

### ***Existing evidence about the relationship between politics and population health***

While single-country evidence such as the review by Scott-Samuel et al<sup>11</sup> on the health effects of Thatcherism, and a recent studies on the effects of Conservative Party austerity in England<sup>12-13</sup> can be valuable, internationally comparative evidence allows us to transcend the particularities of individual countries. The most recent internationally comparative systematic review that assessed a wide range of political features was published in 2011 with searches up to April 2010 (the 2010 review).<sup>14</sup> It did not include a risk of bias assessment. It assessed four key political features: democracy, welfare state, left-of-centre political tradition and globalisation.

The 'contestability'<sup>15</sup> inherent in democracy may be health-promoting due to the potential electoral consequences of unpopular policies. Left-of-centre political tradition, and an advanced welfare state which is a key marker thereof,<sup>3</sup> may be health-promoting due to a greater focus on active state intervention to address social, economic and health inequalities,<sup>6-8</sup> and consequent greater alignment to public health mission statements, such as that of the European Public Health Association.<sup>16</sup> Globalisation is a multi-faceted concept, but may include trade liberalisation and free-markets, which are more favoured by the political right than the left.<sup>3</sup> The 2010 review suggested that globalisation was negatively associated with population health outcomes, while democracy, welfare state and left-of-centre political tradition were positively associated. The majority of studies had been published in the five year period up to the search, indicating an active field of research. This suggests that the 2010 review is likely now to be considerably out of date.

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## ***Aims***

We offer an updated systematic review investigating relationships between four key political features (democracy, welfare state, political tradition, and globalisation) and population health outcomes. This represents the largest systematic review to date of evidence in this field.

## **METHODS**

### ***Design***

A narrative systematic review design was used following the internationally accepted PRISMA guidelines.<sup>17</sup> MB was the lead reviewer. Proportionate independent second review was performed by BH for each stage in the review process, whereby this author independently appraised 20% of records for each stage. There were few disagreements, and where these arose, they were resolved by discussion.

### ***Data sources***

As this was an updated systematic review, all included studies from the 2010 review proceeded directly to the full-text review stage. An update search was conducted on ten scholarly databases from 2010 to April 2017 inclusive (MEDLINE, AMED, EMBASE, PsycINFO (all Ovid), CINAHL, Philosopher's Index (both Ebsco), Science Citation Index Expanded, Social Sciences Citation Index, Emerging Sources Citation Index (all Web of Science) and Sociological Abstracts (ProQuest)), following the conceptual search strategy shown in Table 1, from which search strings for the syntax of each database were developed. The full MEDLINE search strategy is shown in Supplementary file 2. Supplementary searches back to 2006 were conducted on Google Scholar and in relevant bibliographies. The final search was conducted in November 2017.

### ***Inclusion criteria***

Records were screened initially by title and abstract, and then in full text form for potential inclusion according to the following criteria:

- Peer-reviewed journal article in a scientific journal or a scholarly book or chapter
- Study human populations either at the individual or ecological level
- Present at least one measure of a political exposure, conceptualised in terms of the welfare state, political tradition, democracy or globalisation. These political features were defined exactly following Muntaner et al, and listed in Table 2.<sup>14</sup>
- Present at least one measure of a population health outcome. Healthcare spending alone was not considered an eligible outcome
- Use any quantitative empirical design to link the exposure to the outcome
- Present a comparison involving at least 2 countries

#### **Data extraction**

Results were classified into one of four political themes – welfare state, political tradition, democracy and globalisation, as per Table 2. Studies were allowed to contribute to more than one political theme. The following information was extracted for each included study: i) bibliographic details, ii) sampling frame, iii) years of study, iv) design, v) political themes to which the study contributes, vi) measure(s) of political exposures, vii) measure(s) of population health outcome measures, and iix) results classification (positive, negative or inconclusive association between the political exposure and population health outcome measures).

#### **Risk of bias assessment**

Risk of bias assessment was conducted at the study level using the Threats to Validity Tool,<sup>18</sup> using the configuration of Barnish and Barnish,<sup>19</sup> with one modification. Loss-to-follow-up was not considered relevant for the body of studies included in this review. Following Barnish et al,<sup>20</sup> the categories were set as i) low risk of bias (high quality) if  $\geq 70\%$  of eligible items were assessed as at low risk of bias, ii) moderate risk of bias (moderate

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quality) for 40-69%, and iii) high risk of bias (low quality) for  $\leq 39\%$ . This assessment could not be conducted for studies that only comprised of book chapters, since the tool is not suitable, and format incompatibility could introduce bias into the assessment.

### **Data synthesis**

In light of differences in political contexts between countries, and in terms of how political exposures and population health outcomes were measured, narrative synthesis was considered more appropriate than meta-analysis. Studies were grouped by political theme. In addition to our base case analysis, certain scenario analyses were conducted to further explore the data:

1. Studies that take economic factors into consideration, for each of the four themes except globalisation
2. Studies that include developing countries, for each of the four themes
3. Studies looking at general health or quality of life, for each of the four themes
4. Studies using a welfare regime classification scheme, for the welfare state theme
5. Studies using a political tradition classification scheme, for the political tradition theme

The scenario analysis on economic factors was not conducted for the globalisation theme because globalisation itself has a dominant economic component, so this is already measured. A formal test of economic mediation was not required – it was sufficient that studies took economic factors into consideration.

### **Patient and public involvement**

This is a systematic review of a broad range of population health outcomes and could not be represented by one patient group. Therefore, patients were not involved in the conduct of the study. There was no recruitment since this is a systematic review. The project director (MB) shall respond to reputable media requests and may approach selected media outlets about the possibility of disseminating the research findings more broadly.



## RESULTS

### *Search results*

Seventy-three de-duplicated records came from the 2010 review. Update database searches yielded 43, 356 records in total, of which 35,207 remained following deduplication. Supplementary searches on Google Scholar and in bibliographies yielded 55 additional records. From 35, 333 unique records, 255 proceeded to full-text screening and all were retrieved. 176 studies were included in our review (Supplementary file 3), of which 106 came from our update searches and 70 from the 2010 review. 82 studies were excluded at the full-text review stage (Supplementary file 4). Studies were published in final form a median of 6 years (IQR 4-8) after the year of final data collection and the longest lag was 20 years (Figure 1). The most recent data included in the analyses was collected in 2014. A PRISMA flowchart (Figure 2) and PRISMA checklist (Supplementary file 5) are provided. Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate risk of bias and none at high risk of bias. Risk of bias assessment could not be conducted for two studies (1% of total) whose only included publications came in the form of book chapters. Study-level risk of bias profiles are provided in Supplementary file 6.

### *Welfare state*

A total of 102 studies addressed the welfare state theme. Of these, 79 (77%) provided evidence that was favourable about the association of increased welfare state generosity with population health, 20 (20%) were inconclusive, and three (3%) were negative. Most studies either classified welfare state generosity in terms of a welfare regime classification or in terms of expenditure on health and social care. Welfare regime classifications did vary between studies, but often compared an 'advanced', e.g. Nordic<sup>21</sup> welfare regime with liberal and also market-driven/conservative alternatives. Health outcomes for welfare state studies included self-rated general health, quality of life,

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3 prevalence of chronic conditions, mental health, life expectancy and child and infant  
4 mortality. Supplementary file 7 provides study-level details.

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7 Among studies that took economic factors into consideration (n=83), 82% found a  
8 more generous welfare state to be positively associated with population health. Among  
9 studies including developing countries (n=23), 83% found this association. Among  
10 studies that used a general health or quality of life outcome (n=32), 69% found this association.  
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12 Considering only studies that used a welfare regime classification (n=45), 73% found this  
13 association.  
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### 19 **Political tradition**

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22 A total of seventeen studies addressed the political tradition theme. Of these, 15  
23 (88%) were positive about the association of left-of-centre political tradition with population  
24 health, while two (12%) were inconclusive. Ways in which political tradition was measured  
25 included political tradition classification of ruling government, time in power by different  
26 parties, voter partisanship, proportion of seats held by left-wing or left-of-centre parties and  
27 working class power. Population health outcomes included life expectancy, infant and child  
28 mortality, life expectancy, older adult mortality, general self-rated health and successful  
29 implementation of effective health policies. Supplementary file 8 provides study-level details.  
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39 All studies in the political tradition theme considered economic factors, so no  
40 scenario analysis was conducted on this factor. Among studies including developing  
41 countries, all (n=6) found left-of-centre political tradition to be positively associated with  
42 population health outcomes. Among studies that used a general health or quality of life  
43 outcome, all (n=6) found this association. Among studies that used a political tradition  
44 classification scheme (n=8), 88% found this association.  
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### 51 **Democracy**

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54 A total of 44 studies addressed the democracy theme. Of these, 34 (77%) were  
55 positive, eight (18%) were inconclusive and two (5%) negative. Ways in which democracy  
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3 was measured included political transition to democracy, years of democracy since 1900,  
4 the presence of elections and standardised indices such as Polity IV.<sup>22</sup> Population health  
5 outcomes included measures such as general self-rated health, life expectancy, older adult  
6 mortality, and successful implementation of effective health policies, while there was a  
7 particular focus on infant and child mortality and other child health outcomes. Supplementary  
8 file 9 provides study-level details.  
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15 Among studies taking economic factors into consideration (n=39), 77% found  
16 democracy to be positively associated with population health outcomes. Among studies  
17 including developing countries (n=25), 76% found this association. Among studies that used  
18 a general health or quality of life outcome, all (n=3) found this association.  
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### 23 **Globalisation**

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26 A total of 28 studies addressed the globalisation theme. Of these, seven (25%) were  
27 positive, seven (25%) were inconclusive, and fourteen (50%) were negative. Measures of  
28 globalisation included world-system role, foreign trade, debt dependency, imports and  
29 exports, as well as membership of organisations such as the World Trade Organization and  
30 standardised indices such as the Maastricht Globalization Index<sup>23</sup> and the KOF Index.<sup>24</sup>  
31 Many studies measured infant and child health outcomes and mortality, while assessed  
32 measures including life expectancy, obesity, water pollution and tobacco smoking rates.  
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Supplementary file 10 provides study-level results.

All globalisation studies included data from developing countries, so no scenario analysis was performed on this factor. Only one study in this theme assessed general health or quality of life, and found a positive association between globalisation and health-related quality of life.

### 51 **Health outcomes**

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54 Table 3 provides an overview of the results for each political exposure theme  
55 subdivided by health outcome. For the welfare state political exposure, the most commonly  
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3 studied health outcomes were general health (n=35, 24 positive, 11 negative), life  
4 expectancy/adult mortality (n=28, 21 positive, 2 inconclusive, 5 negative), child mortality  
5 (n=13, 13 positive), and health inequalities (n=13, 11 positive, 2 inconclusive), noting that the  
6 latter are also measured indirectly through many of the other health outcomes in the table.  
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8 For political tradition, studies were more dispersed across outcomes, although the two  
9  
10 outcomes that received considerably more study than the others were life expectancy/adult  
11 mortality (n=9, 8 positive, 1 inconclusive) and infant mortality (n=8, 8 positive). For  
12  
13 democracy, by far the most widely studied outcomes were life expectancy/adult mortality  
14 (n=20, 16 positive, 1 negative, 3 inconclusive) and infant mortality (n=20, 15 positive, 1  
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16 negative, 4 inconclusive). Less consistent results were found for child mortality (n=10, 5  
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18 positive, 5 inconclusive).

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25 For globalisation, studies were quite dispersed across outcomes and the results  
26  
27 patterning differed between outcomes, consistent with the evidence base in the review being  
28  
29 least conclusive for the globalisation outcome. For child mortality (n=6), the results were  
30  
31 equally split between positive (n=2), negative (n=2), and negative (n=2). The results were  
32  
33 also split for infant mortality (n=10, 4 positive, 3 negative, 3 inconclusive). For adult  
34  
35 mortality/life expectancy, there was a pattern in favour of a positive association with  
36  
37 globalisation (n=6, 4 positive, 1 negative, 1 inconclusive), while for nutritional, overweight  
38  
39 and obesity-related outcomes, the pattern was in favour of a negative association with  
40  
41 globalisation (n=6, 0 positive, 1 inconclusive, 5 negative).

## 42 43 44 **DISCUSSION**

### 45 46 47 ***Summary of findings***

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50 We present a body of evidence from 176 internationally comparative scholarly  
51  
52 studies that together provides powerful evidence that key political characteristics are related  
53  
54 to a range of population health outcomes. The evidence was favourable about a positive  
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56 association with population health for all of increased welfare state generosity, left-of-centre  
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3 democratic political tradition and democracy, supported by over three quarters of eligible  
4 studies. Twice as much evidence supported a negative association with population health for  
5 globalisation than a positive association, although a quarter of studies were inconclusive.  
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### 8 9 **Scenario analyses**

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12 Scenario analyses showed that i) most studies considered economic factors and  
13 excluding those that did not made little difference to the results, ii) apart from in the  
14 globalisation theme a minority of studies included developing countries but the results of  
15 those that did were generally consistent with those that did not, iii) classification schemes for  
16 welfare state and political tradition made little difference to the results, and iv) the proportion  
17 of studies using general health or quality of life outcome measures was relatively low, but the  
18 results were directionally consistent with the wider set of studies.  
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28 In terms of analytical strategies to consider economic factors, a popular approach  
29 was to incorporate Gross Domestic Product (GDP) or Gross National Product (GNP) into the  
30 analytical modelling. Another approach used by some studies was to incorporate a measure  
31 of household income into the analysis. The former approach considers economic factors at  
32 the societal level, while the latter considers economic factors at the family level. The  
33 scenario analysis of studies including developing countries considered all studies that  
34 included developing countries, and was not restricted to studies that considered exclusively  
35 developing countries. The rationale for this was to provide an analysis in which any results  
36 particular to affluent, for example Organisation for Economic Co-operation and Development  
37 (OECD), countries, were excluded, thereby offering a broader and more representative  
38 insight into the relationship between political factors and global population health. Indeed,  
39 this was a systematic review of internationally comparative studies, in order to provide a  
40 global perspective. The scenario analysis provided for studies that included developing  
41 countries helps safeguard our findings against the potential that the observed findings are  
42 only applicable to affluent or developed countries. Many studies included data from a wide  
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3 range of countries, and combined with the approach of not excluding studies from the  
4 scenario analysis that did not study exclusively developing countries, this offered a  
5 safeguard against the potential dominance of data from a narrow set of countries. We  
6 therefore do not consider that there is any evidence that the analyses in this report are  
7 dominated by data from specific countries.  
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### 13 ***Risk of bias assessment***

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16 Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate  
17 risk of bias and none at high risk of bias. However, low risk of bias of individual studies does  
18 not mean that there is necessarily low risk of bias across studies, especially when grouping  
19 so many heterogeneous studies. The three types of potential bias that were found quite  
20 often were chance, group equivalence and potential conflict of interest. Most studies were  
21 very large, however they tended not to provide a rationale for their sample size or provide  
22 information to let us assess whether there may have been under- or indeed overpowered to  
23 detect associations. Group equivalence is very hard to achieve in studies such as the ones  
24 eligible for our review, since it would entail countries being similar in most other ways except  
25 the political variable of interest. Substantive conflicts of interest were rare, but more of an  
26 issue was an absence of funding statements or declarations as to whether there were any  
27 conflicts of interest. This absence was particularly notable among studies published in social  
28 science journals. No studies declared any party political members among the authors, yet it  
29 seems incongruous to believe that no author among 176 health policy studies was a  
30 member of a political party. Rather, it seems that political conflicts of interest are seldom  
31 declared, when potentially they should.  
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### 49 ***Strengths***

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52 We offer the largest systematic review on the political determinants of population  
53 health, and the first wide ranging internationally comparative systematic review of similar  
54 scope since 2010. The use of a systematic review design offers a robust and reproducible  
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3 method that minimises potential reviewer bias in the selection and evaluation of studies for  
4 potential inclusion.<sup>25</sup> Our review also involved searching ten major scholarly databases and  
5 this very thorough coverage of the literature is reflected in a very low proportion of studies  
6 being identified from supplementary searches. All publications identified for full-text  
7 screening were successfully obtained. Conducting searches back to 2006 as part of our  
8 update enabled us to include a further ten eligible studies published before the search date  
9 of the 2010 review. We independently evaluated all studies from the 2010 review and  
10 allowed studies to contribute to multiple themes, allowing further relevant data to be  
11 included. The internationally comparative approach ensures relevance to readers worldwide  
12 and transcends the limitations associated with single-country studies. Unlike the authors of  
13 the 2010 review, we were able to provide a risk of bias assessment.

### 24 25 **Limitations**

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28 Resources precluded a new review from inception, and required us to update an  
29 English-language only review from 2010. Moreover, conducting an update required us to  
30 maintain consistency with the 2010 review in terms of inclusion criteria, and precluded us  
31 from considering a wider range of grey literature sources, such as OECD reports, which may  
32 have relevant data. Moreover, the categorical form of data extraction in terms of positive,  
33 inconclusive or negative results followed this previous review and was necessitated by its  
34 scope and scale. Limiting reviews to the English language may not exert systematic bias in  
35 systematic reviews, at least according to evidence from reviews of healthcare  
36 interventions.<sup>26</sup> The diversity of political and health-system contexts as well as measures of  
37 political exposures and population health outcomes precluded meta-analysis. The  
38 internationally comparative approach increases relevance for an international readership, yet  
39 it introduces complexities in the mapping between political characteristics and political  
40 parties in both systematic and idiosyncratic ways.<sup>27-31</sup> Public health policy evidence is  
41 typically observational, which reflects real-world situations. Observational studies do not  
42 intrinsically overstate effect sizes<sup>32</sup> and can be highly valuable.<sup>5</sup> Causative inference can be  
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3 made more complicated by different causal pathways, different confounders, and different  
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5 covariates, although systems such as Bradford Hill<sup>33</sup> may be used as a starting point.  
6  
7 Studies did not regularly report their study design thoroughly or consistently in terms of  
8  
9 recognised design labels beyond the basics such as ecological vs individual studies, which  
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11 limited the level of detail in which information on study design could be extracted.  
12

### 13 ***Comparison with previous reviews***

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16 Our review offers a seven and a half year search advance on the most recent  
17  
18 internationally comparative systematic review to offer an equivalent scope. The 2010 review  
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20 by Muntaner et al<sup>14</sup> included 73 studies, of which 70 were eligible for our review. Three were  
21  
22 excluded from our review since they only included healthcare spending as an outcome. We  
23  
24 considered that to be circular, since healthcare spending was also frequently used by  
25  
26 studies as a marker of welfare state generosity. To these 70 studies, we added a further 106  
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28 (10 of which were dated prior to the search of the 2010 review), giving a total of 176 studies  
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30 in our review. Those added by our update constituted 60% of the total (58% if the 10 studies  
31  
32 we added from prior to 2010 were removed from the numerator and denominator),  
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34 demonstrating how the scale of the evidence base for the political determinants of population  
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36 health has more than doubled over the past seven and a half years.  
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40 The strength of evidence that welfare state generosity is positively associated with  
41  
42 population health has increased slightly (77% vs 72% positive), while the number of studies  
43  
44 has more than tripled (102 vs 32). The strength of evidence that left-of-centre political  
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46 tradition is positively associated with population health has increased markedly (88% vs 60%  
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48 positive), while the number of studies has increased modestly (17 vs 12). Notably, far fewer  
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50 studies have explicitly studied political tradition than the welfare state, which is one of the  
51  
52 key markers of political tradition. The strength of evidence that democracy is positively  
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54 associated with population health is largely unchanged (77% vs 78%), while the number of  
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56 studies has increased substantially (44 vs 27). The strength of evidence that globalisation is  
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3 negatively associated with population health has weakened (50% vs 75% negative), while  
4 the number of studies has increased sevenfold (28 vs 4).  
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8 A prior review in the interim<sup>34</sup> had found that the strength of evidence for the benefits  
9 of welfare state generosity was greater for studies assessing spending patterns than welfare  
10 regime typologies. We did not find a strong effect – 73% of studies assessing regime  
11 typologies were positive compared to 77% of studies irrespective of how the welfare state  
12 was measured. The Nordic model found in Scandinavia was presented by most studies as  
13 the example of an advanced welfare state. However, classifications used in these typologies  
14 are imperfect, and in many ways the Scottish system (see supplementary file 1) could be  
15 argued to represent a more advanced welfare state, since Norway for example does not  
16 offer universal free healthcare at point of use. Our findings on the welfare state and political  
17 tradition were also consistent with those of Scott-Samuel et al<sup>11</sup> regarding Thatcherism in the  
18 United Kingdom, which found a widening of health inequalities resultant from the introduction  
19 of reduced state welfare provision and increased privatisation and pro-market policies.  
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### 31 32 ***Perspectives on the role of academia*** 33

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35 The presentation of an evidence base from 176 studies associating political factors with a  
36 range of population health outcomes offers an opportunity for the reader to reflect on the role  
37 of public health academia, in light of university research impact policies in many countries,  
38 and recently scholarly debates on the role of academia. Academic public health has a long  
39 pro-social political history.<sup>35</sup> A recent BMJ article<sup>36</sup> offers insight into ongoing debate on the  
40 relative priority of action and research in public health, while Smith et al<sup>37</sup> reflect on whether  
41 or not advocacy is a disciplinary duty for public health academics, and Kapilashrami et al<sup>38</sup>  
42 provide an interesting example of an advocacy programme. Indeed, there has been  
43 reticence both at the individual<sup>4</sup> and organisational<sup>39</sup> level to engage in advocacy.  
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3 knowledge translation with stakeholders, which may be valuable but also depends on  
4 ideological match.  
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### 6 7 8 **Recommendations for research**

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10 It is important that health research increasingly focuses on real-world contexts to  
11 supplement more idealised studies.<sup>5</sup> Health research that does not consider political and  
12 cultural factors may lack relevance and generalisability,<sup>41</sup> especially research into the social  
13 determinants of health. Further research into the globalisation political exposure theme may  
14 help elucidate the evidence base in this area, and potentially distinguish different influences  
15 that may explain why globalisation seems to be able to be associated both positively and  
16 negatively with population health across health outcomes.  
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### 24 25 **Implications for policy and practice**

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28 Clinicians and decision makers should be aware of the context in which they work,  
29 and the political influences on medicine and health outcomes. They should seek to find ways  
30 to increase the use of evidence in decisions impacting on health. Ideas such as ‘health in all  
31 policies’<sup>42</sup> are worthwhile, but only if they are genuinely put into action and not seen as a ‘tick  
32 box’ exercise.  
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### 39 40 **Conclusion**

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42 In conclusion, we present a systematic review of 176 studies that demonstrates that  
43 politics is an important determinant of population health outcomes, and one with which the  
44 academic and clinical population health community should engage more for the benefit of  
45 the health of our populations.  
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### 50 51 **FOOTNOTES**

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54 **Contributors:** MB was the project director and project manager. The study was  
55 conceptualised by MB with input from MT and BH. Searches were conducted by MB. Study  
56 selection, data extraction and quality assessment were conducted by MB with proportionate  
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second review from BH. Data interpretation was led by MB with input from MT and BH. MB wrote the first draft of the paper. MT and BH commented on the draft manuscript and thereby contributed important revisions. All tables, figures and supplementary files were made by MB. All authors approved the submission. MB is the guarantor.

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**Competing interests:** The authors have personal views and/or memberships on the political left that we do not consider conflict with the vision of public health. MB is a member of the Labour Party (United Kingdom), MT is a member of the Scottish National Party (SNP, a centre-left pro-independence party that forms the devolved government of Scotland) and BH is not a member of any party. This work was not done on behalf of any political party and is not endorsed, influenced or supported in any way by the parties of which authors are members. MB is a social democrat/liberal socialist. MT is a democratic socialist and supports Scottish independence. BH is a democratic socialist. The authors engage in appropriate activities to promote public health and social justice. We have no financial conflicts of interest.

**Ethics approval:** No ethics approval was required for this systematic review of published literature.

**Declaration:** All views presented in this article are the authors' own, and not necessarily those of their institutions nor bodies that fund their other research projects.

**Data sharing statement:** No further data are available.

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## TABLES

**Table 1. Conceptual search strategy**

((democracy OR autocracy OR welfare regime OR welfare state OR welfare capitalism OR politics OR political tradition OR internationality OR globalization) AND (health OR health services OR population health OR public health OR health economics OR health expenditure))

**Table 2. Definitions of political exposure variables**

Exposure variable	Definition
Welfare state	“if the analysis included welfare regimes or welfare state indicators (e.g. universal health coverage), but not measures of political ideology (e.g. along the left-right dimension)”
Political tradition	“if the study included variables referring to the left-right political dimension (e.g. social democratic / egalitarian/ left vs. liberal / conservative / right political parties in government)”
Democracy	“if the hypotheses tested involved democratic institutions or political rights”
Globalisation	“if the article examined how high, middle, and/ or low countries are integrated through global networks of trade, foreign investment, and multinational corporations”

Source of definitions: Muntaner C, Borrell C, Ng E, et al. Politics, welfare regimes, and population health: controversies and evidence. *Sociol Health Illn* 2011; 33: 946-64.

**Table 3. Overview of overall result classification by political exposure and health outcome**

	Welfare state			Political tradition			Democracy			Globalisation		
	P	N	I	P	N	I	P	N	I	P	N	I
Birth weight	4	0	0	2	0	0	0	0	0	0	0	0
Cancer	1	0	0	0	0	0	0	0	0	0	1	0
Cerebrovascular disease	0	0	0	0	0	0	0	0	0	0	1	0
Child mortality	13	0	0	3	0	0	5	0	5	2	2	2
Child wellbeing	1	0	0	0	0	0	0	0	0	0	0	1

Chronic conditions	5	1	2	1	0	0	0	0	0	0	0	0
Diabetes	0	0	0	0	0	0	0	0	0	0	1	0
Fertility and reproductive health	1	0	0	0	0	0	2	0	1	0	0	0
General health	24	0	11	4	0	0	4	0	0	1	0	0
Health behaviours	1	0	0	0	0	0	0	0	0	0	0	0
Health care burden/need	3	0	0	0	0	0	0	0	0	0	0	0
Heart disease	0	0	0	0	0	0	0	0	0	0	1	0
Health inequalities*	11	0	2	2	0	0	0	0	0	0	0	0
HIV/AIDS	1	0	0	0	0	0	1	0	0	0	1	0
Homicide and suicide	0	0	1	0	0	0	0	0	0	0	1	0
Immunisation/vaccination rates	0	0	0	0	0	0	0	1	0	0	1	0
Implementation of effect health policy	0	0	0	0	0	1	1	0	0	0	0	0
Infant mortality	16	0	2	8	0	0	15	1	4	4	3	3
Life expectancy/adult mortality	21	2	5	8	0	1	16	1	3	4	1	1
Maternal health	0	1	0	0	0	0	0	0	0	0	0	0
Mental health	9	0	1	0	0	0	1	0	0	0	0	0
Nutrition, overweight and obesity	0	0	0	0	0	0	1	0	2	0	5	1
Oral health	2	0	0	0	0	0	0	0	0	0	0	0
Physical activity/health	1	0	0	2	0	0	1	0	0	0	0	0
Pneumonia	0	0	0	0	0	0	0	0	0	0	1	0
Smoking	0	0	1	1	0	1	0	0	0	0	1	0
Tuberculosis	2	0	0	0	0	0	1	0	0	0	0	2
Water pollution	0	0	0	0	0	0	0	0	0	0	2	0
Wellbeing of the unemployed	1	0	1	0	0	0	0	0	0	0	0	0

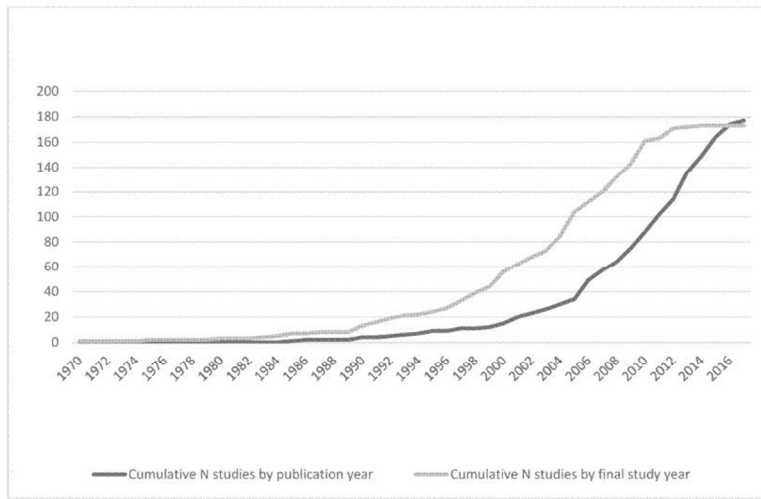
Columns denote political exposure variables; rows denote health outcome variables; P = Positive, N = Negative, I = Inconclusive, \* this is additionally indirectly measured by many of the other outcomes

## FIGURE LEGENDS

**Figure 1.** Accumulation of evidence on the political determinants of population health over time.

**Figure 2.** PRISMA 2009 flow diagram.





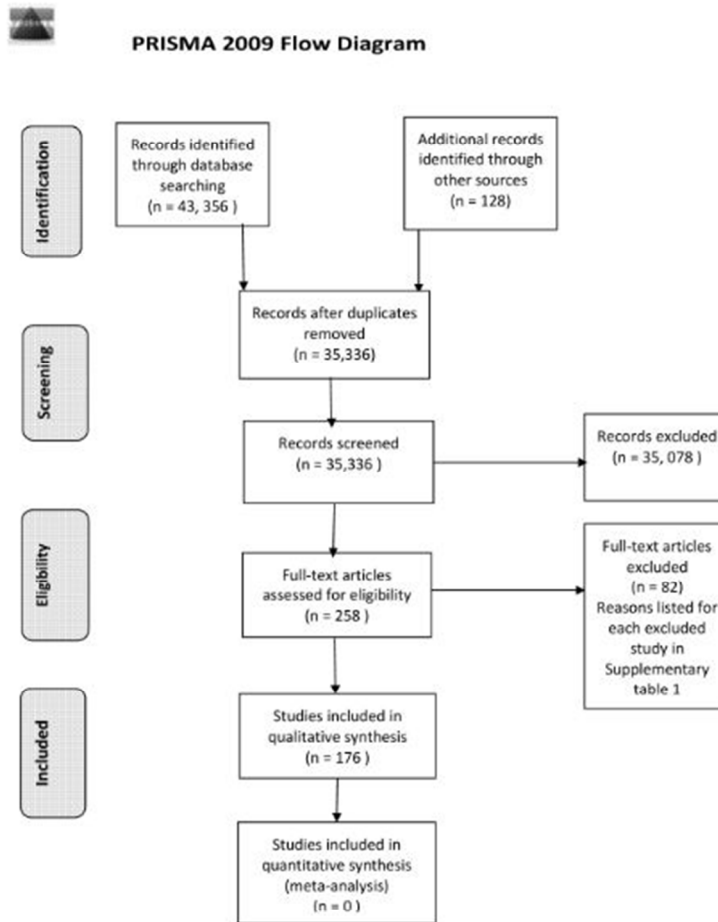
Accumulation of evidence on the political determinants of population health over time.

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From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

PRISMA 2009 flow diagram.

48x63mm (300 x 300 DPI)

**Supplementary file 1. Devolution and health systems: examples of the differences in health provision between Scotland and England**

<b>Scotland</b>	<b>England</b>
<b>Free dental checks at 6-monthly intervals (although there is a charge for treatment)</b>	<b>Dental check costs £20.60</b>
<b>Free NHS prescriptions</b>	<b>Prescription costs £8.60</b>
<b>Free NHS eye tests</b>	<b>Commercial eye tests</b>
<b>Free personal and nursing care upon assessed need</b>	<b>Commercial care</b>
<b>Public health is NHS-run</b>	<b>Public health is local authority-run</b>
<b>Offers a free baby box scheme, supplying parents of newborn children with around 40 different essential items</b>	<b>No baby box scheme</b>
<b>Minimum alcohol unit pricing (implementation date 1 May 2018)</b>	<b>No minimum alcohol unit pricing</b>

All information correct at time of writing. Certain services that are chargeable in England are offered free of charge to those on certain state benefits, but are not universally free.

Table adapted from a slide from the following conference presentation by the lead author of this manuscript Dr Max Barnish: "Barnish M. Health policy and the politics of being an early career researcher. Invited oral presentation, Early Career Researchers Workshop, Society for Social Medicine Annual Scientific Meeting, Manchester, UK, 2017". The copyright to this slide is held by Dr Barnish.

## Supplementary file 2. Full MEDLINE search strategy

Platform: OVID

Version: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present

Notes:

1. .mp indicates a keyword
2. In capitals followed by / indicates a MeSH term
3. exp indicates a MeSH term is exploded to encompass all subcategories, this was done by default

Search string:

(democracy.mp OR democratic.mp OR exp DEMOCRACY/ OR autocracy.mp OR autocratic.mp OR “welfare regime”.mp OR exp SOCIAL WELFARE/ OR “welfare state”.mp OR “welfare capitalism”.mp OR politics.mp OR political.mp OR exp POLITICS/ OR “political tradition”.mp OR globalisation.mp OR globalization.mp OR internationality.mp OR exp INTERNATIONALITY/)

AND

(health.mp OR exp HEALTH/ OR “health services”.mp OR exp HEALTH SERVICES/ OR “population health”.mp OR exp POPULATION HEALTH/ OR “public health”.mp OR exp PUBLIC HEALTH/ OR “health economic”.mp OR “health economics.mp” OR “health expenditure”.mp OR “health expenditures.mp” OR exp HEALTH EXPENDITURES/ )

Limits: English language

### Supplementary file 3. List of all publications included in the review

1. Ades F, Senterre C, de Azambuja E, et al. Discrepancies in cancer incidence and mortality and its relationship to health expenditure in the 27 European Union member states. *Ann Oncol* 2013; 24: 2897-902.
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#### Supplementary file 4. List of all publications excluded at full-text screening, with reasons

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# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12



# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data) and the role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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**Supplementary file 6. Study-level risk of bias assessment**

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Ades, 2013	Green	Amber	Green	Green	Green	Green	Green	Green
Adeyi, 1997	Green	Amber	Amber	Green	Green	Green	Green	Green
Akinci, 2014	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Alvarez-Dardet, 2006	Green	Amber	Green	Green	Green	Green	Green	Green
Avendano, 2009	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2014	Green	Amber	Green	Green	Green	Green	Green	Green
Bambra, 2009	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2009	Green	Amber	Amber	Green	Green	Green	Green	Green
Bambra, 2006	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2005	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Batniji, 2014	Green	Amber	Green	Green	Green	Green	Green	Green
Baum, 2003	Green	Amber	Amber	Green	Green	Green	Amber	Amber

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Bergh, 2010	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Besley, 2006	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Bosdriesz, 2015	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Borrell, 2009	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bozorgmehr, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bradley, 2011	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Brandt, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bremberg, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Burroway, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Burstrom, 2010	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
Cereseto, 1986	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Chung, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Conley, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Copeland, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
Correa, 1992	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Corsi, 2014	Green	Yellow	Green	Green	Green	Green	Green	Green
Costa-Font, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Craveiro, 2017	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Cross, 2009	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
De Vogli, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Dahl, 2013	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Deeming, 2012	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Devaux, 2015	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Dietrich, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Doherty, 2010	Green	Yellow	Yellow	Green	Green	Green	Green	Green

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	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Dujardin, 2011								
Eikemo, 2008								
Eikemo, 2008								
Elgar, 2011								
Elola, 1995								
Engster, 2011								
Esmaeli, 2011								
Espelt, 2008								
Esser, 2010								
Estimé, 2014								
Fan, 2015								
Farfan-Portet, 2010								
Fayissa, 2001								
Foubert, 2014								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Frey, 1999								
Fritzell, 2012								
Fritzell, 2013								
Fumagalli, 2013								
Gauri, 2002								
Gerring, 2008								
Gesthuizen, 2012								
Ghobarah, 2004								
Gilligan, 2015								
Gizeles, 2009								
Glass, 2016								
Goryakin, 2015								
Granados, 2010								

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Jorgenson, 2009								
Jorgenson, 2009								
Karim, 2010								
Kick, 1990								
Klenk, 2016								
Klomp, 2008								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Krueger, 2015								
Kudamatsu, 2012								
Kuovo, 2015								
Lahelma, 1994								
Lake, 2001								
Lena, 1993								
Levecque, 2011								
Levecque, 2015								
Levine, 2006								
Lin, 2012								
Lin, 2014								
London, 1990								
López-Casasnovas, 2014								
Lundberg, 2008								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Mackenbach, 2013								
Mackenbach, 2013								
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Martens, 2010								
Maynard, 2015								
Maynard, 2016								
Miething, 2013								
Menon-Johansson, 2005								
Milner, 2011								
Minagawa, 2013								
Moon, 1985								
Moor, 2013								
Moore, 2006								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Muldoon, 2011	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Muntaner, 2017	Green	Yellow	Green	Green	Green	Green	Green	Green
Muntaner, 2002	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navarro, 2006	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Navarro, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navarro, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navia, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Nelson, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Norden mark, 2006	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Novignon, 2012	Green	Yellow	Green	Green	Green	Green	Green	Green
Oberlander, 2017	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Olafsdottir, 2007	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Olsen, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Oster, 2012	Green	Yellow	Green	Green	Green	Green	Yellow	Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Owen, 2007								
Palència, 2013								
Pickett, 2007								
Pillai, 2006								
Pinzón-Flórez, 2015								
Platts, 2015								
Ploubidis, 2012								
Popham, 2013								
Raphael, 2004								
Reeves, 2014								
Richter, 2012								
Ross, 2006								
Rostila, 2007								
Rovny, 2011								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Sacker, 2011								
Safaei, 2006								
Sanders, 2009								
Sarti, 2013								
Sekine, 2009								
Shandra, 2010								
Shandra, 2004								
Shen, 2001								
Shen, 1997								
Shim, 2015								
Stavrova, 2011								
Stroup, 2007								
Stuckler, 2010								
Tsai, 2006								
Van der Heuvel, 2013								

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Van Tuyckom, 2011	Green	Amber	Green	Green	Green	Green	Green	Green
Vahid Shahidi, 2016	Green	Amber	Amber	Green	Green	Green	Green	Green
Veenhoven, 2000	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Veenhoven, 1995	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Vöörmann, 2013	Amber	Amber	Amber	Green	Green	Green	Amber	Amber
Wejnert, 2008	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Whitehead, 2000	Amber	Amber	Amber	Green	Green	Green	Green	Amber
Witvliet, 2013	Green	Amber	Amber	Green	Green	Green	Green	Green
Wu, 2007	Green	Amber	Amber	Green	Green	Green	Amber	Amber
York, 2014	Green	Amber	Green	Green	Green	Green	Amber	Green
Zambon, 2006	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Zweifel, 2000	Green	Amber	Amber	Green	Green	Green	Amber	Amber

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

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Supplementary file 7. Table of study-level characteristics and results for welfare state

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Avendano et al, 2009	2004-2007	Ecological	Yes	11 countries from 3 European regions	Welfare regimes	Chronic conditions, self-reported health, depression	Positive
2	Bambra, 2005	1997-1999	Ecological	No	18 OECD countries	Welfare regimes	Health care index	Positive
3	Bambra, 2006	1980-1998	Ecological	No	18 OECD countries	Welfare regimes	Infant mortality	Positive
4	Bambra and Eikemo, 2009	2002-2004	Individual	No	37,499 persons from 21 European countries	Welfare regimes	Self-reported health, long-standing illness	Positive
5	Bambra et al, 2009	1998-2004	Individual	No	118,245 persons from 13 European countries	Welfare regimes	Self-rated health	Inconclusive
6	Burstrom et al, 2010	1999-2001	Individual	Yes	28,485 persons from	Family policy models	Self-rated health, limiting long-	Positive

					Italy, Sweden and Britain		standing illness	
7	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 wealthy OECD countries	Public sector medical care	Infant mortality rate, low birth weight, under-five mortality weight	Positive
8	Chung and Muntaner, 2007	1960-1998	Ecological	Yes	18 wealthy countries	Welfare regimes	Infant mortality rate, low birth weight	Positive
9	Conley and Springer, 2001	1960-1992	Ecological	Yes	19 OECD countries	Welfare regimes, welfare state spending	Infant mortality	Positive
10	Dahl et al, 2006	1970-2005	Ecological	Yes	Up to 11 European countries	Welfare regimes	Absolute and relative health inequalities	Inconclusive
11	Eikemo et al, 2008	2002-2004	Individual	No	69, 821 persons from 23 European countries	Welfare regimes	Self-reported health, limiting longstanding illness	Inconclusive
12	Eikemo et al, 2008	2002-2004	Individual	No	65, 065 persons from 21 European countries	Welfare regimes	Subjective poor health, limiting longstanding illness	Positive
13	Elola et al, 1995	1990-1991	Ecological	Yes	17 Western European countries	Health care system	Infant mortality, life expectancy	Positive

14	Farfan-Portet et al, 2010	2001	Individual	No	5,729,859 persons in Belgium and Britain	Welfare regimes	Self-reported health	Inconclusive
15	Fayissa, 2001	1993	Ecological	Yes	34 sub-Saharan African countries	Public health expenditure	Infant mortality, child mortality	Positive
16	Grosse et al, 2010	2004	Individual	No	38,122 persons from 24 European countries	Welfare regimes	Perception of need for seeking primary health care	Positive
17	Karim, 2010	2003	Ecological	Yes	30 countries in Europe, North America, Australia and Asia	Welfare regimes	Infant mortality, life expectancy	Positive
18	Klomp and de Haan, 2008	2000-2005	Ecological	Yes	101 low, middle and high income countries	Governance	19 mortality, disease, sickness indicators	Positive
19	Lahelma and Arber, 1994	1985-1987	Individual	No	Ca. 30,000 persons from Britain, Finland, Norway and Sweden	Welfare regimes	Limiting long-standing illness	Negative
20	Lundberg et al, 2008	1950-2000	Ecological	Yes	18 OECD countries	Family policy models	Infant mortality, mortality among those aged 30-59 and over 65	Positive

21	Menon-Johansson, 2005	2002	Ecological	Yes	149 countries	Governance	HIV prevalence	Positive
22	Muntaner et al, 2006	1980-1995	Individual	Yes	Sweden, Italy, and England and Wales (combined)	Welfare regimes	Mortality level per occupational class, population attributable risk, index of dissimilarity	Inconclusive
23	Nordenmark et al, 2006	1992-2001	Individual	Yes	3442 persons from Sweden, Ireland and Great Britain	Unemployment benefit type	Psychological distress	Positive
24	Ouweneel, 2002	1980-1990	Ecological	Yes	42 'first-world, second-world and third-world' countries	Social security system	Self-rated health	Inconclusive
25	Raphael and Bryant, 2004	1999	Ecological	Yes	5 countries (Canada, Denmark, Sweden, UK, US)	Welfare state spending	Life expectancy	Positive
26	Rostila, 2007	2002-2003	Individual	Yes	36,489 persons in 20 European countries	Welfare regimes	Self-rated health, life expectancy	Positive
27	Sanders et al, 2009	1998-2002	Individual	Yes	12,888 persons in 4 countries (UK, Finland, Germany, Australia)	Welfare regimes	Oral health	Positive

28	Sekine et al, 2009	1991-2003	Individual	No	17,801 persons in Britain, Finland and Japan	Welfare regimes	The Short-Form 36: physical and mental health functioning	Positive
29	Veenhoven and Ouweneel, 1995	1965-1985	Ecological	Yes	Up to 97 rich and poor countries	Welfare state expenditure	Life expectancy	Positive
30	Veenhoven, 2000	1980-1990	Ecological	Yes	40 countries	Welfare state expenditure	Life expectancy, self-rated health	Inconclusive
31	Whitehead et al, 2000	1979-1996	Individual	No	80,792 persons from Britain and Sweden	Social benefit system	Self-perceived health, limiting longstanding illness	Inconclusive
32	Zambon et al, 2006	2001-2002	Individual	Yes	160, 325 persons from 32 European and North American countries	Welfare regimes	Self-reported health, well-being, health symptom load, health behaviours	Positive
<b>Studies from our update</b>								
33	Ades et al, 2013	2008-2012	Ecological	Yes	27 European Union countries	Healthcare spending	Cancer incidence and mortality	Positive
34	Akinci et al, 2014	1990-2010	Ecological	Yes	19 Middle Eastern and North African countries	Healthcare spending	Infant, under-5, and maternal mortality	Positive

35	Bambra et al, 2014	2010	Individual	Yes	21,705 men and women from 27 European countries	Welfare regime	Self-rated health	Inconclusive
36	Batniji et al, 2014	1980-2011	Ecological	Yes	22 Arab countries	Governance	Mortality	Positive
37	Bentley et al, 2016	2001-2008	Ecological	Yes	Australia and UK	Housing benefit generosity	Mental health	Positive
38	Bradley et al, 2011	2009	Ecological	Yes	30 OECD countries	Healthcare spending, social care spending	Life expectancy, low birth weight, maternal mortality, potential life years lost	Positive
39	Brandt and Hank, 2014	Up to 2009	Individual	No	More than 13,000 people from 11 European countries	Welfare regimes	Self-rated health, job loss	Positive
40	Bremberg, 2016	1990-2012	Ecological	Yes	28 OECD countries	Family benefit spending, healthcare spending, government expenditure on research and development	Infant mortality	Inconclusive
41	Copeland et al, 2015	1991-2010	Individual	Yes	England (n = 217,514) and Sweden (n = 184,428)	Welfare regimes	Self-rated health, health inequalities	Positive

42	Corsi and Subramanian, 2014	1990-2012	Ecological	Yes	35 sub-Saharan African countries	Maternal and child health service coverage	Under-5 mortality	Positive
43	Craveiro, 2017	2010-2011	Individual	Yes	53,615 individuals from 15 European countries	Welfare regimes	Composite health measure derived from 3 indicators based on factor analysis, health inequalities	Positive
44	Dahl and van der Wel, 2013	2005	Individual	Yes	Around 245,000 individuals from 18 European countries	National social expenditure	Self-rated health, health inequalities	Positive
45	Deeming and Hayes, 2012	2000-2005	Individual	Yes	Just under 30,000 individuals from OECD countries	Welfare regimes	Unhappiness	Positive
46	Devaux, 2015	2006-2009	Individual	Yes	Participants from 18 OECD countries	Health care system	Health inequalities	Positive
47	Dragano et al, 2010	2004-2006	Individual	Yes	9917 older individuals from 12 European countries	Welfare regimes, indicators from the EU Labour Force Survey	Depression (EURO-D and CES-D)	Positive

48	Dujardin et al, 2011	2001	Individual	Yes	5729858 individuals from Belgium and Great Britain	Home care policy system	Health burden of care	Positive
49	Elgar et al, 2011	2006	Individual	Yes	48641 adults from 33 rich and middle-income countries	Healthcare spending	Homicide	Inconclusive
50	Engster and Stensöta, 2011	1995-2005	Individual	Yes	Participants from 20 OECD countries	Family policy regime: family cash and tax benefits, paid parenting leave, public child care support	Child poverty and mortality	Positive
51	Esmaeli et al, 2011	1996-2004	Ecological	Yes	24 Islamic countries	Healthcare spending	Life expectancy	Inconclusive
52	Esser and Palme, 2010	2002-2005	Individual	Yes	13 OECD countries	Pension system	Self-rated health, WHO-5	Positive
53	Foubert et al, 2014	2002-2004	Individual	Yes	213764 individuals from 57 countries	Welfare regimes	Self-rated health	Positive
54	Fritzell et al, 2012	2000-2005	Individual	No	Randomly sampled British, Italian and Swedish mothers	Family policy model	Maternal health	Negative
55	Fritzell et al, 2013	1980-2005	Ecological	Yes	Up to 25 countries per wave	Welfare regimes	Mortality	Positive



56	Gesthuizen et al, 2012	2002-2008	Individual	Yes	Over 90,000 individuals from 32 European countries	Healthcare spending, modernised labour market	Self-rated health	Positive
57	Gilligan and Skrepnek, 2015	1995-2010	Ecological	Yes	21 Eastern Mediterranean countries	Healthcare spending	Life expectancy	Positive
58	Glass et al, 2016	2006-2008	Individual	Yes	22 OECD countries	Family policy	Happiness	Positive
59	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Welfare regimes	Life expectancy, mortality, tobacco consumption	Inconclusive
60	Guarnizo-Herreño et al, 2013	2009	Ecological	No	31 European countries	Welfare regimes	Oral health	Positive
61	Harding et al, 2013	1971-2006	Ecological	No	England and Wales, Italy and Finland	Welfare regimes	Elder mortality	Negative
62	Hájek et al, 2012	1995-2008	Ecological	Yes	27 European Union countries	Healthcare spending	Life expectancy, standardised death rate	Positive
63	Hauck et al, 2016	1990-2012	Ecological	Yes	54 low-income studies	Healthcare spending	Life expectancy	Inconclusive
64	Heijink et al, 2013	1996-2006	Ecological	Yes	14 Western countries	Healthcare spending	Avoidable mortality	Positive
65	Hoffman, 2011	1980-2006	Ecological	Yes	USA and Denmark	Welfare system	Old-age mortality	Negative
66	Kuovo and Räsänen, 2015	2010	Individual	No	10,046 individuals from Finland, Britain,	Welfare system	Subjective well-being	Positive

					Germany and Greece			
67	Levecque et al, 2011	2006-2007	Individual	Yes	41686 people from 23 European countries	Welfare regimes, welfare state generosity	Depression (CES-D)	Positive
68	Levecque et al, 2015	2006-2007	Individual	No	37076 people from 20 European countries	Migrant integration social policy	Depression (CES-D)	Inconclusive
69	Lin et al, 2014	1996-2010	Ecological	Yes	149 countries	Governance	Child mortality	Positive
70	López-Casasnovas and Soley-Bori, 2014	1980-2010	Ecological	Yes	32 OECD countries	Healthcare and social spending, healthcare system	Health Human Development Index	Positive
71	McKinnon et al, 2016	2006-2012	Individual	Yes	Participants from 48 low- and middle-income countries	Maternal health service coverage	Neonatal mortality, health inequality	Positive
72	Maynard, 2016	1985-2005	Ecological	Yes	74 developing countries	Healthcare spending	Tuberculosis mortality	Positive
73	Miething et al, 2013	2000	Individual	Yes	19353 individuals from Sweden, East and West Germany	Welfare regimes	Self-rated health	Inconclusive
74	Minagawa, 2013	1990-2009	Ecological	Yes	23 Eastern European countries	Healthcare spending	Age-specific mortality, self-rated health	Positive

75	Moor et al, 2013	1981-1999	Ecological	Yes	47 European countries and regions	Welfare state generosity (Social Policy Indicators Database)	Life satisfaction	Positive
76	Muldoon et al, 2011	2001-2008	Ecological	No	136 United Nations countries	Healthcare spending	Infant, child and maternal mortality	Positive
77	Muntaner et al, 2017	2003-2010	Household-level ecological	Yes	27 European Union countries	Welfare regimes	Self-rated health, chronic conditions	Positive
78	Nelson and Fritzell, 2014	1990-2009	Ecological	Yes	18 countries	Minimum income benefits	Mortality (life expectancy and age-standardised death rates)	Positive
79	Novignon et al, 2012	1995-2010	Ecological	Yes	44 Sub-Saharan African countries	Healthcare spending	Life expectancy, death rate, infant mortality	Positive
80	Olafsdottir, 2007	1998	Individual	Yes	Participants from USA and Iceland	Welfare regimes, healthcare spending	Self-rated physical health, health inequality	Positive
81	Olsen and Dahl, 2007	2003	Individual	Yes	38,472 individuals from 21 European countries	Healthcare spending	Self-rated health	Positive
82	Palència et al, 2014	2010	Individual	Yes	23782 men and 28655 women from	Gender equality policies	Health inequality	Positive

					26 European countries			
83	Pickett and Wilkinson, 2007	1998-2006	Ecological	Yes	23 rich countries	Income equality	Child wellbeing	Positive
84	Pinzón-Flórez et al, 2015	2000-2010	Ecological	Yes	154 countries	Healthcare spending	Child and maternal mortality	Positive
85	Platts, 2015	2000-2007	Ecological	Yes	UK and Russia	Welfare regimes	Self-rated health	Inconclusive
86	Ploubidis et al, 2012	2006-2007	Individual	Yes	33528 people from 14 European countries	Welfare regimes, income equality	Health in later life	Positive
87	Popham et al, 2013	2006	Ecological	No	37 countries	Welfare regimes	Life expectancy	Positive
88	Reeves et al, 2014	1995-2012	Ecological	Yes	21 European countries	Healthcare spending, social spending, pension expenditure	Tuberculosis control	Positive
89	Richter et al, 2012	2006	Individual	Yes	141091 adolescents from 32 countries	Welfare regimes	Subjective health, health inequality	Positive
90	Rovny, 2011	1990-1999	Ecological	Yes	17 OECD countries	Family social policy	Fertility	Positive
91	Sacker et al, 2011	1995-2001	Ecological	Yes	Britain, Germany, Denmark and USA	Welfare regimes	Self-rated health	Positive
92	Sarti et al, 2013	2005	Individual	Yes	Participants from	Welfare regimes	Self-rated health, health inequality	Positive

					European countries			
93	Shim, 2015	1980-2010	Ecological	Yes	19 OECD countries	Social welfare expenditure	Infant mortality	Inconclusive
94	Stavrova et al, 2011	1999-2009	Individual	Yes	Participants from 28 OECD countries	Unemployment benefit policies	Wellbeing among the unemployed	Inconclusive
95	Stuckler et al, 2010	1980-2005	Ecological	Yes	Up to 18 European Union countries	Social welfare spending	All-cause mortality, cause-specific mortality	Positive
96	Van der Heuvel et al, 2013	1950-2000	Ecological	Yes	Sweden, Netherlands, Canada, USA, Cuba	Welfare regimes, Redistributive welfare policy	Infant mortality, low birth weight, under 5 mortality	Positive
97	Van der Wel et al, 2011	2005	Ecological	Yes	26 European countries	Income equality, spending on active labour market policies, benefit generosity, employment protection	Social inequality in sickness	Positive
98	Van Tuyckom, 2011	Up to 2008	Individual	Yes	24,846 people from 27 European Union countries	Healthcare spending	Physical activity	Positive

99	Vahid Shahidi et al, 2016	2012	Individual	Yes	22123 individuals from 23 countries with a welfare state	Welfare social policy	Self-rated health of the unemployed	Positive
100	Vöörmann and Helemäe, 2013	2010	Individual	Yes	5480 individuals from 4 Eastern European countries	Welfare regimes	Self-rated health, health inequalities	Inconclusive
101	Wu and Chiang,2007	2002	Ecological	Yes	Taiwan and 21 comparison industrialized countries	Income inequality, healthcare spending, public social expenditure	Child mortality, under-five mortality	Positive
102	York and Bell, 2014	2005	Ecological	Yes	Countries from the World Bank database with relevant data	Healthcare spending, gender equality policies	Self-reported life satisfaction (0-10)	Positive

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Supplementary file 8. Table of study-level characteristics and results for political tradition

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Borrell et al, 2009	2000	Individual	Yes	196,280 persons from 13 European countries	Political tradition classification	Self-rated health	Positive
2	Cereseto and Waitzkin, 1986	1983-1984	Ecological	Yes	123 countries, grouped by level of economic development	Political-economic system	Physical quality of life index	Positive
3	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 OECD countries	Voter partisanship	Low birth weight, infant mortality, under-five mortality	Positive
4	Correa and Namkoong, 1992	1980	Ecological	Yes	116 countries with a population over 1 million	Political conditions; political tradition classification	Life expectancy, mortality	Positive

5	Espelt et al, 2008	2004	Individual	Yes	16,901 persons in 9 European countries	Political tradition classification	Self-reported health, long-term illness	Positive
6	Lena and London, 1993	1983	Ecological	Yes	Up to 84 peripheral and non-core nations	Political tradition classification	Infant mortality, child mortality, life expectancy	Positive
7	London and Williams, 1990	1965-1970	Ecological	Yes	Up to 110 periphery and semi-periphery nations	Political tradition classification	Infant mortality, life expectancy	Positive
8	Moon and Dixon, 1985	1970-1975	Ecological	Yes	116 nations	Political ideology (left, right, centre)	Physical Quality of Life Index: life expectancy, infant mortality	Positive
9	Muntaner et al, 2002	1989-1992	Ecological	Yes	16 wealthy countries	Working class power, voter partisanship, time in power by different parties	Life expectancy, self-rated health, low birth weight, and age- and cause-specific mortality	Positive
10	Navarro et al, 2003	1950-1998	Ecological	Yes	17 OECD countries	Working class power, voter partisanship	Infant mortality, life expectancy, health inequalities	Positive
11	Navarro and Shi, 2001	1960-1996	Ecological	Yes	18 OECD countries	Political tradition classification,	Infant mortality,	Positive



						working class power	health inequalities	
12	Navarro et al, 2006	1972-1996	Ecological	Yes	17 OECD countries	Voter partisanship, time in power by different parties	Infant mortality, life expectancy	Positive
<b>Studies from our update</b>								
13	Bosdriesz et al, 2015	1996-2010	Ecological	Yes	11 European Union countries	Percentage of seats held by social democratic, socialist and other left-wing parties	Tobacco Control Scale	Positive
14	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Political tradition classification	Life expectancy, mortality, tobacco consumption	Inconclusive
15	Huijts et al, 2010	2002-2006	Individual	Yes	29 European countries and Israel	Political tradition classification	Self-rated health	Positive
16	Lin et al, 2012	1970-2004	Ecological	Yes	119 less developed countries	Political regime score from Polity IV	Life expectancy	Positive
17	Mackenbach and McKee, 2013	1990-2009	Ecological	Yes	43 European countries	Left-wing participation in government (share of seats)	Success in implementing effective health policies	Inconclusive

Supplementary file 9. Table of study-level characteristics and results for democracy

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Assessment of economic factors	Political exposures	Population health outcomes	Result category
<b>Studies from 2010 review</b>								
1	Adeyi, 1997	1989-1993	Ecological	10 former Communist countries	No	Transition from Communism to capitalist democracy	Life expectancy, infant mortality, probability of dying between 15 and 65 years	Negative
2	Alvarez-Dardet, 2006	2000	Ecological	23 former Communist countries	Yes	Democratic deficit	Life expectancy, infant mortality, maternal mortality	Positive
3	Baum and Lake, 2003	1967-1997	Ecological	128 poor and non-poor countries	Yes	Democracy (Polity III)	Female life expectancy	Positive
4	Besley and Kudamatsu, 2006	1962-2002	Ecological	Up to 160 countries transitioning to democracy	Yes	Democracy (Polity IV)	Life expectancy, infant mortality	Positive

5	Franco, 2004	1998	Ecological	170 high, medium and low-income countries	Yes	Democracy (Freedom House)	Life expectancy, infant mortality, maternal mortality	Positive
6	Frey and Al-Roumi, 1999	1970-1990	Ecological	87 developed and less-developed countries	No	Democracy (political rights index and civil liberties)	Infant mortality, life expectancy	Positive
7	Gauri and Khaleghian, 2002	1989-1997	Ecological	208 low and middle-income countries	Yes	Democracy (Polity IV)	Vaccine coverage for diphtheria, tetanus, pertussis and measles	Negative
8	Ghobareh et al, 2004	2000	Ecological	179 countries in WHO	Yes	Democracy (Polity IV, Freedom House)	Health-adjusted life expectancy	Positive
9	Gizeles, 2009	1982-2000	Ecological	117 developed and developing countries	Yes	Democracy (Polity IV), state capacity	AIDS infection rate	Positive
10	Houweling et al, 2005	1999	Ecological	43 developing countries in Asia, Africa and Latin America	Yes	Democracy (political rights index)	Under five mortality rate	Inconclusive
11	Kick et al, 1990	1970-1985	Ecological	63 developing countries	Yes	Political democracy (political rights index)	Infant mortality	Positive

12	Klomp and de Haan, 2009	2000-2005	Ecological	171 countries with a population greater than 200,000	Yes	Decree of democracy, political stability	19 national health indicators	Positive
13	Lake and Baum, 2001	1970-1992	Ecological	Up to 110 developed countries	No	Democracy (Polity III)	Life expectancy, infant mortality	Positive
14	Lena and London; 1993	1983	Ecological	Up to 84 peripheral and non-core nations	Yes	Level of democracy	Infant mortality, child mortality, life expectancy	Positive
15	London and Williams; 1990	1965-1970	Ecological	Up to 110 periphery and semi-periphery nations	Yes	Level of political democracy	Infant mortality, life expectancy	Positive
16	Moon and Dixon, 1985	1970-1975	Ecological	116 nations	Yes	Level of political democracy, political stability	Physical Quality of Life Index: life expectancy, infant mortality	Positive
17	Navia and Zweifel, 2003	1990-1997	Ecological	188 democratic or dictatorial countries	Yes	Democracy (yes or no, based on presence of elections)	Fertility, child survival	Positive
18	Pillai and Gupta, 2006	2001	Ecological	129 developing countries	No	Democracy (human rights rating, political rights, and civil liberty, political terror scales)	10 global monitoring indicators of women's reproductive health	Positive
19	Ross, 2006	1970-2000	Ecological	168 countries with a population	Yes	Democracy (Polity IV), years of	Child mortality, infant mortality	Inconclusive

				greater than 200,000		democracy since 1900		
20	Rudra and Haggard, 2005	1975-1997	Ecological	57 less developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
21	Safaei, 2006	2003	Ecological	118 autocratic, incoherent and democratic countries	Yes	Democracy (Polity IV)	Life expectancy, mortality rate, child mortality rate	Positive
22	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Yes	Level of political democracy	Infant mortality	Positive
23	Shandra et al, 2010	1990-2005	Ecological	74 low income countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
24	Stroup, 2007	1980-2000	Ecological	Up to 105 countries	Yes	Political Rights Index (Freedom House)	Life expectancy, child mortality	Positive
25	Tsai, 2006	1975-1998	Ecological	119 developing countries	Yes	Democracy (majority rule and political contention)	Life expectancy, infant mortality under one year, infant mortality under five	Inconclusive
26	Wejnert, 2008	1970-2005	Ecological	58 core and peripheral countries	Yes	Democracy (Polity IV)	Maternal care, fertility rate, maternal mortality, women life expectancy	Inconclusive
27	Zweifel and Navia, 2000	1950-1990	Ecological	138 democratic or	Yes	Democracy (yes or no, defined)	Infant mortality	Positive

				dictatorial countries		by presence of elections)		
<b>Studies from our update</b>								
28	Batniji et al, 2014	1980-2011	Ecological	22 Arab countries	Yes	Extent of democracy	Mortality	Inconclusive
29	Burroway, 2016	1995-2008	Individual	52 developing countries	Yes	Democracy (Polity IV)	Child diarrhoea and malnutrition	Inconclusive
30	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
31	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Under-5 mortality	Inconclusive
32	Dietrich and Bernhard, 2015	1980s to 2012	Ecological	88 countries that were not OECD members in 1984	Yes	Democracy (Polity IV)	Infant mortality, basic nutrition	Inconclusive
33	Doherty and Kelly, 2010	Not stated	Individual	30,816 individuals from 17 European countries	Yes	Satisfaction with democracy on 0-10 scale	Self-reported happiness on 0-10 scales	Positive
34	Fumagalli et al, 2013	1990-2007	Ecological	47 developing countries	Yes	Democracy (Polity IV), political competition	BMI	Positive
35	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Yes	Democracy (Polity IV)	Life expectancy	Positive
36	Klenk et al, 2016	1950-2010	Ecological	64 countries from WHO	Yes	Democratization	Mortality	Positive

				mortality database				
37	Krueger et al, 2015	2002-2004	Individual	313,554 individuals from 67 countries	Yes	Democracy variable resulting from factor analysis of 7 indicators	Self-rated health	Positive
38	Kudamatsu, 2012	Up to 2004	Ecological	Sub-Saharan African countries	Yes	Democratization	Infant mortality	Positive
39	Mackenbach, 2013	1900-2008	Ecological	European countries	No	Democracy (binary)	Life expectancy	Positive
40	Mackenbach et al, 2013	1960-2008	Ecological	European countries	Yes	Democratization	Life expectancy	Positive
41	Mackenbach and McKee, 2013	1990-2009	Ecological	43 European countries	Yes	Democracy (+10 to -10)	Success in implementing effective health policies	Positive
42	Maynard, 2016	1985-2005	Ecological analysis	74 developing countries	Yes	Democracy (Freedom House)	Tuberculosis mortality	Positive
43	Minagawa, 2013	1990-2009	Ecological analysis	23 Eastern European countries	Yes	Freedom (Freedom House, Heritage Foundation)	Age-specific mortality, self-rated health	Positive
44	Witvliet et al, 2013	From 2000, end date not reported	Individual	72524 adults from 20 African countries	Yes	Transparency and freedom from corruption	Self-rated health	Positive

## Supplementary file 10. Table of study-level characteristics and results for globalisation

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
1	Moore et al, 2006	2000	Ecological	128 countries divided into 6 world-system blocks	National trade, world-system role	Infant mortality	Positive
2	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Commodity concentration, multinational corporate penetration, international monetary fund conditionality	Infant mortality	Negative
3	Shen and Williamson, 2001	1965-1991	Ecological	82 less developed countries	Foreign trade, foreign investment, debt increase	Infant mortality	Negative
4	Shen and Williamson, 1997	1960-1991	Ecological	86 less developed countries	Foreign investment, debt dependency	Child survival probability	Negative



Studies from our update							
5	Bergh and Nilsson, 2010	1970-2005	Ecological	92 high-, middle- and low-income countries	KOF index	Life expectancy	Positive
6	Bozorgmehr and Sebastian, 2014	1990-2010	Ecological	22 high-burden tuberculosis countries	World Trade Organization membership status and duration, trade as a percentage of GDP, Economic Freedom of the World Index, KOF Index	Tuberculosis incidence	Inconclusive
7	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Infant mortality	Inconclusive
8	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Under-5 mortality	Inconclusive
9	Costa Font and Mas, 2016	1989-2005	Ecological	26 countries	KOF Index, CSGR Index	Obesity prevalence, caloric intake	Negative
10	Cross et al, 2009	Not stated	Individual	UK, Spain, Kenya and Uganda	Localised or globalised food supply system	Health-related quality of life	Positive
11	De Vogli et al, 2014	1980-2008	Ecological	127 low-, middle- and high-income countries	KOF Index	BMI	Negative

12	Estimé et al, 2014	2005-2010	Household-level ecological	Pacific nations	Food imports	Obesity	Negative
13	Fan and Faioso Le'au, 2015	Up to 2014	Ecological	Independent and American Samoa	Westernisation	Life expectancy, neonatal and child mortality, measles immunisation, diabetes mortality, cancer mortality, cerebrovascular disease mortality, heart disease mortality, pneumonia mortality, overweight and obesity	Negative
14	Gerring and Thacker, 2008	1960-1999	Ecological	All countries with available data	Open international trade policies, low-inflation macroeconomic environments, market-oriented property rights, GATT and WTO membership	Infant mortality	Positive
15	Goryakin et al, 2015	1991-2009	Individual	Up to 887,00 women in 56	KOF Index	Overweight and obesity	Negative

				low- and middle-income countries			
16	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Terms of international trade, foreign investment, debt service and relief	Life expectancy	Inconclusive
17	Jolly et al, 2013	2002	Ecological	27 Latin American and Caribbean countries	Net food import	Obesity	Negative
18	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment	Water pollution	Negative
19	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment, export intensity	Water pollution	Negative
20	Levine and Rothman, 2006	Up to 1990	Ecological	Up to 130 countries	Economic openness	Infant mortality, under-5 mortality, anthropometric measures of child stunting	Inconclusive
21	Martens et al, 2010	Up to 2008	Ecological	Global, subject to data availability	Maastricht Globalization Index	Infant mortality, under-5 mortality, adult mortality	Positive
22	Maynard, 2015	2000-2010	Ecological	Up to 85 low- and middle-	IGTA membership and status,	Youth smoking rates (Global Youth Tobacco Survey)	Negative

				income countries	trade, imports, exports		
23	Maynard, 2016	1985-2005	Ecological	74 developing countries	Debt, trade dependency	Tuberculosis mortality	Inconclusive
24	Milner et al, 2011	1980-2006	Ecological	35 countries	A globalisation index developed for the study	Suicide rate	Negative
25	Mukherjee and Kriekhaus, 2011	1970-2007	Ecological	132 countries	Economic, political and social globalisation	Infant mortality, life expectancy, child mortality	Positive
26	Oberlander et al, 2017	1970-2011	Ecological	70 countries	Social globalisation, trade openness	Nutritional health	Inconclusive
27	Oster, 2010	Up to 2007	Ecological	UN countries with available data	Export activity	HIV	Negative
28	Owen and Wu, 2007	1960-1995	Ecological	219 countries	Openness to trade	Life expectancy, infant mortality	Positive



# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12



# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org).

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# BMJ Open

## How much evidence is there that political factors are related to population health outcomes? An internationally comparative systematic review

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<b>Primary Subject Heading</b>:	Health policy
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Political determinants of health, SOCIAL MEDICINE

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Manuscripts



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3 **How much evidence is there that political factors are related to population health**  
4 **outcomes? An internationally comparative systematic review**

5 Max Barnish,<sup>1</sup> Michelle Tørnes,<sup>2</sup> and Becky Nelson-Horne<sup>3</sup>

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## ABSTRACT

**Objectives:** To provide a seven-year update of the most recent systematic review about the relationships between political features and population health outcomes.

**Setting:** Internationally comparative scholarly literature.

**Data sources:** Ten scholarly bibliographic databases plus supplementary searches in bibliographies and Google Scholar were used to update a previous systematic review. The final search was conducted in November 2017.

**Primary and secondary outcome measures:** Any population health outcome measure, apart from healthcare spending.

**Results:** 73 unique publications were identified from the previous systematic review. The database searches to update the literature identified 45,356 raw records with 35,207 remaining following deduplication. 55 publications were identified from supplementary searches. In total, 258 publications proceeded to full-text review and 176 were included in narrative synthesis. Eighty-five studies were assessed at low risk of bias, 89 at moderate risk of bias and none at high risk of bias. Assessment could not be conducted for 2 studies with only book chapters. No meta-analysis was conducted. 102 studies assessed welfare state generosity and 79 found a positive association. 17 studies assessed political tradition and 15 found a positive association with left-of-centre tradition. 44 studies assessed democracy and 34 found a positive association. 28 studies assessed globalisation and 14 found a negative association, while 7 were positive and 7 inconclusive.

**Conclusions:** This review concludes that welfare state generosity, left-of-centre democratic political tradition and democracy are generally positively associated with population health. Globalisation may be negatively associated with population health, but the results are less conclusive. It is important for the academic public health community to engage with the political evidence base in its research as well as in stakeholder engagement, in order to facilitate positive outcomes for population health.

**Strengths and limitations of this study**

- We offer the largest systematic review on the political determinants of population health.
- The use of a systematic review design offers a robust and reproducible method that minimises potential reviewer bias.
- Our review also involved searching ten major scholarly databases in addition to relevant supplementary searches.
- The internationally comparative approach ensures relevance to readers worldwide.
- Resources meant it was unfeasible to conduct a new review from inception rather than an update of a 2010 review.

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## INTRODUCTION

### *Conceptualising politics*

Politics is an omnipresent feature of modern civilisations worldwide and has been described as the “practice of the art or science of directing and administrating states”.<sup>1</sup> Political views and systems differ substantially globally. However, they can usefully be conceptualised in terms of two axes. The first is democracy vs autocracy, and conceptualises the extent to which the population decides, either directly or indirectly, its government and governance.<sup>2</sup> The second is the left vs right axis, and conceptualises the extent to which a government intervenes in an attempt to secure social goals (progressive, left wing) or focuses on economic freedom and minimal state intervention (conservative, right wing).<sup>3</sup>

### *Opportunities for politics to influence population health*

One of the founding fathers of social medicine Rudolph Virchow said that “Medicine is a social science, and politics nothing but medicine at a larger scale”.<sup>4</sup> Indeed, many pathways to public health impact are political,<sup>5</sup> although the precise structures by which these operate differ between countries. Especially in developed countries, the existence of formal evidence-based systems is common in the licensing of medicines and medical devices (for example the European Medicines Agency and the Food and Drug Administration (United States of America)) and the development of national clinical guidelines and the approval for specific medicines and medical devices to be used in public sector health systems (for example the National Institute of Health and Care Excellence on behalf of the National Health Service in England and Wales).

Nevertheless, as Virchow said, health is about far more than medicine. For example, social and economic inequalities are strong predictors of health inequalities<sup>6-7</sup> and increased income inequality at a societal level has been shown to be strongly associated with worse health outcomes including life expectancy, infant mortality, obesity and mental health, as well as social outcomes such as trust, education level and social mobility.<sup>8</sup> However, there is

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evidence that political ideology and personal interests can exert substantial influences on policy-making processes relevant to health, leading to marked evidence-policy gaps.<sup>9</sup>

Political influences can operate at a variety of levels, including national governments, devolved governments (see supplementary file 1 for an example), and local authorities, which have taken a greater role in public health in recent years in many countries.<sup>10</sup>

### ***Existing evidence about the relationship between politics and population health***

While single-country evidence such as the review by Scott-Samuel et al<sup>11</sup> on the health effects of Thatcherism, and a recent studies on the effects of Conservative Party austerity in England<sup>12-13</sup> can be valuable, internationally comparative evidence allows us to transcend the particularities of individual countries. The most recent internationally comparative systematic review that assessed a wide range of political features was published in 2011 with searches up to April 2010 (the 2010 review).<sup>14</sup> It did not include a risk of bias assessment. It assessed four key political features: democracy, welfare state, left-of-centre political tradition and globalisation.

The 'contestability'<sup>15</sup> inherent in democracy may be health-promoting due to the potential electoral consequences of unpopular policies. Left-of-centre political tradition, and an advanced welfare state which is a key marker thereof,<sup>3</sup> may be health-promoting due to a greater focus on active state intervention to address social, economic and health inequalities,<sup>6-8</sup> and consequent greater alignment to public health mission statements, such as that of the European Public Health Association.<sup>16</sup> Globalisation is a multi-faceted concept, but may include trade liberalisation and free-markets, which are more favoured by the political right than the left.<sup>3</sup> The 2010 review suggested that globalisation was negatively associated with population health outcomes, while democracy, welfare state and left-of-centre political tradition were positively associated. The majority of studies had been published in the five year period up to the search, indicating an active field of research. This suggests that the 2010 review is likely now to be considerably out of date.

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## ***Aims***

We offer an updated systematic review investigating relationships between four key political features (democracy, welfare state, political tradition, and globalisation) and population health outcomes. This represents the largest systematic review to date of evidence in this field.

## **METHODS**

### ***Design***

A narrative systematic review design was used following the internationally accepted PRISMA guidelines.<sup>17</sup> MB was the lead reviewer. Proportionate independent second review was performed by BH for each stage in the review process, whereby this author independently appraised 20% of records for each stage. There were few disagreements, and where these arose, they were resolved by discussion.

### ***Data sources***

As this was an updated systematic review, all included studies from the 2010 review proceeded directly to the full-text review stage. An update search was conducted on ten scholarly databases from 2010 to April 2017 inclusive (MEDLINE, AMED, EMBASE, PsycINFO (all Ovid), CINAHL, Philosopher's Index (both Ebsco), Science Citation Index Expanded, Social Sciences Citation Index, Emerging Sources Citation Index (all Web of Science) and Sociological Abstracts (ProQuest)), following the conceptual search strategy shown in Table 1, from which search strings for the syntax of each database were developed. The full MEDLINE search strategy is shown in Supplementary file 2. Supplementary searches back to 2006 were conducted on Google Scholar and in relevant bibliographies. The final search was conducted in November 2017.

### ***Inclusion criteria***

Records were screened initially by title and abstract, and then in full text form for potential inclusion according to the following criteria:

- Peer-reviewed journal article in a scientific journal or a scholarly book or chapter
- Study human populations either at the individual or ecological level
- Present at least one measure of a political exposure, conceptualised in terms of the welfare state, political tradition, democracy or globalisation. These political features were defined exactly following Muntaner et al, and listed in Table 2.<sup>14</sup>
- Present at least one measure of a population health outcome. Healthcare spending alone was not considered an eligible outcome
- Use any quantitative empirical design to link the exposure to the outcome
- Present a comparison involving at least 2 countries

#### **Data extraction**

Results were classified into one of four political themes – welfare state, political tradition, democracy and globalisation, as per Table 2. Studies were allowed to contribute to more than one political theme. The following information was extracted for each included study: i) bibliographic details, ii) sampling frame, iii) years of study, iv) design, v) political themes to which the study contributes, vi) measure(s) of political exposures, vii) measure(s) of population health outcome measures, and iix) results classification (positive, negative or inconclusive association between the political exposure and population health outcome measures).

#### **Risk of bias assessment**

Risk of bias assessment was conducted at the study level using the Threats to Validity Tool,<sup>18</sup> using the configuration of Barnish and Barnish,<sup>19</sup> with one modification. Loss-to-follow-up was not considered relevant for the body of studies included in this review. Following Barnish et al,<sup>20</sup> the categories were set as i) low risk of bias (high quality) if  $\geq 70\%$  of eligible items were assessed as at low risk of bias, ii) moderate risk of bias (moderate

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quality) for 40-69%, and iii) high risk of bias (low quality) for  $\leq 39\%$ . This assessment could not be conducted for studies that only comprised of book chapters, since the tool is not suitable, and format incompatibility could introduce bias into the assessment.

### **Data synthesis**

In light of differences in political contexts between countries, and in terms of how political exposures and population health outcomes were measured, narrative synthesis was considered more appropriate than meta-analysis. Studies were grouped by political theme. In addition to our base case analysis, certain scenario analyses were conducted to further explore the data:

1. Studies that take economic factors into consideration, for each of the four themes except globalisation
2. Studies that include developing countries, for each of the four themes
3. Studies looking at general health or quality of life, for each of the four themes
4. Studies using a welfare regime classification scheme, for the welfare state theme
5. Studies using a political tradition classification scheme, for the political tradition theme

The scenario analysis on economic factors was not conducted for the globalisation theme because globalisation itself has a dominant economic component, so this is already measured. A formal test of economic mediation was not required – it was sufficient that studies took economic factors into consideration.

### **Patient and public involvement**

This is a systematic review of a broad range of population health outcomes and could not be represented by one patient group. Therefore, patients were not involved in the conduct of the study. There was no recruitment since this is a systematic review. The project director (MB) shall respond to reputable media requests and may approach selected media outlets about the possibility of disseminating the research findings more broadly.



## RESULTS

### *Search results*

Seventy-three de-duplicated records came from the 2010 review. Update database searches yielded 43, 356 records in total, of which 35,207 remained following deduplication. Supplementary searches on Google Scholar and in bibliographies yielded 55 additional records. From 35, 333 unique records, 255 proceeded to full-text screening and all were retrieved. 176 studies were included in our review (Supplementary file 3), of which 106 came from our update searches and 70 from the 2010 review. 82 studies were excluded at the full-text review stage (Supplementary file 4). Studies were published in final form a median of 6 years (IQR 4-8) after the year of final data collection and the longest lag was 20 years (Figure 1). The most recent data included in the analyses was collected in 2014. A PRISMA flowchart (Figure 2) and PRISMA checklist (Supplementary file 5) are provided. Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate risk of bias and none at high risk of bias. Risk of bias assessment could not be conducted for two studies (1% of total) whose only included publications came in the form of book chapters. Study-level risk of bias profiles are provided in Supplementary file 6.

### *Welfare state*

A total of 102 studies addressed the welfare state theme. Of these, 79 (77%) provided evidence that was favourable about the association of increased welfare state generosity with population health, 20 (20%) were inconclusive, and three (3%) were negative. Most studies either classified welfare state generosity in terms of a welfare regime classification or in terms of expenditure on health and social care. Welfare regime classifications did vary between studies, but often compared an 'advanced', e.g. Nordic<sup>21</sup> welfare regime with liberal and also market-driven/conservative alternatives. Health outcomes for welfare state studies included self-rated general health, quality of life,

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3 prevalence of chronic conditions, mental health, life expectancy and child and infant  
4 mortality. Supplementary file 7 provides study-level details.

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7 Among studies that took economic factors into consideration (n=83), 82% found a  
8 more generous welfare state to be positively associated with population health. Among  
9 studies including developing countries (n=23), 83% found this association. Among  
10 studies that used a general health or quality of life outcome (n=32), 69% found this association.  
11 Considering only studies that used a welfare regime classification (n=45), 73% found this  
12 association.  
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### 19 **Political tradition**

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22 A total of seventeen studies addressed the political tradition theme. Of these, 15  
23 (88%) were positive about the association of left-of-centre political tradition with population  
24 health, while two (12%) were inconclusive. Ways in which political tradition was measured  
25 included political tradition classification of ruling government, time in power by different  
26 parties, voter partisanship, proportion of seats held by left-wing or left-of-centre parties and  
27 working class power. Population health outcomes included life expectancy, infant and child  
28 mortality, life expectancy, older adult mortality, general self-rated health and successful  
29 implementation of effective health policies. Supplementary file 8 provides study-level details.  
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39 All studies in the political tradition theme considered economic factors, so no  
40 scenario analysis was conducted on this factor. Among studies including developing  
41 countries, all (n=6) found left-of-centre political tradition to be positively associated with  
42 population health outcomes. Among studies that used a general health or quality of life  
43 outcome, all (n=6) found this association. Among studies that used a political tradition  
44 classification scheme (n=8), 88% found this association.  
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### 51 **Democracy**

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54 A total of 44 studies addressed the democracy theme. Of these, 34 (77%) were  
55 positive, eight (18%) were inconclusive and two (5%) negative. Ways in which democracy  
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3 was measured included political transition to democracy, years of democracy since 1900,  
4 the presence of elections and standardised indices such as Polity IV.<sup>22</sup> Population health  
5 outcomes included measures such as general self-rated health, life expectancy, older adult  
6 mortality, and successful implementation of effective health policies, while there was a  
7 particular focus on infant and child mortality and other child health outcomes. Supplementary  
8 file 9 provides study-level details.  
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15 Among studies taking economic factors into consideration (n=39), 77% found  
16 democracy to be positively associated with population health outcomes. Among studies  
17 including developing countries (n=25), 76% found this association. Among studies that used  
18 a general health or quality of life outcome, all (n=3) found this association.  
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### 23 **Globalisation**

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26 A total of 28 studies addressed the globalisation theme. Of these, seven (25%) were  
27 positive, seven (25%) were inconclusive, and fourteen (50%) were negative. Measures of  
28 globalisation included world-system role, foreign trade, debt dependency, imports and  
29 exports, as well as membership of organisations such as the World Trade Organization and  
30 standardised indices such as the Maastricht Globalization Index<sup>23</sup> and the KOF Index.<sup>24</sup>  
31 Many studies measured infant and child health outcomes and mortality, while assessed  
32 measures including life expectancy, obesity, water pollution and tobacco smoking rates.  
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Supplementary file 10 provides study-level results.

All globalisation studies included data from developing countries, so no scenario analysis was performed on this factor. Only one study in this theme assessed general health or quality of life, and found a positive association between globalisation and health-related quality of life.

### 51 **Health outcomes**

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54 Table 3 provides an overview of the results for each political exposure theme  
55 subdivided by health outcome. For the welfare state political exposure, the most commonly  
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3 studied health outcomes were general health (n=35, 24 positive, 11 negative), life  
4 expectancy/adult mortality (n=28, 21 positive, 2 inconclusive, 5 negative), child mortality  
5 (n=13, 13 positive), and health inequalities (n=13, 11 positive, 2 inconclusive), noting that the  
6 latter are also measured indirectly through many of the other health outcomes in the table.  
7  
8 For political tradition, studies were more dispersed across outcomes, although the two  
9  
10 outcomes that received considerably more study than the others were life expectancy/adult  
11 mortality (n=9, 8 positive, 1 inconclusive) and infant mortality (n=8, 8 positive). For  
12  
13 democracy, by far the most widely studied outcomes were life expectancy/adult mortality  
14 (n=20, 16 positive, 1 negative, 3 inconclusive) and infant mortality (n=20, 15 positive, 1  
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16 negative, 4 inconclusive). Less consistent results were found for child mortality (n=10, 5  
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18 positive, 5 inconclusive).

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25 For globalisation, studies were quite dispersed across outcomes and the results  
26  
27 patterning differed between outcomes, consistent with the evidence base in the review being  
28  
29 least conclusive for the globalisation outcome. For child mortality (n=6), the results were  
30  
31 equally split between positive (n=2), negative (n=2), and negative (n=2). The results were  
32  
33 also split for infant mortality (n=10, 4 positive, 3 negative, 3 inconclusive). For adult  
34  
35 mortality/life expectancy, there was a pattern in favour of a positive association with  
36  
37 globalisation (n=6, 4 positive, 1 negative, 1 inconclusive), while for nutritional, overweight  
38  
39 and obesity-related outcomes, the pattern was in favour of a negative association with  
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41 globalisation (n=6, 0 positive, 1 inconclusive, 5 negative).

## 42 43 44 **DISCUSSION**

### 45 46 47 ***Summary of findings***

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50 We present a body of evidence from 176 internationally comparative scholarly  
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52 studies that together provides powerful evidence that key political characteristics are related  
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54 to a range of population health outcomes. The evidence was favourable about a positive  
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56 association with population health for all of increased welfare state generosity, left-of-centre  
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3 democratic political tradition and democracy, supported by over three quarters of eligible  
4 studies. Twice as much evidence supported a negative association with population health for  
5 globalisation than a positive association, although a quarter of studies were inconclusive.  
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### 8 9 **Scenario analyses**

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12 Scenario analyses showed that i) most studies considered economic factors and  
13 excluding those that did not made little difference to the results, ii) apart from in the  
14 globalisation theme a minority of studies included developing countries but the results of  
15 those that did were generally consistent with those that did not, iii) classification schemes for  
16 welfare state and political tradition made little difference to the results, and iv) the proportion  
17 of studies using general health or quality of life outcome measures was relatively low, but the  
18 results were directionally consistent with the wider set of studies.  
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28 In terms of analytical strategies to consider economic factors, a popular approach  
29 was to incorporate Gross Domestic Product (GDP) or Gross National Product (GNP) into the  
30 analytical modelling. Another approach used by some studies was to incorporate a measure  
31 of household income into the analysis. The former approach considers economic factors at  
32 the societal level, while the latter considers economic factors at the family level. The  
33 scenario analysis of studies including developing countries considered all studies that  
34 included developing countries, and was not restricted to studies that considered exclusively  
35 developing countries. The rationale for this was to provide an analysis in which any results  
36 particular to affluent, for example Organisation for Economic Co-operation and Development  
37 (OECD), countries, were excluded, thereby offering a broader and more representative  
38 insight into the relationship between political factors and global population health. Indeed,  
39 this was a systematic review of internationally comparative studies, in order to provide a  
40 global perspective. The scenario analysis provided for studies that included developing  
41 countries helps safeguard our findings against the potential that the observed findings are  
42 only applicable to affluent or developed countries. Many studies included data from a wide  
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3 range of countries, and combined with the approach of not excluding studies from the  
4 scenario analysis that did not study exclusively developing countries, this offered a  
5 safeguard against the potential dominance of data from a narrow set of countries. We  
6 therefore do not consider that there is any evidence that the analyses in this report are  
7 dominated by data from specific countries.  
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### 13 ***Risk of bias assessment***

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16 Eighty-five studies (49%) were assessed at low risk of bias, 89 (51%) at moderate  
17 risk of bias and none at high risk of bias. However, low risk of bias of individual studies does  
18 not mean that there is necessarily low risk of bias across studies, especially when grouping  
19 so many heterogeneous studies. The three types of potential bias that were found quite  
20 often were chance, group equivalence and potential conflict of interest. Most studies were  
21 very large, however they tended not to provide a rationale for their sample size or provide  
22 information to let us assess whether there may have been under- or indeed overpowered to  
23 detect associations. Group equivalence is very hard to achieve in studies such as the ones  
24 eligible for our review, since it would entail countries being similar in most other ways except  
25 the political variable of interest. Substantive conflicts of interest were rare, but more of an  
26 issue was an absence of funding statements or declarations as to whether there were any  
27 conflicts of interest. This absence was particularly notable among studies published in social  
28 science journals. No studies declared any party political members among the authors, yet it  
29 seems incongruous to believe that no author among 176 health policy studies was a  
30 member of a political party. Rather, it seems that political conflicts of interest are seldom  
31 declared, when potentially they should.  
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### 49 ***Strengths***

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52 We offer the largest systematic review on the political determinants of population  
53 health, and the first wide ranging internationally comparative systematic review of similar  
54 scope since 2010. The use of a systematic review design offers a robust and reproducible  
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3 method that minimises potential reviewer bias in the selection and evaluation of studies for  
4 potential inclusion.<sup>25</sup> Our review also involved searching ten major scholarly databases and  
5 this very thorough coverage of the literature is reflected in a very low proportion of studies  
6 being identified from supplementary searches. All publications identified for full-text  
7 screening were successfully obtained. Conducting searches back to 2006 as part of our  
8 update enabled us to include a further ten eligible studies published before the search date  
9 of the 2010 review. We independently evaluated all studies from the 2010 review and  
10 allowed studies to contribute to multiple themes, allowing further relevant data to be  
11 included. The internationally comparative approach ensures relevance to readers worldwide  
12 and transcends the limitations associated with single-country studies. Unlike the authors of  
13 the 2010 review, we were able to provide a risk of bias assessment.

### 24 25 **Limitations**

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28 Resources precluded a new review from inception, and required us to update an  
29 English-language only review from 2010. Moreover, conducting an update required us to  
30 maintain consistency with the 2010 review in terms of inclusion criteria, and precluded us  
31 from considering a wider range of grey literature sources, such as OECD reports, which may  
32 have relevant data. Moreover, the categorical form of data extraction in terms of positive,  
33 inconclusive or negative results followed this previous review and was necessitated by its  
34 scope and scale. Limiting reviews to the English language may not exert systematic bias in  
35 systematic reviews, at least according to evidence from reviews of healthcare  
36 interventions.<sup>26</sup> The diversity of political and health-system contexts as well as measures of  
37 political exposures and population health outcomes precluded meta-analysis. The  
38 internationally comparative approach increases relevance for an international readership, yet  
39 it introduces complexities in the mapping between political characteristics and political  
40 parties in both systematic and idiosyncratic ways.<sup>27-31</sup> Public health policy evidence is  
41 typically observational, which reflects real-world situations. Observational studies do not  
42 intrinsically overstate effect sizes<sup>32</sup> and can be highly valuable.<sup>5</sup> Causative inference can be  
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3 made more complicated by different causal pathways, different confounders, and different  
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5 covariates, although systems such as Bradford Hill<sup>33</sup> may be used as a starting point.  
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7 Studies did not regularly report their study design thoroughly or consistently in terms of  
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9 recognised design labels beyond the basics such as ecological vs individual studies, which  
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11 limited the level of detail in which information on study design could be extracted.  
12

### 13 ***Comparison with previous reviews***

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16 Our review offers a seven and a half year search advance on the most recent  
17  
18 internationally comparative systematic review to offer an equivalent scope. The 2010 review  
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20 by Muntaner et al<sup>14</sup> included 73 studies, of which 70 were eligible for our review. Three were  
21  
22 excluded from our review since they only included healthcare spending as an outcome. We  
23  
24 considered that to be circular, since healthcare spending was also frequently used by  
25  
26 studies as a marker of welfare state generosity. To these 70 studies, we added a further 106  
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28 (10 of which were dated prior to the search of the 2010 review), giving a total of 176 studies  
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30 in our review. Those added by our update constituted 60% of the total (58% if the 10 studies  
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32 we added from prior to 2010 were removed from the numerator and denominator),  
33  
34 demonstrating how the scale of the evidence base for the political determinants of population  
35  
36 health has more than doubled over the past seven and a half years.  
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40 The strength of evidence that welfare state generosity is positively associated with  
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42 population health has increased slightly (77% vs 72% positive), while the number of studies  
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44 has more than tripled (102 vs 32). The strength of evidence that left-of-centre political  
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46 tradition is positively associated with population health has increased markedly (88% vs 60%  
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48 positive), while the number of studies has increased modestly (17 vs 12). Notably, far fewer  
49  
50 studies have explicitly studied political tradition than the welfare state, which is one of the  
51  
52 key markers of political tradition. The strength of evidence that democracy is positively  
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54 associated with population health is largely unchanged (77% vs 78%), while the number of  
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56 studies has increased substantially (44 vs 27). The strength of evidence that globalisation is  
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3 negatively associated with population health has weakened (50% vs 75% negative), while  
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5 the number of studies has increased sevenfold (28 vs 4).  
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8 A prior review in the interim<sup>34</sup> had found that the strength of evidence for the benefits  
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10 of welfare state generosity was greater for studies assessing spending patterns than welfare  
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12 regime typologies. We did not find a strong effect – 73% of studies assessing regime  
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14 typologies were positive compared to 77% of studies irrespective of how the welfare state  
15  
16 was measured. The Nordic model found in Scandinavia was presented by most studies as  
17  
18 the example of an advanced welfare state. However, classifications used in these typologies  
19  
20 are imperfect, and in many ways the Scottish system (see supplementary file 1) could be  
21  
22 argued to represent a more advanced welfare state, since Norway for example does not  
23  
24 offer universal free healthcare at point of use. Our findings on the welfare state and political  
25  
26 tradition were also consistent with those of Scott-Samuel et al<sup>11</sup> regarding Thatcherism in the  
27  
28 United Kingdom, which found a widening of health inequalities resultant from the introduction  
29  
30 of reduced state welfare provision and increased privatisation and pro-market policies.  
31

### 32 ***Perspectives on the role of academia***

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35 The presentation of an evidence base from 176 studies associating political factors with a  
36  
37 range of population health outcomes offers an opportunity for the reader to reflect on the role  
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39 of public health academia, in light of university research impact policies in many countries,  
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41 and recently scholarly debates on the role of academia. Academic public health has a long  
42  
43 pro-social political history.<sup>35</sup> A recent BMJ article<sup>36</sup> offers insight into ongoing debate on the  
44  
45 relative priority of action and research in public health, while Smith et al<sup>37</sup> reflect on whether  
46  
47 or not advocacy is a disciplinary duty for public health academics, and Kapilashrami et al<sup>38</sup>  
48  
49 provide an interesting example of an advocacy programme. Indeed, there has been  
50  
51 reticence both at the individual<sup>4</sup> and organisational<sup>39</sup> level to engage in advocacy.  
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53 Meanwhile, Schafer<sup>40</sup> offers insight into the potential of partnership approaches to  
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3 knowledge translation with stakeholders, which may be valuable but also depends on  
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5 ideological match.  
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### 7 ***Recommendations for research***

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10 It is important that health research increasingly focuses on real-world contexts to  
11  
12 supplement more idealised studies.<sup>5</sup> Health research that does not consider political and  
13  
14 cultural factors may lack relevance and generalisability,<sup>41</sup> especially research into the social  
15  
16 determinants of health. Further research into the globalisation political exposure theme may  
17  
18 help elucidate the evidence base in this area, and potentially distinguish different influences  
19  
20 that may explain why globalisation seems to be able to be associated both positively and  
21  
22 negatively with population health across health outcomes.  
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### 24 ***Implications for policy and practice***

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28 Clinicians and decision makers should be aware of the context in which they work,  
29  
30 and the political influences on medicine and health outcomes. They should seek to find ways  
31  
32 to increase the use of evidence in decisions impacting on health. Ideas such as ‘health in all  
33  
34 policies’<sup>42</sup> are worthwhile, but only if they are genuinely put into action and not seen as a ‘tick  
35  
36 box’ exercise.  
37

### 38 ***Conclusion***

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42 In conclusion, we present a systematic review of 176 studies that demonstrates that  
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44 welfare state, left-of-centre democratic political tradition and democracy are generally positively  
45  
46 associated with a range of population health outcomes.  
47

### 48 **FOOTNOTES**

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51  
52 **Contributors:** MB was the project director and project manager. The study was  
53  
54 conceptualised by MB with input from MT and BH. Searches were conducted by MB. Study  
55  
56 selection, data extraction and quality assessment were conducted by MB with proportionate  
57  
58 second review from BH. Data interpretation was led by MB with input from MT and BH. MB  
59  
60 wrote the first draft of the paper. MT and BH commented on the draft manuscript and

thereby contributed important revisions. All tables, figures and supplementary files were made by MB. All authors approved the submission. MB is the guarantor.

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**Ethics approval:** No ethics approval was required for this systematic review of published literature.

**Declaration:** All views presented in this article are the authors' own, and not necessarily those of their institutions nor bodies that fund their other research projects.

**Data sharing statement:** No further data are available.

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## TABLES

**Table 1. Conceptual search strategy**

((democracy OR autocracy OR welfare regime OR welfare state OR welfare capitalism OR politics OR political tradition OR internationality OR globalization) AND (health OR health services OR population health OR public health OR health economics OR health expenditure))

**Table 2. Definitions of political exposure variables**

Exposure variable	Definition
Welfare state	“if the analysis included welfare regimes or welfare state indicators (e.g. universal health coverage), but not measures of political ideology (e.g. along the left-right dimension)”
Political tradition	“if the study included variables referring to the left-right political dimension (e.g. social democratic / egalitarian/ left vs. liberal / conservative / right political parties in government)”
Democracy	“if the hypotheses tested involved democratic institutions or political rights”
Globalisation	“if the article examined how high, middle, and/ or low countries are integrated through global networks of trade, foreign investment, and multinational corporations”

Source of definitions: Muntaner C, Borrell C, Ng E, et al. Politics, welfare regimes, and population health: controversies and evidence. *Sociol Health Illn* 2011; 33: 946-64.

**Table 3. Overview of overall result classification by political exposure and health outcome**

	Welfare state			Political tradition			Democracy			Globalisation		
	P	N	I	P	N	I	P	N	I	P	N	I
Birth weight	4	0	0	2	0	0	0	0	0	0	0	0
Cancer	1	0	0	0	0	0	0	0	0	0	1	0
Cerebrovascular disease	0	0	0	0	0	0	0	0	0	0	1	0
Child mortality	13	0	0	3	0	0	5	0	5	2	2	2
Child wellbeing	1	0	0	0	0	0	0	0	0	0	0	1

Chronic conditions	5	1	2	1	0	0	0	0	0	0	0	0
Diabetes	0	0	0	0	0	0	0	0	0	0	1	0
Fertility and reproductive health	1	0	0	0	0	0	2	0	1	0	0	0
General health	24	0	11	4	0	0	4	0	0	1	0	0
Health behaviours	1	0	0	0	0	0	0	0	0	0	0	0
Health care burden/need	3	0	0	0	0	0	0	0	0	0	0	0
Heart disease	0	0	0	0	0	0	0	0	0	0	1	0
Health inequalities*	11	0	2	2	0	0	0	0	0	0	0	0
HIV/AIDS	1	0	0	0	0	0	1	0	0	0	1	0
Homicide and suicide	0	0	1	0	0	0	0	0	0	0	1	0
Immunisation/vaccination rates	0	0	0	0	0	0	0	1	0	0	1	0
Implementation of effect health policy	0	0	0	0	0	1	1	0	0	0	0	0
Infant mortality	16	0	2	8	0	0	15	1	4	4	3	3
Life expectancy/adult mortality	21	2	5	8	0	1	16	1	3	4	1	1
Maternal health	0	1	0	0	0	0	0	0	0	0	0	0
Mental health	9	0	1	0	0	0	1	0	0	0	0	0
Nutrition, overweight and obesity	0	0	0	0	0	0	1	0	2	0	5	1
Oral health	2	0	0	0	0	0	0	0	0	0	0	0
Physical activity/health	1	0	0	2	0	0	1	0	0	0	0	0
Pneumonia	0	0	0	0	0	0	0	0	0	0	1	0
Smoking	0	0	1	1	0	1	0	0	0	0	1	0
Tuberculosis	2	0	0	0	0	0	1	0	0	0	0	2
Water pollution	0	0	0	0	0	0	0	0	0	0	2	0
Wellbeing of the unemployed	1	0	1	0	0	0	0	0	0	0	0	0

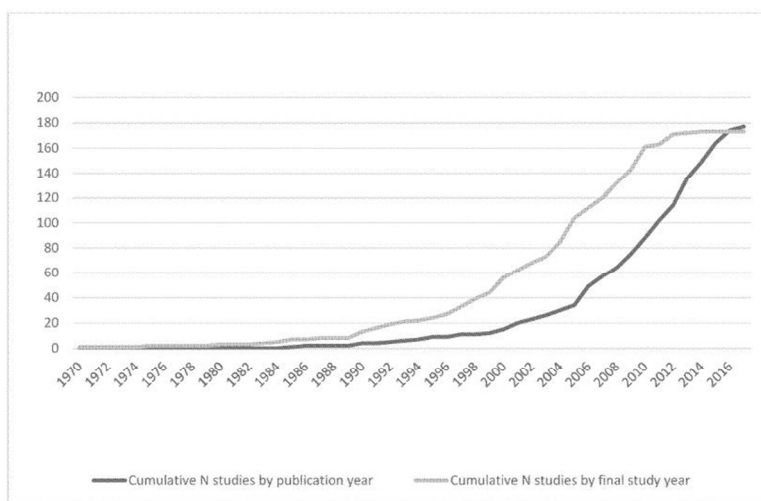
Columns denote political exposure variables; rows denote health outcome variables; P = Positive, N = Negative, I = Inconclusive, \* this is additionally indirectly measured by many of the other outcomes

## FIGURE LEGENDS

**Figure 1.** Accumulation of evidence on the political determinants of population health over time.

**Figure 2.** PRISMA 2009 flow diagram.





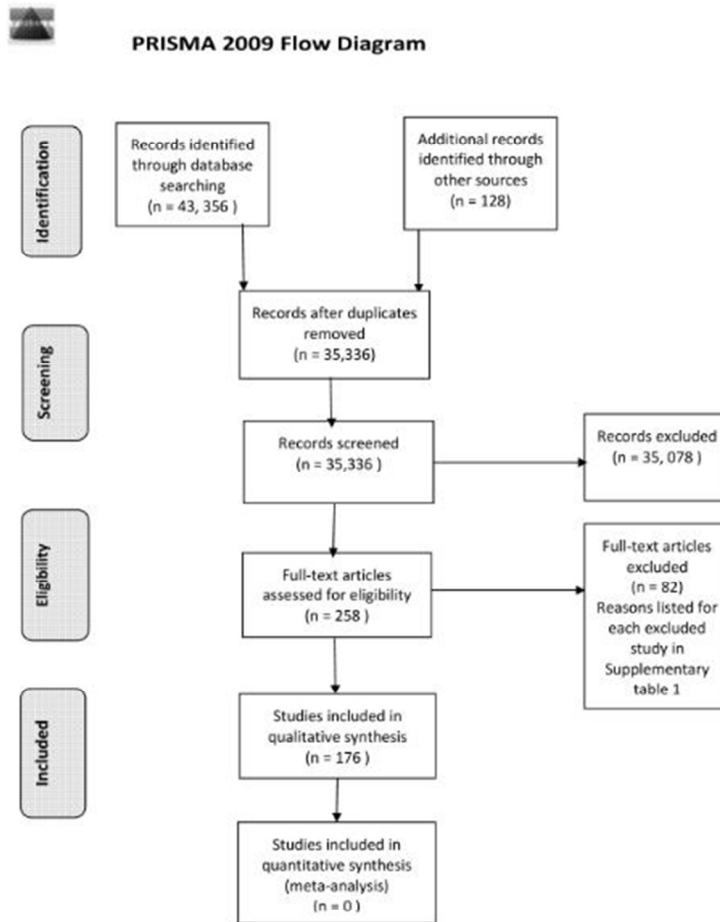
Accumulation of evidence on the political determinants of population health over time.

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From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

PRISMA 2009 flow diagram.

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**Supplementary file 1. Devolution and health systems: examples of the differences in health provision between Scotland and England**

<b>Scotland</b>	<b>England</b>
<b>Free dental checks at 6-monthly intervals (although there is a charge for treatment)</b>	<b>Dental check costs £20.60</b>
<b>Free NHS prescriptions</b>	<b>Prescription costs £8.60</b>
<b>Free NHS eye tests</b>	<b>Commercial eye tests</b>
<b>Free personal and nursing care upon assessed need</b>	<b>Commercial care</b>
<b>Public health is NHS-run</b>	<b>Public health is local authority-run</b>
<b>Offers a free baby box scheme, supplying parents of newborn children with around 40 different essential items</b>	<b>No baby box scheme</b>
<b>Minimum alcohol unit pricing (implementation date 1 May 2018)</b>	<b>No minimum alcohol unit pricing</b>

All information correct at time of writing. Certain services that are chargeable in England are offered free of charge to those on certain state benefits, but are not universally free.

Table adapted from a slide from the following conference presentation by the lead author of this manuscript Dr Max Barnish: "Barnish M. Health policy and the politics of being an early career researcher. Invited oral presentation, Early Career Researchers Workshop, Society for Social Medicine Annual Scientific Meeting, Manchester, UK, 2017". The copyright to this slide is held by Dr Barnish.

## Supplementary file 2. Full MEDLINE search strategy

Platform: OVID

Version: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present

Notes:

1. .mp indicates a keyword
2. In capitals followed by / indicates a MeSH term
3. exp indicates a MeSH term is exploded to encompass all subcategories, this was done by default

Search string:

(democracy.mp OR democratic.mp OR exp DEMOCRACY/ OR autocracy.mp OR autocratic.mp OR “welfare regime”.mp OR exp SOCIAL WELFARE/ OR “welfare state”.mp OR “welfare capitalism”.mp OR politics.mp OR political.mp OR exp POLITICS/ OR “political tradition”.mp OR globalisation.mp OR globalization.mp OR internationality.mp OR exp INTERNATIONALITY/)

AND

(health.mp OR exp HEALTH/ OR “health services”.mp OR exp HEALTH SERVICES/ OR “population health”.mp OR exp POPULATION HEALTH/ OR “public health”.mp OR exp PUBLIC HEALTH/ OR “health economic”.mp OR “health economics.mp” OR “health expenditure”.mp OR “health expenditures.mp” OR exp HEALTH EXPENDITURES/ )

Limits: English language

**Supplementary file 3. List of all publications included in the review**

1. Ades F, Senterre C, de Azambuja E, et al. Discrepancies in cancer incidence and mortality and its relationship to health expenditure in the 27 European Union member states. *Ann Oncol* 2013; 24: 2897-902.
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#### Supplementary file 4. List of all publications excluded at full-text screening, with reasons

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# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12



# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org).

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**Supplementary file 6. Study-level risk of bias assessment**

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Ades, 2013	Green	Amber	Green	Green	Green	Green	Green	Green
Adeyi, 1997	Green	Amber	Green	Green	Green	Green	Green	Green
Akinci, 2014	Green	Amber	Green	Green	Green	Green	Amber	Amber
Alvarez-Dardet, 2006	Green	Amber	Green	Green	Green	Green	Green	Green
Avendano, 2009	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2014	Green	Amber	Green	Green	Green	Green	Green	Green
Bambra, 2009	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2009	Green	Amber	Amber	Green	Green	Green	Green	Green
Bambra, 2006	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Bambra, 2005	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Batniji, 2014	Green	Amber	Green	Green	Green	Green	Green	Green
Baum, 2003	Green	Amber	Amber	Green	Green	Green	Amber	Amber

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Bergh, 2010	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Besley, 2006	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Bosdriesz, 2015	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Borrell, 2009	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bozorgmehr, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bradley, 2011	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Brandt, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Bremberg, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Burroway, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Burstrom, 2010	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
Cereseto, 1986	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Chuang, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Chung, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Conley, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Copeland, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
Correa, 1992	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Corsi, 2014	Green	Yellow	Green	Green	Green	Green	Green	Green
Costa-Font, 2016	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Craveiro, 2017	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Cross, 2009	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow
De Vogli, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Dahl, 2013	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Deeming, 2012	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Devaux, 2015	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Dietrich, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Doherty, 2010	Green	Yellow	Yellow	Green	Green	Green	Green	Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Dujardin, 2011								
Eikemo, 2008								
Eikemo, 2008								
Elgar, 2011								
Elola, 1995								
Engster, 2011								
Esmaeli, 2011								
Espelt, 2008								
Esser, 2010								
Estimé, 2014								
Fan, 2015								
Farfan-Portet, 2010								
Fayissa, 2001								
Foubert, 2014								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Frey, 1999								
Fritzell, 2012								
Fritzell, 2013								
Fumagalli, 2013								
Gauri, 2002								
Gerring, 2008								
Gesthuizen, 2012								
Ghobarah, 2004								
Gilligan, 2015								
Gizeles, 2009								
Glass, 2016								
Goryakin, 2015								
Granados, 2010								

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Jorgenson, 2009								
Jorgenson, 2009								
Karim, 2010								
Kick, 1990								
Klenk, 2016								
Klomp, 2008								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Krueger, 2015								
Kudamatsu, 2012								
Kuovo, 2015								
Lahelma, 1994								
Lake, 2001								
Lena, 1993								
Levecque, 2011								
Levecque, 2015								
Levine, 2006								
Lin, 2012								
Lin, 2014								
London, 1990								
López-Casasnovas, 2014								
Lundberg, 2008								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Mackenbach, 2013								
Mackenbach, 2013								
Mackenbach, 2013								
Martens, 2010								
Maynard, 2015								
Maynard, 2016								
Miething, 2013								
Menon-Johansson, 2005								
Milner, 2011								
Minagawa, 2013								
Moon, 1985								
Moor, 2013								
Moore, 2006								

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Muldoon, 2011	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Muntaner, 2017	Green	Yellow	Green	Green	Green	Green	Green	Green
Muntaner, 2002	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navarro, 2006	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Navarro, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navarro, 2001	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Navia, 2003	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Nelson, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Norden mark, 2006	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Novignon, 2012	Green	Yellow	Green	Green	Green	Green	Green	Green
Oberlander, 2017	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Olafsdottir, 2007	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Olsen, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Oster, 2012	Green	Yellow	Green	Green	Green	Green	Yellow	Green

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Owen, 2007	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Palència, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Pickett, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Pillai, 2006	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Pinzón-Flórez, 2015	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Platts, 2015	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Ploubidis, 2012	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Popham, 2013	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Raphael, 2004	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow
Reeves, 2014	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Richter, 2012	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Ross, 2006	Green	Yellow	Green	Green	Green	Green	Yellow	Green
Rostila, 2007	Green	Yellow	Yellow	Green	Green	Green	Green	Green
Rovny, 2011	Green	Yellow	Yellow	Green	Green	Green	Yellow	Yellow

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First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Sacker, 2011								
Safaei, 2006								
Sanders, 2009								
Sarti, 2013								
Sekine, 2009								
Shandra, 2010								
Shandra, 2004								
Shen, 2001								
Shen, 1997								
Shim, 2015								
Stavrova, 2011								
Stroup, 2007								
Stuckler, 2010								
Tsai, 2006								
Van der Heuvel, 2013								

First author, year	Selection bias	Selection bias	Chance	Detection bias	Detection bias	Detection/Reporting bias	Reporting bias	Summary
	Participant representativeness	Group equivalence	Sample size rationale	Exposure measure	Outcome measure	Appropriate analysis	Conflict of interest	
Van Tuyckom, 2011	Green	Amber	Green	Green	Green	Green	Green	Green
Vahid Shahidi, 2016	Green	Amber	Amber	Green	Green	Green	Green	Green
Veenhoven, 2000	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Veenhoven, 1995	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Vöörmann, 2013	Amber	Amber	Amber	Green	Green	Green	Amber	Amber
Wejnert, 2008	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Whitehead, 2000	Amber	Amber	Amber	Green	Green	Green	Green	Amber
Witvliet, 2013	Green	Amber	Amber	Green	Green	Green	Green	Green
Wu, 2007	Green	Amber	Amber	Green	Green	Green	Amber	Amber
York, 2014	Green	Amber	Green	Green	Green	Green	Amber	Green
Zambon, 2006	Green	Amber	Amber	Green	Green	Green	Amber	Amber
Zweifel, 2000	Green	Amber	Amber	Green	Green	Green	Amber	Amber

Green = high quality (low risk of bias); Amber = moderate quality (moderate risk of bias) or unknown; Red = low quality (high risk of bias)

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Supplementary file 7. Table of study-level characteristics and results for welfare state

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Avendano et al, 2009	2004-2007	Ecological	Yes	11 countries from 3 European regions	Welfare regimes	Chronic conditions, self-reported health, depression	Positive
2	Bambra, 2005	1997-1999	Ecological	No	18 OECD countries	Welfare regimes	Health care index	Positive
3	Bambra, 2006	1980-1998	Ecological	No	18 OECD countries	Welfare regimes	Infant mortality	Positive
4	Bambra and Eikemo, 2009	2002-2004	Individual	No	37,499 persons from 21 European countries	Welfare regimes	Self-reported health, long-standing illness	Positive
5	Bambra et al, 2009	1998-2004	Individual	No	118,245 persons from 13 European countries	Welfare regimes	Self-rated health	Inconclusive
6	Burstrom et al, 2010	1999-2001	Individual	Yes	28,485 persons from	Family policy models	Self-rated health, limiting long-	Positive

					Italy, Sweden and Britain		standing illness	
7	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 wealthy OECD countries	Public sector medical care	Infant mortality rate, low birth weight, under-five mortality weight	Positive
8	Chung and Muntaner, 2007	1960-1998	Ecological	Yes	18 wealthy countries	Welfare regimes	Infant mortality rate, low birth weight	Positive
9	Conley and Springer, 2001	1960-1992	Ecological	Yes	19 OECD countries	Welfare regimes, welfare state spending	Infant mortality	Positive
10	Dahl et al, 2006	1970-2005	Ecological	Yes	Up to 11 European countries	Welfare regimes	Absolute and relative health inequalities	Inconclusive
11	Eikemo et al, 2008	2002-2004	Individual	No	69, 821 persons from 23 European countries	Welfare regimes	Self-reported health, limiting longstanding illness	Inconclusive
12	Eikemo et al, 2008	2002-2004	Individual	No	65, 065 persons from 21 European countries	Welfare regimes	Subjective poor health, limiting longstanding illness	Positive
13	Elola et al, 1995	1990-1991	Ecological	Yes	17 Western European countries	Health care system	Infant mortality, life expectancy	Positive

14	Farfan-Portet et al, 2010	2001	Individual	No	5,729,859 persons in Belgium and Britain	Welfare regimes	Self-reported health	Inconclusive
15	Fayissa, 2001	1993	Ecological	Yes	34 sub-Saharan African countries	Public health expenditure	Infant mortality, child mortality	Positive
16	Grosse et al, 2010	2004	Individual	No	38,122 persons from 24 European countries	Welfare regimes	Perception of need for seeking primary health care	Positive
17	Karim, 2010	2003	Ecological	Yes	30 countries in Europe, North America, Australia and Asia	Welfare regimes	Infant mortality, life expectancy	Positive
18	Klomp and de Haan, 2008	2000-2005	Ecological	Yes	101 low, middle and high income countries	Governance	19 mortality, disease, sickness indicators	Positive
19	Lahelma and Arber, 1994	1985-1987	Individual	No	Ca. 30,000 persons from Britain, Finland, Norway and Sweden	Welfare regimes	Limiting long-standing illness	Negative
20	Lundberg et al, 2008	1950-2000	Ecological	Yes	18 OECD countries	Family policy models	Infant mortality, mortality among those aged 30-59 and over 65	Positive

21	Menon-Johansson, 2005	2002	Ecological	Yes	149 countries	Governance	HIV prevalence	Positive
22	Muntaner et al, 2006	1980-1995	Individual	Yes	Sweden, Italy, and England and Wales (combined)	Welfare regimes	Mortality level per occupational class, population attributable risk, index of dissimilarity	Inconclusive
23	Nordenmark et al, 2006	1992-2001	Individual	Yes	3442 persons from Sweden, Ireland and Great Britain	Unemployment benefit type	Psychological distress	Positive
24	Ouweneel, 2002	1980-1990	Ecological	Yes	42 'first-world, second-world and third-world' countries	Social security system	Self-rated health	Inconclusive
25	Raphael and Bryant, 2004	1999	Ecological	Yes	5 countries (Canada, Denmark, Sweden, UK, US)	Welfare state spending	Life expectancy	Positive
26	Rostila, 2007	2002-2003	Individual	Yes	36,489 persons in 20 European countries	Welfare regimes	Self-rated health, life expectancy	Positive
27	Sanders et al, 2009	1998-2002	Individual	Yes	12,888 persons in 4 countries (UK, Finland, Germany, Australia)	Welfare regimes	Oral health	Positive

28	Sekine et al, 2009	1991-2003	Individual	No	17,801 persons in Britain, Finland and Japan	Welfare regimes	The Short-Form 36: physical and mental health functioning	Positive
29	Veenhoven and Ouweneel, 1995	1965-1985	Ecological	Yes	Up to 97 rich and poor countries	Welfare state expenditure	Life expectancy	Positive
30	Veenhoven, 2000	1980-1990	Ecological	Yes	40 countries	Welfare state expenditure	Life expectancy, self-rated health	Inconclusive
31	Whitehead et al, 2000	1979-1996	Individual	No	80,792 persons from Britain and Sweden	Social benefit system	Self-perceived health, limiting longstanding illness	Inconclusive
32	Zambon et al, 2006	2001-2002	Individual	Yes	160, 325 persons from 32 European and North American countries	Welfare regimes	Self-reported health, well-being, health symptom load, health behaviours	Positive
<b>Studies from our update</b>								
33	Ades et al, 2013	2008-2012	Ecological	Yes	27 European Union countries	Healthcare spending	Cancer incidence and mortality	Positive
34	Akinci et al, 2014	1990-2010	Ecological	Yes	19 Middle Eastern and North African countries	Healthcare spending	Infant, under-5, and maternal mortality	Positive

35	Bambra et al, 2014	2010	Individual	Yes	21,705 men and women from 27 European countries	Welfare regime	Self-rated health	Inconclusive
36	Batniji et al, 2014	1980-2011	Ecological	Yes	22 Arab countries	Governance	Mortality	Positive
37	Bentley et al, 2016	2001-2008	Ecological	Yes	Australia and UK	Housing benefit generosity	Mental health	Positive
38	Bradley et al, 2011	2009	Ecological	Yes	30 OECD countries	Healthcare spending, social care spending	Life expectancy, low birth weight, maternal mortality, potential life years lost	Positive
39	Brandt and Hank, 2014	Up to 2009	Individual	No	More than 13,000 people from 11 European countries	Welfare regimes	Self-rated health, job loss	Positive
40	Bremberg, 2016	1990-2012	Ecological	Yes	28 OECD countries	Family benefit spending, healthcare spending, government expenditure on research and development	Infant mortality	Inconclusive
41	Copeland et al, 2015	1991-2010	Individual	Yes	England (n = 217,514) and Sweden (n = 184, 428)	Welfare regimes	Self-rated health, health inequalities	Positive

42	Corsi and Subramanian, 2014	1990-2012	Ecological	Yes	35 sub-Saharan African countries	Maternal and child health service coverage	Under-5 mortality	Positive
43	Craveiro, 2017	2010-2011	Individual	Yes	53,615 individuals from 15 European countries	Welfare regimes	Composite health measure derived from 3 indicators based on factor analysis, health inequalities	Positive
44	Dahl and van der Wel, 2013	2005	Individual	Yes	Around 245,000 individuals from 18 European countries	National social expenditure	Self-rated health, health inequalities	Positive
45	Deeming and Hayes, 2012	2000-2005	Individual	Yes	Just under 30,000 individuals from OECD countries	Welfare regimes	Unhappiness	Positive
46	Devaux, 2015	2006-2009	Individual	Yes	Participants from 18 OECD countries	Health care system	Health inequalities	Positive
47	Dragano et al, 2010	2004-2006	Individual	Yes	9917 older individuals from 12 European countries	Welfare regimes, indicators from the EU Labour Force Survey	Depression (EURO-D and CES-D)	Positive

48	Dujardin et al, 2011	2001	Individual	Yes	5729858 individuals from Belgium and Great Britain	Home care policy system	Health burden of care	Positive
49	Elgar et al, 2011	2006	Individual	Yes	48641 adults from 33 rich and middle-income countries	Healthcare spending	Homicide	Inconclusive
50	Engster and Stensöta, 2011	1995-2005	Individual	Yes	Participants from 20 OECD countries	Family policy regime: family cash and tax benefits, paid parenting leave, public child care support	Child poverty and mortality	Positive
51	Esmaeli et al, 2011	1996-2004	Ecological	Yes	24 Islamic countries	Healthcare spending	Life expectancy	Inconclusive
52	Esser and Palme, 2010	2002-2005	Individual	Yes	13 OECD countries	Pension system	Self-rated health, WHO-5	Positive
53	Foubert et al, 2014	2002-2004	Individual	Yes	213764 individuals from 57 countries	Welfare regimes	Self-rated health	Positive
54	Fritzell et al, 2012	2000-2005	Individual	No	Randomly sampled British, Italian and Swedish mothers	Family policy model	Maternal health	Negative
55	Fritzell et al, 2013	1980-2005	Ecological	Yes	Up to 25 countries per wave	Welfare regimes	Mortality	Positive



56	Gesthuizen et al, 2012	2002-2008	Individual	Yes	Over 90,000 individuals from 32 European countries	Healthcare spending, modernised labour market	Self-rated health	Positive
57	Gilligan and Skrepnek, 2015	1995-2010	Ecological	Yes	21 Eastern Mediterranean countries	Healthcare spending	Life expectancy	Positive
58	Glass et al, 2016	2006-2008	Individual	Yes	22 OECD countries	Family policy	Happiness	Positive
59	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Welfare regimes	Life expectancy, mortality, tobacco consumption	Inconclusive
60	Guarnizo-Herreño et al, 2013	2009	Ecological	No	31 European countries	Welfare regimes	Oral health	Positive
61	Harding et al, 2013	1971-2006	Ecological	No	England and Wales, Italy and Finland	Welfare regimes	Elder mortality	Negative
62	Hájek et al, 2012	1995-2008	Ecological	Yes	27 European Union countries	Healthcare spending	Life expectancy, standardised death rate	Positive
63	Hauck et al, 2016	1990-2012	Ecological	Yes	54 low-income studies	Healthcare spending	Life expectancy	Inconclusive
64	Heijink et al, 2013	1996-2006	Ecological	Yes	14 Western countries	Healthcare spending	Avoidable mortality	Positive
65	Hoffman, 2011	1980-2006	Ecological	Yes	USA and Denmark	Welfare system	Old-age mortality	Negative
66	Kuovo and Räsänen, 2015	2010	Individual	No	10,046 individuals from Finland, Britain,	Welfare system	Subjective well-being	Positive

					Germany and Greece			
67	Levecque et al, 2011	2006-2007	Individual	Yes	41686 people from 23 European countries	Welfare regimes, welfare state generosity	Depression (CES-D)	Positive
68	Levecque et al, 2015	2006-2007	Individual	No	37076 people from 20 European countries	Migrant integration social policy	Depression (CES-D)	Inconclusive
69	Lin et al, 2014	1996-2010	Ecological	Yes	149 countries	Governance	Child mortality	Positive
70	López-Casasnovas and Soley-Bori, 2014	1980-2010	Ecological	Yes	32 OECD countries	Healthcare and social spending, healthcare system	Health Human Development Index	Positive
71	McKinnon et al, 2016	2006-2012	Individual	Yes	Participants from 48 low- and middle-income countries	Maternal health service coverage	Neonatal mortality, health inequality	Positive
72	Maynard, 2016	1985-2005	Ecological	Yes	74 developing countries	Healthcare spending	Tuberculosis mortality	Positive
73	Miething et al, 2013	2000	Individual	Yes	19353 individuals from Sweden, East and West Germany	Welfare regimes	Self-rated health	Inconclusive
74	Minagawa, 2013	1990-2009	Ecological	Yes	23 Eastern European countries	Healthcare spending	Age-specific mortality, self-rated health	Positive

75	Moor et al, 2013	1981-1999	Ecological	Yes	47 European countries and regions	Welfare state generosity (Social Policy Indicators Database)	Life satisfaction	Positive
76	Muldoon et al, 2011	2001-2008	Ecological	No	136 United Nations countries	Healthcare spending	Infant, child and maternal mortality	Positive
77	Muntaner et al, 2017	2003-2010	Household-level ecological	Yes	27 European Union countries	Welfare regimes	Self-rated health, chronic conditions	Positive
78	Nelson and Fritzell, 2014	1990-2009	Ecological	Yes	18 countries	Minimum income benefits	Mortality (life expectancy and age-standardised death rates)	Positive
79	Novignon et al, 2012	1995-2010	Ecological	Yes	44 Sub-Saharan African countries	Healthcare spending	Life expectancy, death rate, infant mortality	Positive
80	Olafsdottir, 2007	1998	Individual	Yes	Participants from USA and Iceland	Welfare regimes, healthcare spending	Self-rated physical health, health inequality	Positive
81	Olsen and Dahl, 2007	2003	Individual	Yes	38,472 individuals from 21 European countries	Healthcare spending	Self-rated health	Positive
82	Palència et al, 2014	2010	Individual	Yes	23782 men and 28655 women from	Gender equality policies	Health inequality	Positive

					26 European countries			
83	Pickett and Wilkinson, 2007	1998-2006	Ecological	Yes	23 rich countries	Income equality	Child wellbeing	Positive
84	Pinzón-Flórez et al, 2015	2000-2010	Ecological	Yes	154 countries	Healthcare spending	Child and maternal mortality	Positive
85	Platts, 2015	2000-2007	Ecological	Yes	UK and Russia	Welfare regimes	Self-rated health	Inconclusive
86	Ploubidis et al, 2012	2006-2007	Individual	Yes	33528 people from 14 European countries	Welfare regimes, income equality	Health in later life	Positive
87	Popham et al, 2013	2006	Ecological	No	37 countries	Welfare regimes	Life expectancy	Positive
88	Reeves et al, 2014	1995-2012	Ecological	Yes	21 European countries	Healthcare spending, social spending, pension expenditure	Tuberculosis control	Positive
89	Richter et al, 2012	2006	Individual	Yes	141091 adolescents from 32 countries	Welfare regimes	Subjective health, health inequality	Positive
90	Rovny, 2011	1990-1999	Ecological	Yes	17 OECD countries	Family social policy	Fertility	Positive
91	Sacker et al, 2011	1995-2001	Ecological	Yes	Britain, Germany, Denmark and USA	Welfare regimes	Self-rated health	Positive
92	Sarti et al, 2013	2005	Individual	Yes	Participants from	Welfare regimes	Self-rated health, health inequality	Positive

					European countries			
93	Shim, 2015	1980-2010	Ecological	Yes	19 OECD countries	Social welfare expenditure	Infant mortality	Inconclusive
94	Stavrova et al, 2011	1999-2009	Individual	Yes	Participants from 28 OECD countries	Unemployment benefit policies	Wellbeing among the unemployed	Inconclusive
95	Stuckler et al, 2010	1980-2005	Ecological	Yes	Up to 18 European Union countries	Social welfare spending	All-cause mortality, cause-specific mortality	Positive
96	Van der Heuvel et al, 2013	1950-2000	Ecological	Yes	Sweden, Netherlands, Canada, USA, Cuba	Welfare regimes, Redistributive welfare policy	Infant mortality, low birth weight, under 5 mortality	Positive
97	Van der Wel et al, 2011	2005	Ecological	Yes	26 European countries	Income equality, spending on active labour market policies, benefit generosity, employment protection	Social inequality in sickness	Positive
98	Van Tuyckom, 2011	Up to 2008	Individual	Yes	24,846 people from 27 European Union countries	Healthcare spending	Physical activity	Positive

99	Vahid Shahidi et al, 2016	2012	Individual	Yes	22123 individuals from 23 countries with a welfare state	Welfare social policy	Self-rated health of the unemployed	Positive
100	Vöörmann and Helemäe, 2013	2010	Individual	Yes	5480 individuals from 4 Eastern European countries	Welfare regimes	Self-rated health, health inequalities	Inconclusive
101	Wu and Chiang,2007	2002	Ecological	Yes	Taiwan and 21 comparison industrialized countries	Income inequality, healthcare spending, public social expenditure	Child mortality, under-five mortality	Positive
102	York and Bell, 2014	2005	Ecological	Yes	Countries from the World Bank database with relevant data	Healthcare spending, gender equality policies	Self-reported life satisfaction (0-10)	Positive

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**Supplementary file 8. Table of study-level characteristics and results for political tradition**

Serial number	Authors, publication year	Years of study	Level of analysis	Assessment of economic factors	Setting	Political exposures	Population health outcomes	Result category
<b>Studies from the 2010 review</b>								
1	Borrell et al, 2009	2000	Individual	Yes	196,280 persons from 13 European countries	Political tradition classification	Self-rated health	Positive
2	Cereseto and Waitzkin, 1986	1983-1984	Ecological	Yes	123 countries, grouped by level of economic development	Political-economic system	Physical quality of life index	Positive
3	Chung and Muntaner, 2006	1960-1994	Ecological	Yes	19 OECD countries	Voter partisanship	Low birth weight, infant mortality, under-five mortality	Positive
4	Correa and Namkoong, 1992	1980	Ecological	Yes	116 countries with a population over 1 million	Political conditions; political tradition classification	Life expectancy, mortality	Positive

5	Espelt et al, 2008	2004	Individual	Yes	16,901 persons in 9 European countries	Political tradition classification	Self-reported health, long-term illness	Positive
6	Lena and London, 1993	1983	Ecological	Yes	Up to 84 peripheral and non-core nations	Political tradition classification	Infant mortality, child mortality, life expectancy	Positive
7	London and Williams, 1990	1965-1970	Ecological	Yes	Up to 110 periphery and semi-periphery nations	Political tradition classification	Infant mortality, life expectancy	Positive
8	Moon and Dixon, 1985	1970-1975	Ecological	Yes	116 nations	Political ideology (left, right, centre)	Physical Quality of Life Index: life expectancy, infant mortality	Positive
9	Muntaner et al, 2002	1989-1992	Ecological	Yes	16 wealthy countries	Working class power, voter partisanship, time in power by different parties	Life expectancy, self-rated health, low birth weight, and age- and cause-specific mortality	Positive
10	Navarro et al, 2003	1950-1998	Ecological	Yes	17 OECD countries	Working class power, voter partisanship	Infant mortality, life expectancy, health inequalities	Positive
11	Navarro and Shi, 2001	1960-1996	Ecological	Yes	18 OECD countries	Political tradition classification,	Infant mortality,	Positive



						working class power	health inequalities	
12	Navarro et al, 2006	1972-1996	Ecological	Yes	17 OECD countries	Voter partisanship, time in power by different parties	Infant mortality, life expectancy	Positive
<b>Studies from our update</b>								
13	Bosdriesz et al, 2015	1996-2010	Ecological	Yes	11 European Union countries	Percentage of seats held by social democratic, socialist and other left-wing parties	Tobacco Control Scale	Positive
14	Granados, 2010	1950-2000	Ecological	Yes	8 European countries	Political tradition classification	Life expectancy, mortality, tobacco consumption	Inconclusive
15	Huijts et al, 2010	2002-2006	Individual	Yes	29 European countries and Israel	Political tradition classification	Self-rated health	Positive
16	Lin et al, 2012	1970-2004	Ecological	Yes	119 less developed countries	Political regime score from Polity IV	Life expectancy	Positive
17	Mackenbach and McKee, 2013	1990-2009	Ecological	Yes	43 European countries	Left-wing participation in government (share of seats)	Success in implementing effective health policies	Inconclusive

Supplementary file 9. Table of study-level characteristics and results for democracy

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Assessment of economic factors	Political exposures	Population health outcomes	Result category
<b>Studies from 2010 review</b>								
1	Adeyi, 1997	1989-1993	Ecological	10 former Communist countries	No	Transition from Communism to capitalist democracy	Life expectancy, infant mortality, probability of dying between 15 and 65 years	Negative
2	Alvarez-Dardet, 2006	2000	Ecological	23 former Communist countries	Yes	Democratic deficit	Life expectancy, infant mortality, maternal mortality	Positive
3	Baum and Lake, 2003	1967-1997	Ecological	128 poor and non-poor countries	Yes	Democracy (Polity III)	Female life expectancy	Positive
4	Besley and Kudamatsu, 2006	1962-2002	Ecological	Up to 160 countries transitioning to democracy	Yes	Democracy (Polity IV)	Life expectancy, infant mortality	Positive

5	Franco, 2004	1998	Ecological	170 high, medium and low-income countries	Yes	Democracy (Freedom House)	Life expectancy, infant mortality, maternal mortality	Positive
6	Frey and Al-Roumi, 1999	1970-1990	Ecological	87 developed and less-developed countries	No	Democracy (political rights index and civil liberties)	Infant mortality, life expectancy	Positive
7	Gauri and Khaleghian, 2002	1989-1997	Ecological	208 low and middle-income countries	Yes	Democracy (Polity IV)	Vaccine coverage for diphtheria, tetanus, pertussis and measles	Negative
8	Ghobareh et al, 2004	2000	Ecological	179 countries in WHO	Yes	Democracy (Polity IV, Freedom House)	Health-adjusted life expectancy	Positive
9	Gizeles, 2009	1982-2000	Ecological	117 developed and developing countries	Yes	Democracy (Polity IV), state capacity	AIDS infection rate	Positive
10	Houweling et al, 2005	1999	Ecological	43 developing countries in Asia, Africa and Latin America	Yes	Democracy (political rights index)	Under five mortality rate	Inconclusive
11	Kick et al, 1990	1970-1985	Ecological	63 developing countries	Yes	Political democracy (political rights index)	Infant mortality	Positive

12	Klomp and de Haan, 2009	2000-2005	Ecological	171 countries with a population greater than 200,000	Yes	Decree of democracy, political stability	19 national health indicators	Positive
13	Lake and Baum, 2001	1970-1992	Ecological	Up to 110 developed countries	No	Democracy (Polity III)	Life expectancy, infant mortality	Positive
14	Lena and London; 1993	1983	Ecological	Up to 84 peripheral and non-core nations	Yes	Level of democracy	Infant mortality, child mortality, life expectancy	Positive
15	London and Williams; 1990	1965-1970	Ecological	Up to 110 periphery and semi-periphery nations	Yes	Level of political democracy	Infant mortality, life expectancy	Positive
16	Moon and Dixon, 1985	1970-1975	Ecological	116 nations	Yes	Level of political democracy, political stability	Physical Quality of Life Index: life expectancy, infant mortality	Positive
17	Navia and Zweifel, 2003	1990-1997	Ecological	188 democratic or dictatorial countries	Yes	Democracy (yes or no, based on presence of elections)	Fertility, child survival	Positive
18	Pillai and Gupta, 2006	2001	Ecological	129 developing countries	No	Democracy (human rights rating, political rights, and civil liberty, political terror scales)	10 global monitoring indicators of women's reproductive health	Positive
19	Ross, 2006	1970-2000	Ecological	168 countries with a population	Yes	Democracy (Polity IV), years of	Child mortality, infant mortality	Inconclusive

				greater than 200,000		democracy since 1900		
20	Rudra and Haggard, 2005	1975-1997	Ecological	57 less developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
21	Safaei, 2006	2003	Ecological	118 autocratic, incoherent and democratic countries	Yes	Democracy (Polity IV)	Life expectancy, mortality rate, child mortality rate	Positive
22	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Yes	Level of political democracy	Infant mortality	Positive
23	Shandra et al, 2010	1990-2005	Ecological	74 low income countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
24	Stroup, 2007	1980-2000	Ecological	Up to 105 countries	Yes	Political Rights Index (Freedom House)	Life expectancy, child mortality	Positive
25	Tsai, 2006	1975-1998	Ecological	119 developing countries	Yes	Democracy (majority rule and political contention)	Life expectancy, infant mortality under one year, infant mortality under five	Inconclusive
26	Wejnert, 2008	1970-2005	Ecological	58 core and peripheral countries	Yes	Democracy (Polity IV)	Maternal care, fertility rate, maternal mortality, women life expectancy	Inconclusive
27	Zweifel and Navia, 2000	1950-1990	Ecological	138 democratic or	Yes	Democracy (yes or no, defined)	Infant mortality	Positive

				dictatorial countries		by presence of elections)		
<b>Studies from our update</b>								
28	Batniji et al, 2014	1980-2011	Ecological	22 Arab countries	Yes	Extent of democracy	Mortality	Inconclusive
29	Burroway, 2016	1995-2008	Individual	52 developing countries	Yes	Democracy (Polity IV)	Child diarrhoea and malnutrition	Inconclusive
30	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Infant mortality	Positive
31	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Yes	Democracy (Polity IV)	Under-5 mortality	Inconclusive
32	Dietrich and Bernhard, 2015	1980s to 2012	Ecological	88 countries that were not OECD members in 1984	Yes	Democracy (Polity IV)	Infant mortality, basic nutrition	Inconclusive
33	Doherty and Kelly, 2010	Not stated	Individual	30,816 individuals from 17 European countries	Yes	Satisfaction with democracy on 0-10 scale	Self-reported happiness on 0-10 scales	Positive
34	Fumagalli et al, 2013	1990-2007	Ecological	47 developing countries	Yes	Democracy (Polity IV), political competition	BMI	Positive
35	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Yes	Democracy (Polity IV)	Life expectancy	Positive
36	Klenk et al, 2016	1950-2010	Ecological	64 countries from WHO	Yes	Democratization	Mortality	Positive

				mortality database				
37	Krueger et al, 2015	2002-2004	Individual	313,554 individuals from 67 countries	Yes	Democracy variable resulting from factor analysis of 7 indicators	Self-rated health	Positive
38	Kudamatsu, 2012	Up to 2004	Ecological	Sub-Saharan African countries	Yes	Democratization	Infant mortality	Positive
39	Mackenbach, 2013	1900-2008	Ecological	European countries	No	Democracy (binary)	Life expectancy	Positive
40	Mackenbach et al, 2013	1960-2008	Ecological	European countries	Yes	Democratization	Life expectancy	Positive
41	Mackenbach and McKee, 2013	1990-2009	Ecological	43 European countries	Yes	Democracy (+10 to -10)	Success in implementing effective health policies	Positive
42	Maynard, 2016	1985-2005	Ecological analysis	74 developing countries	Yes	Democracy (Freedom House)	Tuberculosis mortality	Positive
43	Minagawa, 2013	1990-2009	Ecological analysis	23 Eastern European countries	Yes	Freedom (Freedom House, Heritage Foundation)	Age-specific mortality, self-rated health	Positive
44	Witvliet et al, 2013	From 2000, end date not reported	Individual	72524 adults from 20 African countries	Yes	Transparency and freedom from corruption	Self-rated health	Positive

## Supplementary file 10. Table of study-level characteristics and results for globalisation

Serial number	Authors, publication year	Years of study	Level of analysis	Setting	Political exposures	Population health outcomes	Result category
1	Moore et al, 2006	2000	Ecological	128 countries divided into 6 world-system blocks	National trade, world-system role	Infant mortality	Positive
2	Shandra et al, 2004	1980-1997	Ecological	59 developing countries	Commodity concentration, multinational corporate penetration, international monetary fund conditionality	Infant mortality	Negative
3	Shen and Williamson, 2001	1965-1991	Ecological	82 less developed countries	Foreign trade, foreign investment, debt increase	Infant mortality	Negative
4	Shen and Williamson, 1997	1960-1991	Ecological	86 less developed countries	Foreign investment, debt dependency	Child survival probability	Negative



Studies from our update							
5	Bergh and Nilsson, 2010	1970-2005	Ecological	92 high-, middle- and low-income countries	KOF index	Life expectancy	Positive
6	Bozorgmehr and Sebastian, 2014	1990-2010	Ecological	22 high-burden tuberculosis countries	World Trade Organization membership status and duration, trade as a percentage of GDP, Economic Freedom of the World Index, KOF Index	Tuberculosis incidence	Inconclusive
7	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Infant mortality	Inconclusive
8	Chuang et al, 2013	1980-2009	Ecological	46 less-developed countries	Debt, foreign investment	Under-5 mortality	Inconclusive
9	Costa Font and Mas, 2016	1989-2005	Ecological	26 countries	KOF Index, CSGR Index	Obesity prevalence, caloric intake	Negative
10	Cross et al, 2009	Not stated	Individual	UK, Spain, Kenya and Uganda	Localised or globalised food supply system	Health-related quality of life	Positive
11	De Vogli et al, 2014	1980-2008	Ecological	127 low-, middle- and high-income countries	KOF Index	BMI	Negative

12	Estimé et al, 2014	2005-2010	Household-level ecological	Pacific nations	Food imports	Obesity	Negative
13	Fan and Faioso Le'au, 2015	Up to 2014	Ecological	Independent and American Samoa	Westernisation	Life expectancy, neonatal and child mortality, measles immunisation, diabetes mortality, cancer mortality, cerebrovascular disease mortality, heart disease mortality, pneumonia mortality, overweight and obesity	Negative
14	Gerring and Thacker, 2008	1960-1999	Ecological	All countries with available data	Open international trade policies, low-inflation macroeconomic environments, market-oriented property rights, GATT and WTO membership	Infant mortality	Positive
15	Goryakin et al, 2015	1991-2009	Individual	Up to 887,00 women in 56	KOF Index	Overweight and obesity	Negative

				low- and middle-income countries			
16	Hauck et al, 2012	1990-2012	Ecological	54 low-income studies	Terms of international trade, foreign investment, debt service and relief	Life expectancy	Inconclusive
17	Jolly et al, 2013	2002	Ecological	27 Latin American and Caribbean countries	Net food import	Obesity	Negative
18	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment	Water pollution	Negative
19	Jorgenson, 2009	1980-2000	Ecological	Less-developed countries	Foreign direct investment, export intensity	Water pollution	Negative
20	Levine and Rothman, 2006	Up to 1990	Ecological	Up to 130 countries	Economic openness	Infant mortality, under-5 mortality, anthropometric measures of child stunting	Inconclusive
21	Martens et al, 2010	Up to 2008	Ecological	Global, subject to data availability	Maastricht Globalization Index	Infant mortality, under-5 mortality, adult mortality	Positive
22	Maynard, 2015	2000-2010	Ecological	Up to 85 low- and middle-	IGTA membership and status,	Youth smoking rates (Global Youth Tobacco Survey)	Negative

				income countries	trade, imports, exports		
23	Maynard, 2016	1985-2005	Ecological	74 developing countries	Debt, trade dependency	Tuberculosis mortality	Inconclusive
24	Milner et al, 2011	1980-2006	Ecological	35 countries	A globalisation index developed for the study	Suicide rate	Negative
25	Mukherjee and Kriekhaus, 2011	1970-2007	Ecological	132 countries	Economic, political and social globalisation	Infant mortality, life expectancy, child mortality	Positive
26	Oberlander et al, 2017	1970-2011	Ecological	70 countries	Social globalisation, trade openness	Nutritional health	Inconclusive
27	Oster, 2010	Up to 2007	Ecological	UN countries with available data	Export activity	HIV	Negative
28	Owen and Wu, 2007	1960-1995	Ecological	219 countries	Openness to trade	Life expectancy, infant mortality	Positive



# PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7, but not meta-analysis



# PRISMA 2009 Checklist

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	7, but no meta-analysis
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Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	NA, no meta-analysis
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA, no meta-analysis
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7-8, Figure 2, Supplementary file 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICO, follow-up period) and provide the citations.	Tables 2-5
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8, Supplementary file 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Tables 2-5, no meta-analysis
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	NA, no meta-analysis
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	NA, no meta-analysis
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA, no meta-analysis
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	11-12



# PRISMA 2009 Checklist

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Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-15
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data), role of funders for the systematic review.	15

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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