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Health Inequalities in Infectious Diseases: A Systematic Overview of Reviews

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ABSTRACT:

Objectives: The aim of this systematic overview of reviews was to synthesise available evidence on inequalities in infectious disease based on three dimensions of inequalities; inclusion health groups, protected characteristics, and socioeconomic inequalities.

Methods: We searched Medline, Embase, Web of Science, Open Grey databases in November 2021. We included reviews published from the year 2000 which examined inequalities in the incidence, prevalence or consequences infectious diseases based on the dimensions of interest. Our search focused on tuberculosis, human immunodeficiency virus, sexually transmitted infections, Hepatitis C, vaccination, and antimicrobial resistance. However, we also included eligible reviews of any other infectious diseases. We appraised the quality of reviews using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist. We conducted a narrative data synthesis.

Results: We included 108 reviews in our synthesis covering all the dimensions of inequalities for most of the infectious disease topics of interest, but the quality and volume of review evidence and consistency of their findings varied. The existing literature reviews provides strong evidence that people of inclusion health groups and lower socio-economic status are consistently at higher risk of infectious diseases, AMR, and incomplete/delayed vaccination. In the protected characteristics dimension, ethnicity and sexual orientation are important factors contributing to inequalities across the various infectious disease topics included in this overview of reviews.

Conclusion: Our findings support the idea that developing targeted interventions for these high-risk groups rather than operating in infectious disease siloes might contribute to reducing infectious disease burden and its impact on health inequalities.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The protocol used for this systematic overview of reviews was pre-designed and registered in advance.
- We included 108 reviews covering various dimensions of inequalities across several key infectious diseases, providing a broad overview of inequalities in infectious diseases, especially those relevant to high-income countries.
- The gaps observed in some areas are not necessarily lack of evidence as some primary studies may not have been synthesised in reviews.

INTRODUCTION

The World Health Organisation regards experiencing the highest possible standard of health as a fundamental human right of every individual regardless of personal or social circumstances.[1] Nevertheless, avoidable inequalities exist in the prevalence of diseases and illnesses, general health status, and access to health care between various social groups.[2] A complex interaction between structural (for example, income and wealth distribution) and individual-level (for example, health behaviours and living conditions) determinants of health contributes to the increased vulnerability to poorer health among particular social groups.[3 4]

Infectious diseases pose a significant health burden with substantial health inequalities globally.[5] In the United Kingdom (UK), infectious diseases constitute 7% of deaths alongside 4% of lost life years.[6] The economic burden of infectious diseases in the UK is estimated to be around £30 billion per year.[6] Although infectious diseases impose substantial, negative health and economic consequences within populations, many infectious diseases are vaccine-preventable and avoidable through adequate control measures.[7] However, some groups remain under vaccinated[8] and other control measures may be difficult or impossible to implement for some, depending on circumstances.[9] Traditionally, policy makers often target infectious diseases individually, but it is known that specific groups are often at higher risks regardless of specific infectious diseases.[10-14] In efforts to tackle the observed disparities and to reduce the burden of infectious diseases, a strategic approach that tackles infectious diseases among high-risk groups is required.[15] To inform the development of needs-tailored public health policies and initiatives to achieve this goal, a comprehensive synthesis of evidence is required, highlighting the inequalities in infectious diseases according to varying personal and social characteristics.

This project was commissioned by Public Health England (PHE) to gain an overview of the available evidence on health inequalities relating to key infectious disease topics in the UK from a population perspective. PHE had specific interest in three dimensions of inequalities; inclusion health groups (socially excluded and vulnerable populations), protected characteristics, and socioeconomic inequalities. The infectious disease topics of interest were TB, HIV, STIs, HCV, vaccination, and antimicrobial resistance (AMR). Therefore, the aim of this systematic overview of reviews was to describe the existing literature, relevant to the UK, relating to inequalities in the prevalence/incidence of key infectious disease topics as specified by PHE.

METHODS

We conducted a systematic overview of reviews, pre-registered in PROSPERO, an international prospective register of systematic reviews (2020 CRD42020220203 https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020220203).

Patient and public involvement

This study had no direct patient or public engagement.

Search strategy and study selection

We developed a search strategy using synonyms and MeSH terms for inequalities, inclusion health groups, protected characteristics and socioeconomic factors which were combined with synonyms and MeSH terms for infectious diseases and synonyms for reviews (online supplemental file 1 appendix 1). We searched electronic databases from inception to November 2021; Medline, Embase, Web of Science and to identify relevant grey literature we searched Open Grey database (http://www.opengrey.eu/) and contacted experts in our network.

We exported citations into Endnote, removed duplicates and then exported them into a web-tool, Rayyan (https://www.rayyan.ai/) to facilitate citation screening. Articles were screened against pre-defined eligibility criteria (Table 1). Titles and abstracts were screened by a single reviewer and 10% were double screened by a second reviewer. Full texts of the potentially relevant articles were obtained and screened independently by two reviewers. Discrepancies were resolved by discussion.

Table 1: Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
Population: Review including studies from the UK population or other high-income countries. *Exposure*: • Socioeconomic status: this includes education, income, occupation, social class, and deprivation measured at individual or aggregated level. • Protected characteristics: age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation. • Inclusion health groups: vulnerable migrants, people experiencing homelessness and rough sleeping, people who engage in sex work, and Gypsy Roma and Traveller communities. *Outcome*: Inequalities relating to incidence, prevalence, and consequences of infectious diseases. Despite specific interest in TB, HIV, STIs, HCV, immunisation, and AMR, we included reviews relating to any infectious diseases, except reviews focused on COVID-19. *Types of reviews*: Any literature review which reports all the following (a) explicit objectives, (b) clear search strategies and (c) eligibility criteria. *Publication date*: Published from the year 2000 onwards. *Language*: No language restrictions.	We excluded reviews of qualitative studies and articles that are not systematic reviews as defined above. We excluded review protocols, but we searched the titles to check if the findings have been published. We excluded reviews on COVID-19, as advised by PHE, to avoid overlap with other reviews. We also excluded articles focussed on travel-related infections. Reviews which excluded the UK in their eligibility criteria or had not included populations relevant to the UK population (for example, papers where all results were from low-income countries) were excluded.

Data extraction

We designed and piloted a data extraction form in Microsoft Excel to extract information including: first author's last name, publication year, corresponding author's country, review methodology,

inclusion and exclusion criteria, infectious disease(s), population(s) included, dimension(s) of inequality, outcomes, conclusions, and strengths and limitations. Data extraction was performed by one reviewer and checked by another.

Quality assessment

Two reviewers independently assessed review quality using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist.[16] Disagreements were resolved by discussion.

Data synthesis

We tabulated the dimension of inequalities against the infectious disease topic to create an evidence matrix which was used to highlight areas where reviews already exist and where there may be gaps. Data were synthesised narratively based on the dimensions of inequalities.

RESULTS

Figure 1 shows the study selection. We retrieved 14713 citations from the electronic database searches and 11135 titles and abstracts were screened after removal of duplicates. One of the experts we contacted sent an article which highlighted UK-based evidence for several inclusion health groups, but did not fulfil other criteria for inclusion [17]. After examining 437 full text articles against the eligibility criteria, 108 were included in our synthesis.

Characteristics of included reviews are summarised in online supplemental file 2. Included reviews were published between 2005-2020 with 95% published after 2010. Fifty-eight (54%) included meta-analysis while the remaining studies used narrative/descriptive synthesis approaches. The reviews covered the three dimensions of inequalities across various infectious disease topics. A summarised version of the evidence matrix, showing how many reviews were identified for each cell is presented in Figure 2. The full evidence matrix is presented in online supplemental file 1 appendix 2.

Methodological quality of included reviews

Assessment of the methodological quality of each included review is presented in online supplemental file 1 appendix 3 and the proportion of included reviews that met each AMSTAR2 Criteria are presented in Figure 3. Many reviews fulfilled criteria such as including components of PICOS in their research questions and inclusion criteria (87%), performing duplicate study selection (55%), discussing heterogeneity (70%) and disclosure of conflicts of interest (83%). Justification of the exclusions for each excluded study were not presented and none reported funding sources for included studies. These two criteria are more common among Cochrane reviews of interventions and generally omitted from most published non-Cochrane reviews.

Evidence Relating to Inclusion Health Groups

Of the 108 included reviews, 43 reported on inclusion health groups. The evidence is generally consistent across these groups showing that people who belong to inclusion health groups are often at higher risk of infectious diseases, AMR and under-vaccination. For example, many reviews reported on general migrants (21),[14 18-41] and vulnerable migrants such as asylum seekers, refugees, and trafficked sex workers (7).[14 19 22 28 34 42 43] The reviews often reported that migrants have a higher risk of infectious diseases than the host population, though the magnitude of the association may vary for different geographical regions and different infectious diseases. For example, in the UK, 35% of people with chronic HCV are migrants despite being just 9% of the general population.[20] Other reviews showed that HIV and STIs were more prevalent among migrants.[31 32] The prevalence of HIV-TB co-infection was higher among immigrants compared with nationals in various countries including England and Wales although the immigrant group reported slightly better survival/lower mortality which authors commented may be due to the possible healthy migrant effect.[37] In another review, migrants were reported to be at higher risk of TB death.[26] Evidence from the UK showed an increasing number of migrants contracted HIV after they arrived in the UK between 2002-2011 suggesting that the higher prevalence of infectious diseases among migrants is not limited to pre-migration infection.[27] A meta-analysis showed that refugees were more likely to have chronic HBV compared to general migrants (OR 1.42 95% CI 1.01 to 1.99).[34] Some reviews reported no clear evidence that immigrant sex workers had higher risk of HIV and STIs compared with non-migrant sex workers.[40 41] However, one reported that trafficked sex workers were at a higher risk of HIV and STIs compared to female sex workers in general.[43] The prevalence of *Helicobacter pylori* among

immigrants varied according to continent of origin and the prevalence is higher among migrants compared with their children.[29]

Several reviews reported lower vaccination rates or delayed/incomplete vaccination among migrants and refugees in Europe.[25 28 30 36] However, the association may vary depending on the type of migrant group. For example, authors have reported that the uptake of vaccination among refugees was lower compared with asylum seekers.[19] In a meta-analysis, migrants had increased odds of MDR-TB incidence compared to non-migrants (OR 3.91, 95% CI 2.98–5.14).[38] In two other reviews, AMR carriage and infection were reported to be more prevalent among migrants in Europe.[21 42]

Three reviews examined Gypsy Roma and Traveller communities.[8 44 45] One showed that Roma and Irish Travellers in the UK were often under-vaccinated.[8] Another reported that Roma in Barcelona had a TB incidence 5.3 times greater than Spain's national TB incidence.[45] Higher prevalence of HIV has also been reported among Iranian, Roma, and Peruvian Indigenous populations compared to the general population.[44] We did not identify any reviews that examined the association between being from Gypsy Roma or Traveller communities and AMR.

We identified eight reviews which examined the association of homelessness with infectious diseases. They all reported higher risk of various infectious diseases or AMR among people experiencing homelessness compared to those who were not homeless.[26 35 46-51] We did not identify any reviews that examined the association between vaccination and homelessness. Eight reviews explored infectious disease risks among those engaging in sex work compared to the general population.[39 43 52-57] The evidence suggests higher risks of various infectious diseases, such as HBV, HDV, HIV and HPV, among sex workers.[39 52-54 56 57] A review which examined factors associated with HBV vaccination among MSM found mixed evidence relating to sexual risk-taking including involvement in sex-trade.[55] We did not identify any reviews exploring the association of being a sex worker with AMR.

Evidence Relating to Protected Characteristics

Seventy-four reviews reported on protected characteristics, however, our synthesis only found clear evidence for inequalities by ethnicity and sexual orientation. Inequalities in infectious diseases relating to race and ethnicity were explored in 19 reviews.[26 30 33 36 49 51 55 58-69] The available evidence suggests a higher rate of various infectious diseases such as TB, HIV, and STIs and under-

vaccination in people who belong to an ethnic minority group. For example, a meta-analysis found that recent transmission of TB was associated with being of ethnic minority (OR 3.03, 95% CI 2.21-4.16).[49] A meta-analysis indicated that on average young Black women were less likely to initiate HPV vaccination than young White women (combined OR: 0.89, 95% CI: 0.82–0.97).[61] In a meta-analysis of studies from Europe, children from parents of ethnic minorities (compared to the majority) were less likely to be vaccinated for measles, mumps and rubella (OR 0.89, CI 0.86–0.93 in a fixed effect model).[67] However, the effect disappeared in the random effects model (OR 1.03, 95% CI 0.79–1.34), probably due to heterogeneity between studies.[67] Seasonal influenza vaccine uptake among older people was associated with being White (combined OR 1.30, 95% CI 1.14–1.49).[30] Only one review on race and AMR was identified and it reported that people from some Black ethnic groups in the USA and Europe, and Aboriginal ethnic groups living in Canada and Australia are less likely to have AMR-Neisseria gonorrhoea (AMR-NG) than the White majority population.[58] Ten included reviews examined the association of sexual orientation with infectious disease topics, mostly focused on MSM.[24 51 53 54 56 58 70-73] In a review, MSM were found to be at risk of acquiring HIV post-migration.[71] However, in a network meta-analysis the highest risk of advanced HIV disease among people living with HIV was found in those with heterosexual contact compared with MSM as well as injection drug use.[70] Some reviews examined disparities of HIV in MSM but did not compare risk between MSM and other populations.[33 64] Other infectious diseases such as HBV, HCV and HDV are also higher in MSM than in the general population.[24 54 72] AMR-NG was reported to be more common among MSM compared with heterosexual men in England and Wales (OR 5.47, 95% CI 3.99–7.48).[58] We did not identify any reviews which assessed the association of sexual orientation with vaccination.

From the reviews identified, inequalities in infectious disease topics based on other protected characteristics, such as age and sex are mixed, and for other protected characteristics the synthesised evidence is scant and inconclusive. The association of infectious diseases with age has been reported in various reviews.[21 22 30 36 49 51 55-60 62 63 65 67 69 74-103]. However, the association varied. Infectious diseases such as HIV, STIs, and TB have been reported to be associated with younger age in some reviews,[49 58 76 79 88] while HCV and Hepatitis E (HEV) were associated with older age.[22 82 95] Seasonal influenza vaccine uptake was higher in older age groups.[30 65 69 100] A review reported that many studies found an association between HBV vaccination and younger age.[55] Suboptimal vaccination compliance was associated with mother's younger age.[36 63] On the other hand, another review reported that HPV vaccine intention and initiation were positively associated with younger parent's age.[62] Four included reviews examined the association of AMR with age.[21 58 102 103] In one review,

MDR TB was associated with being younger than 65 years (pooled OR 2.53, 95% CI 1.74 – 4.83)[21] while another review reported that AMR-NG was more common in those 25 years or older than in younger adults.[58] Overall, age group classifications often varied between reviews which made it difficult to identify a clear pattern.

Twenty-eight reviews explored inequalities based on sex,[21 39 40 46 48 49 51 53 58 65 67 74 78 82 84 85 87 89 90 93 96 100 104-109] but the findings varied depending on specific infectious disease. For example, TB transmission was reported to be associated with being male[48 49] while the prevalence of chlamydia was slightly higher in females than in males.[78] Other reviews reported that seasonal influenza vaccine uptake is often higher in elderly men compared to elderly women, but the differences are not statistically significant in multivariate regression analysis.[65] A meta-analysis of studies from Europe showed that male patients were more likely to have MDR TB (OR 1.38, 95% CI 1.16 – 1.65).[21]

Six reviews described the influence of being married or in civil partnerships on vaccination.[25 30 65 67 69 96] Generally, those who were married had higher vaccination uptake although some studies found no association or higher uptake among those who were never married. No included review examined inequalities in infectious disease prevalence or AMR based on marital status. Only four included reviews reported the prevalence of infectious diseases (HBV, HCV, latent or acute toxoplasma infection) in pregnant women compared with the general population and the findings were mixed[22 24 56 110] We found no reviews that examined the association of pregnancy with vaccination uptake or risk of AMR.

Six reviews reported on inequalities relating to religion and meningococcal disease, as well as vaccination.[8 25 59 61 63 90] A recent meta-analysis of two studies showed that religious events attendance was significantly associated with a decreased risk of invasive meningococcal disease (OR 0.47 (95% CI, 0.28–0.79, p 0.0004).[90] Meta-analyses showed no strong evidence between various vaccination and religion including frequency of attendance at a place of worship.[25 61] Jewish Orthodox people in the UK and Belgium and Orthodox Protestants in the Netherlands were described as being under-vaccinated.[8] We did not identify any studies on the association of religion with the risk of any of the key infectious diseases or AMR.

Two reviews examined the association between gender reassignment and the risk of infectious diseases (HIV and HBV).[53 56] The prevalence of HIV was significantly higher among transgender female sex workers compared with biologically female sex workers (RR = 4.02, 95% CI 1.60 -

10.11).[53] However, in another review, transgender persons had lower prevalence of HBV compared to other groups such as sex workers, injection drug users, MSM and pregnant women.[56] We did not identify any reviews examining the association of gender reassignment with other infectious diseases of interest, vaccination or AMR.

We did not identify any review that reported the association of disability with our key infectious diseases topics. However, we identified one review which reported that disability was associated with a higher incidence of listeriosis.[111]

Evidence Relating to Socioeconomic Inequalities

Fifty reviews explored socioeconomic status. The evidence consistently shows that those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, or poor living situations are at higher risk of infectious diseases, AMR and lower vaccine uptake. For example, many reviews highlighted that low income, poverty and unemployment were associated with various infectious diseases including, HIV, STIs, TB, HBV and HCV among others.[26 27 35 39 64 75 82 84 85 90 94 111-114]

Level of education, income or occupation are often associated with vaccination uptake. [19 25 30 36 55 60 61 63 65 67 69 100 115-119] Reviews have also reported an association of MDR-TB and AMR with lower level of income or education.[47 120 121] Many reviews examined the association of infectious disease topics of interest with areal level socioeconomic status,[25 30 36 59 60 63 65 69 100 116 119 122] deprivation,[61 65 66 75 78 111 119 123] or living situation.[30 36 44 47 49 51 60 65 67 69 84 85 87 90 94 96 101 105 113 121] One meta-analysis showed significant association between neighbourhood deprivation and chlamydia infection (pooled OR 1.76, 95 % CI: 1.14–1.49). [78] In another meta-analysis, TB was associated with residing in an urban area (OR 1.52, 95%CI 1.35–1.72).[49] Those living in overcrowded or poor housing conditions had higher risk of TB.[44] AIDS mortality is significantly associated with lower socioeconomic status.[122] Group A Streptococcal infection, gastrointestinal infections and meningococcal disease were associated with poor living conditions.[75 84 85 90 111 113]

Two included reviews explored association between AMR and areal level deprivation.[47 121] Although the evidence is scant, the findings suggests that those living in deprived areas or poor living conditions may be at higher risk of AMR.

DISCUSSION

This overview of reviews provides a broad synopsis of three dimensions of inequalities (inclusion health groups, protected characteristics, and socio-economic inequalities) across several infectious disease topics. We synthesised the existing evidence based on the dimension of inequalities. Of the three dimensions of inequalities assessed, the evidence relating to people in the inclusion health groups is the most consistent although the volume of evidence identified for each group varied. Most of the reviews identified under this dimension were on migration status, with higher prevalence of infectious diseases, AMR and lower vaccine uptake among migrants compared to non-migrants. Vulnerable migrants (such as refugees, asylum-seekers, and trafficked persons) are at higher risk when compared to general migrants and the size of inequalities varied depending on the country of origin. Although few reviews were identified for the remaining inclusion health groups, the evidence suggests that homelessness is associated with risk of infectious diseases and AMR; Gypsy Roma/ Traveller communities are often under vaccinated and are also at greater risk of infectious diseases; and people who engage in sex work are at greater risk of some infectious diseases.

There is a plethora of evidence from reviews showing higher prevalence of infectious diseases and under-vaccination among minority ethnic groups. We also identified several reviews suggesting higher prevalence of infectious diseases and AMR among MSM. These suggest that ethnicity and sexual orientation are important protected characteristics and targeting or tailoring interventions for such groups may be beneficial to reduce inequalities in infectious diseases.

Many reviews examined the association with age and sex, however, the identified associations varied depending on the specific infectious disease or type of vaccination. In addition, for most of the reviews, the comparator age groups were often unclear. Therefore, we are not able to identify specific age groups with higher risk across various infectious disease topics. Other factors besides equity issues may contribute significantly to associations with age. Also, vaccinations are often offered at specific ages so it is expected that uptake would be higher among those groups that are targeted. However, it is important to highlight that we found evidence suggesting that childhood vaccination compliance is lower for those with younger mothers/parents [36 59 63]. Based on this review, age and sex may be important for some infectious diseases but the group at higher risk may vary across diseases.

Reviews exploring marital status focused on vaccination and generally reported higher vaccination uptake among those who are married. It is not possible to draw a conclusion regarding the association of religion, disability, transgenderism, and pregnancy with infectious diseases based on the findings of this review as the synthesised evidence is scant and often inconsistent. More evidence is therefore needed to be able to establish the presence and direction of any associations of these factors with infectious diseases.

Several reviews provide compelling evidence of higher risk of infectious diseases, AMR, and lower vaccination uptake among those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, and poor living situations. Although most of the evidence in this dimension is on vaccination, those of lower socioeconomic groups are often at higher risk from infectious diseases and should be targeted for intervention.

Strengths and limitations

The protocol used to guide the conduct of this review was designed a priori. We conducted a comprehensive literature search of four electronic databases with no language limits and searched for grey literature. Data extraction was checked by a second reviewer to improve accuracy and quality assessments were performed by two reviewers independently. Due to the timeframe required for the work, we could not complete all the initial titles and abstract screening in duplicate, however, full texts of potentially relevant reviews were independently screened by two reviewers. Despite our best efforts, we acknowledge that some relevant reviews may have been missed. The lack of synthesised evidence observed in some areas does not necessarily mean a lack of evidence. There may be primary studies in those areas which have not been synthesised in reviews and meta-analyses. Some underserved populations (such as people who inject drugs and prisoners) are not covered in this overview as these are beyond the scope of the work. Notwithstanding, we believe this provides a useful summary of available evidence relating to inequalities in infectious diseases relevant to high-income countries and highlights areas where evidence may be lacking or minimal.

The quality of the included reviews varied significantly as some were not necessarily systematic reviews for which AMSTAR2 is designed. Heterogeneity between studies was a limitation reported in many of the included reviews and so pooled estimates should be interpreted with caution.

Conclusion

Overall, we provide strong evidence of groups consistently at higher risk of infectious diseases, AMR and under-vaccination. Developing targeted interventions for high-risk groups rather than focusing on individual infections could contribute significantly to reducing infectious disease burden. This reviews also highlights important evidence gaps that should be considered when commissioning future evidence syntheses or primary studies.

Figure Legends

Figure 1: PRISMA flow diagram for study selection.

Figure 2: Matrix showing the number of reviews identified for each dimension of inequality and infectious disease topic. Colour ranges from red which indicates where no review was identified, up to green for a maximum number of reviews (15).

Figure 3: AMSTAR2 results for included reviews

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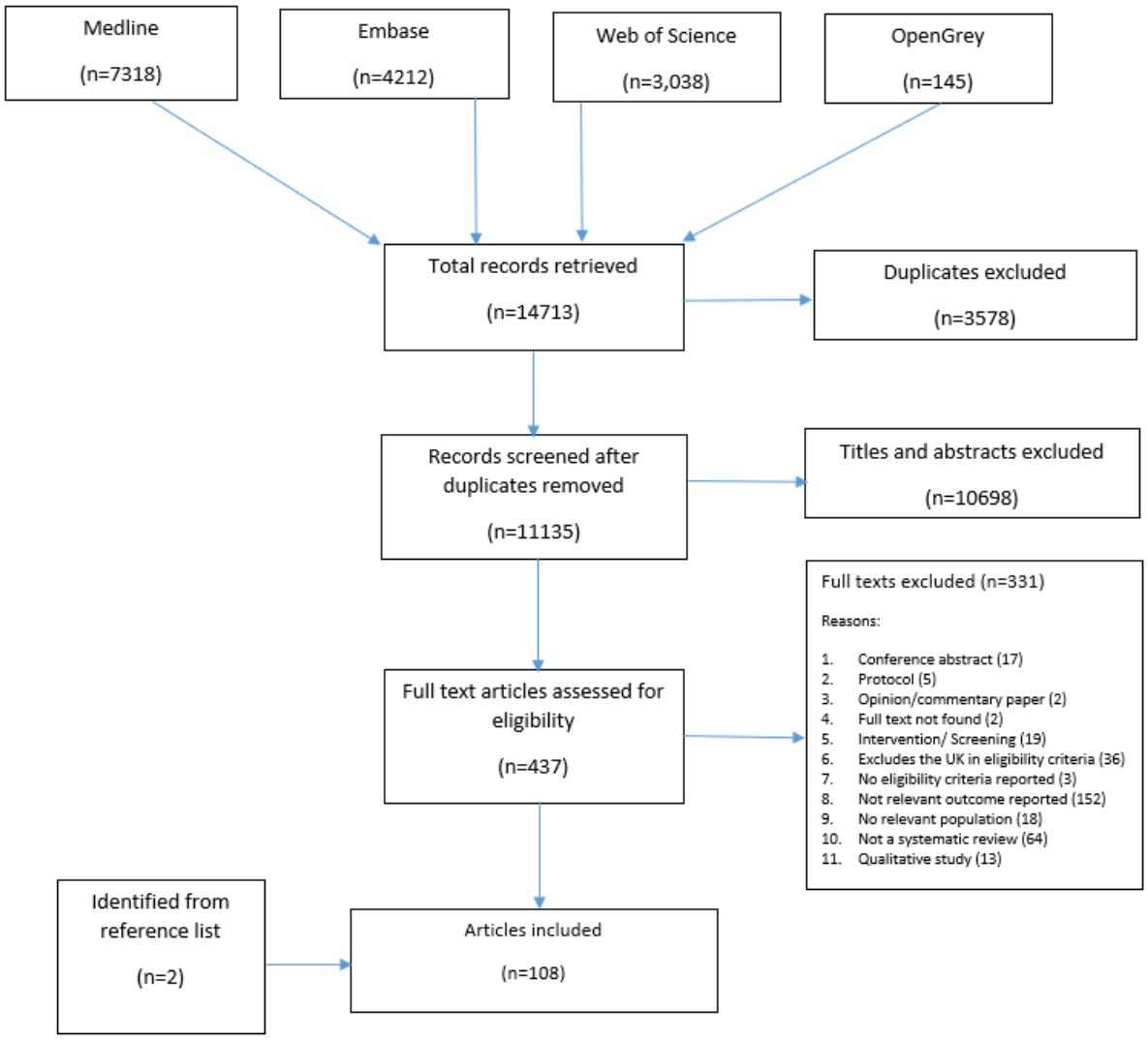
Figure 1: PRISMA flow diagram for study selection



Dimension of inequalities	Variables	Tuberculosis	HIV	STI	Hepatitis C	Vaccination	AMR/multi-drug resistance	Others
Protected characteristics	Age	2	3	4	3	13	4	19
	Sex	2	7	4	3	5	2	11
	Marriage and civil partnership	0	0	0	0	6	0	0
	Pregnancy and maternity	0	0	0	2	0	0	3
	Race (or ethnicity)	3	2	1	0	11	1	1
	Religion or belief	0	0	0	0	5	0	1
	Sexual orientation	0	4	0	2	0	1	4
	Gender reassignment	0	1	0	0	0	0	1
	Disability	0	0	0	0	0	0	1
Inclusion Health Groups	Vulnerable migrants	0	1	1	2	2	1	3
	General migrants	5	8	4	5	5	2	6
	People experiencing homelessness and rough sleeping	3	2	0	2	0	1	3
	People who engage in sex work	0	4	2	0	1	0	2
	Gypsy Roma/ Traveller communities/Indigenous people	2	0	0	0	1	0	0
Socioeconomic inequalities	Level of education/income	1	4	1	0	18	3	9
	Employment/occupation	1	2	2	1	10	0	5
	Social class/Area level socioeconomic status	0	1	0	0	11	0	1
	Deprivation	1	0	1	0	4	0	2
	Residence/living situation (e.g living in a home environment with moisture damage, house tenure)	2	0	0	0	7	2	10

APPENDIX 1: SEARCH STRATEGY

Searched Ovid MEDLINE(R) ALL 1946 to November 23, 2021 on 24/11/2021

Search terms for systematic reviews found at http://extranet.santecom.qc.ca/wiki/!biblio3s/doku.php?id=concepts:revues-de-la-litterature-et-meta-analyses

	Search	Result
1	inequality.mp. or Socioeconomic Factors/	183584
2	inequalities.mp.	24364
3	protected characteristics.mp.	10
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12922
6	migrant$.mp. or "Transients and Migrants"/	26370
7	Sex Work/ or Sex Workers/ or sex work*.mp.	10781
8	Gypsy roma.mp.	18
9	Human immunodeficiency virus/	21059
10	acquired immune deficiency syndrome/	77137
11	infection/	40269
12	tuberculosis/	108757
13	parasitosis/	0
14	hepatitis/	22837
15	Vaccination/	90391
16	Immunization/	52361
17	Communicable Disease/	31146
18	infectious disease.ti,ab,kw.	39865
19	infection.ti,ab,kw.	1211775
20	tuberculosis.ti,ab,kw.	203159
21	hiv.ti,ab,kw.	331192
22	aids.ti,ab,kw.	156336
23	hepatitis.ti,ab,kw.	228655
24	"immuni*".ti,ab,kw.	342218
25	"vaccin*".ti,ab,kw.	354100
26	Communicable disease.ti,ab,kw.	4291

27 Parasitic disease.ti,ab,kw. 3780

28 infectious disease$.mp. or Communicable Diseases/ 145081

29 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or exp Review Literature as Topic/ or exp Review/ or Meta-Analysis as Topic/ or Meta-Analysis/ or "systematic review"/ 3165549

30 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 240954

31 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 2364192

32 30 and 31 32588

33 29 and 32 2822

34 social class.mp. or social class/ 48149

35 poverty.mp. or poverty/ 65773

36 income.mp. or income/ 162454

37 educational status.mp. or educational status/ 58473

38 economic status.mp. or economic status/ 15731

39 travellers.mp. 4716

40 rough sleeping.mp. 23

41 homelessness/ 8802

42 30 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 476015

43 sexually transmitted disease/ or STI.mp. 32214

44 AMR.mp. 5408

45 antimicrobial resistance.mp. or antibiotic resistance/ 85277

46 anti-microbial resistance.mp. 196

47 31 or 43 or 44 or 45 or 46 2444675

48 42 and 47 62612

49 29 and 48 8144

50 limit 49 to yr="2000 -Current" 7318

Embase Classic+Embase 1947 to 2021 November 23 searched on 24/11/2021

Searches		Results
1	inequality.mp. or Socioeconomic Factors/	159438
2	inequalities.mp.	26580
3	protected characteristics.mp.	18
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12270
6	migrant$.mp. or "Transients and Migrants"/	59556
7	Sex Work/ or Sex Workers/ or sex work*.mp.	14114
8	Gypsy roma.mp.	22
9	Human immunodeficiency virus/	125500
10	acquired immune deficiency syndrome/	136979
11	infection/	402825
12	tuberculosis/	162052
13	parasitosis/	24410
14	hepatitis/	67370
15	Vaccination/	179733
16	Immunization/	117275
17	Communicable Disease/	34287
18	infectious disease.ti,ab,kw.	50469
19	infection.ti,ab,kw.	1631799
20	tuberculosis.ti,ab,kw.	245043
21	hiv.ti,ab,kw.	426227
22	aids.ti,ab,kw.	190986
23	hepatitis.ti,ab,kw.	334114
24	"immuni*".ti,ab,kw.	440252
25	"vaccin*".ti,ab,kw.	438145
26	Communicable disease.ti,ab,kw.	5111
27	Parasitic disease.ti,ab,kw.	4822

28 infectious disease$.mp. or Communicable Diseases/ 150812

29 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 254578

30 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 3242281

31 29 and 30 37750

32 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or systematic review/ or "systematic review (topic)"/ or meta analysis/ or "meta analysis (topic)"/ 713296

33 31 and 32 1343

34 social class.mp. or social class/ 40328

35 poverty.mp. or poverty/ 64722

36 income.mp. or income/ 221004

37 educational status.mp. or educational status/ 90042

38 economic status.mp. or economic status/ 23383

39 travellers.mp. 6111

40 rough sleeping.mp. 30

41 homelessness/ 12187

42 29 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 588825

43 sexually transmitted disease/ or STI.mp. 62753

44 AMR.mp. 9242

45 antimicrobial resistance.mp. or antibiotic resistance/ 188533

46 anti-microbial resistance.mp. 289

47 30 or 43 or 44 or 45 or 46 3400990

48 32 and 42 and 47 4243

49 limit 48 to yr="2000 -Current" 4212

Searched Web of Science on 24/11/2021 (Web of Science Core Collection)

Inequalities related terms searched in topics and combined with title search for infectious diseases. This makes the search capture inequality related articles where inequalities are not necessarily mentioned in the title. Had to limit the infectious diseases to titles in order to focus on relevant papers.

#1	(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") (Topic) and Review (Document Type)	53,359
#2	("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance") (Title) and Review (Document Type)	64,026
#3	#1 AND #2 Timespan: 2000-01-01 to 2021-11-24 (Publication Date)	3,038

Searched Opengrey on 24112021

(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") AND ("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance")

145 articles retrieved with the search

APPENDIX 2: EVIDENCE MATRIX

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Protected characteristics	Age	Nava-Aguilera, 2009 (1) Schepisi, 2018 (13)	Ghiasvand, 2020 (0) Behera, 2018 (unclear) Sultana, 2021 (0)	Crichton,2015 (3) Denning, 2018 (2) Wu, 2021 (0) Mirzadeh, 2021 (2)	Colledge, 2020 (16) Greenaway, 2015 (0) Dugan, 2021 (unclear)	Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Hermann, 2019 (15) Tauli, 2016 (0) Malerba, 2015 (1) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3) Song, 2021 (at least 2) Sultana, 2021 (0)	Leumi, 2020 (unclear) Macina, 2021 (7) Lafond, 2021 (unclear) Dong, 2020 (unclear) Bonten, 2020 (21) Ly, 2021 (4) Li, 2020 (7) Rostami, 2019a (2) Rostami, 2019b (3) Rostami, 2021 (2) Badri, 2021 (4) Schierhout, 2020 (0) Adams, 2018 (unclear, at least 1) Zamani, 2018 (2) Lindsay, 2015 (4) Possenti, 2016 (0) Richterman, 2018 (0) Strifler, 2015 (6) Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sex	Beijer, 2012 (4) Nava-Aguilera, 2009 (1)	Beijer, 2012 (0) Operario, 2008 (0) Van Gerwen, 2020 (0) Leung, 2019 (unclear) Eilami, 2019 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)	Crichton,2015 (3) Van Gerwen, 2020 (0) Whelan, 2021 (1) McBride, 2021 (unclear)	Beijer, 2012 (1) Colledge, 2020 (16) Leung, 2019 (unclear)	Pulver, 2016 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3)	Leung, 2019 (unclear) Aldridge,2018 (unclear, at least 1) Ly, 2021 (4) Spyromitrou-Xioufi, 2020 (0) Possenti, 2016 (0) Richterman, 2018 (0) Rostami, 2021 (2) Schierhout, 2020 (0) Fauroux, 2017 (8) Rostami, 2019a (2) Badri, 2021 (4) Li, 2020 (7)
	Marriage and civil partnership					Okoli, 2020 (1) Nagata, 2013 (unclear, at least 1) Jain, 2017 (5) Tabacchi, 2016 (19) Okoli, 2021 (2) Faria, 2021 (0)		
	Pregnancy and maternity				Hahne, 2013 (9) Greenaway, 2015 (0)			Hahne, 2013 (9) Leumi, 2020 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
								Nourollahpour Shiadeh, 2020 (0)
	Race (or ethnicity)	Nava-Aguilera, 2009 (1) Offer, 2015 (18)[α] Kawatsu, 2014 (1)	Millett, 2012 (13) Prost, 2007 (unclear, at least 3)	Wayal, 2018 (15)[α]		Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2)	Abraha, 2018 (unclear, at least 1)	Ly, 2021 (4)
	Religion or belief					Fisher, 2013 (1) Jain, 2017 (5) Fournet, 2018 (unclear, at least 1) Malerba, 2015 (0) Falagas, 2008 (1)		Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sexual orientation		Fakoya, 2015 (9) Oldenburg, 2014 (1) Operario, 2008 (0) Chen, 2019 (1)		Hahne, 2013 (9) Jin, 2020 (at least 14)		Abraha, 2018 (unclear, at least 1)	Hahne, 2013 (9) Leumi, 2020 (unclear) Ly, 2021 (4) Stockdale, 2020 (unclear, at least 1)
	Gender reassignment		Operario, 2008 (0)					Leumi, 2020 (unclear)
	Disability							Newman, 2015 (3)
Inclusion Health Groups	Vulnerable migrants		Yu, 2020 (0)	Yu, 2020 (0)	Chernet,2017 (unclear) Greenaway, 2015 (0)	Mipatrini, 2017 (7) De Vito, 2017 (4)	Nellums, 2018 (0)	Rossi, 2012 (2) Chernet,2017 (unclear) Mipatrini, 2017 (7) Chernet,2017 (unclear)
	General migrants	Tavares, 2017 (2)[β] Chan, 2017 (1) Kawatsu, 2014 (1) Sandgren, 2014(1) Jackson, 2021 (3)	Tavares, 2017 (2)[β] Platt, 2013a (1) Platt, 2013b (5) Prost, 2007 (unclear, at least 3) Kentikelenis, 2015	Platt, 2011a (1) Platt, 2013b (5) Kentikelenis, 2015 (unclear) McBride, 2021 (unclear)	Hahne, 2013 (9) Chernet,2017 (unclear) Greenaway, 2015 (0) Kentikelenis, 2015 (unclear) Falla, 2018 (1)	Okoli, 2020 (1) Mipatrini, 2017 (7) De Vito, 2017 (4) Jain, 2017 (5) Tauli, 2016 (0)	Faustini, 2005 (3) Jackson, 2021 (3)	Rossi, 2012 (2) Hahne, 2013 (9) Chernet,2017 (unclear) Kentikelenis, 2015 (unclear) Suhrcke, 2011 (unclear) Morais, 2017 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
			(unclear) Pega 2021 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)					
	People experiencing homelessness and rough sleeping	Beijer, 2012 (4) Nava-Aguilera, 2009 (1) Kawatsu, 2014 (1)	Beijer, 2012 (0) Arum, 2021 (6)		Beijer, 2012 (1) Arum, 2021 (6)		Alividza, 2018 (unclear, at least 2)	Aldridge,2018 (unclear, at least 1) Suhrcke, 2011 (unclear) Ly, 2021 (4)
	People who engage in sex work		Yu, 2020 (0) Oldenburg, 2015 (0) Operario, 2008 (0) Kabapy, 2020 (unclear)	Yu, 2020 (0) Wu, 2021 (0)		Vet, 2015 (0)		Leumi, 2020 (unclear) Stockdale, 2020 (unclear, at least 1)
	Gypsy Roma/ Traveller communities /Indigenous people	Tollefson, 2013 (0) Cormier 2019 (0)				Fournet, 2018 (unclear, at least 1)		

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Socioeconomic inequalities	Level of education/income	Kawatsu, 2014 (1)	Rodrigo, 2010 (unclear) Ghiasvand, 2020 (0) Millett, 2012 (13) Kabapy, 2020 (unclear)	Crichton,2015 (3)		Vet, 2015 (0) Larson, 2014 (at least one) Okoli, 2020 (1) Arat, 2019 (2) Fernández, 2015 (8) Forshaw, 2017 (0) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Jain, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Di Gennaro, 2017 (1) Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ding, 2020 (0) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Spyromitrou-Xioufi, 2020 (0) Dong, 2020 (unclear) Suhrcke, 2011 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Employment /occupation	Kawatsu, 2014 (1)	Kentikelenis, 2015 (unclear) Millett, 2012 (13)	Crichton,2015 (3) Kentikelenis, 2015 (unclear)	Kentikelenis, 2015 (unclear)	Arat, 2019 (2) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Faria, 2021 (0)		Kentikelenis, 2015 (unclear) Li, 2020 (7) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Social class/Area level socioeconomic status		Salgado-Barreira, 2014 (1)[v]			Arat, 2019 (2) Okoli, 2020 (1) Fernández, 2015 (8) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) Jain, 2017 (5) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021		Salgado-Barreira, 2014 (1)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Deprivation	Offer, 2015 (18)[α]		Crichton,2015 (3)		Vukovic, 2019 (6) Fisher, 2013 (1) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1)		Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Residence/living situation (e.g urban vs rural, living in a home environment with moisture damage, house tenure)	Nava-Aguilera, 2009 (1) Cormier 2019 (0)				Okoli, 2020 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Tauli, 2016 (0) Okoli, 2021 (2) Faria, 2021 (0)	Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ly, 2021 (4) Dong, 2020 (unclear) Spyromitrou-Xioufi, 2020 (0) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Coffey, 2018 (unclear) Rostami, 2021 (2) Fauroux, 2017 (8) Rostami, 2019a (2)

APPENDIX 3: QUALITY ASSESSMENT OF INDIVIDUAL REVIEWS USING ASSESSMENT OF MULTIPLE SYSTEMATIC REVIEWS VERSION 2 (AMSTAR2) CHECKLIST

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tavares, 2017	Y	N	Y	P Y	N	N	N	Y	N	N	N M C	N M C	Y	N	N M C	Y
Tollefson, 2013	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Vet, 2015	Y	N	N	P Y	N	N	N	P Y	Y	N	N M C	N M C	Y	N	N M C	Y
Beijer 2012	Y	N	N	P Y	N	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Behera, 2018	Y	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Vukovic, 2019	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	N	N M C	Y
Platt, 2013a	Y	N	N	P Y	N	N	N	Y	P Y	N	N M C	N M C	Y	Y	N M C	Y
Platt, 2013b	Y	N	N	Y	N	N	N	N	P Y	N	N M C	N M C	Y	Y	N M C	Y
Prost, 2007	Y	N	N	Y	N	N	N	P Y	N	N	N M C	N M C	N	N	N M C	N
Pulver, 2016	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Rossi, 2012	Y	P Y	N	Y	Y	Y	N	P Y	N	N	Y	N	N	Y	N	Y
Rostami, 2019	Y	Y	N	P Y	N	Y	N	P Y	N	N	Y	N	Y	Y	Y	Y
Di Gennaro, 2017	Y	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Fauroux, 2017	Y	P Y	N	Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hahne, 2013	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Jin, 20	Y	Y	N	P Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Larson, 2014	N	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Nava-Aguilera, 2009	N	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Okoli, 2020	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Schierhout, 2020	N	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Wayal, 2018	Y	N	N	Y	N	Y	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Yu, 2020	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Gorjana, 2017	Y	N	N	P Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Rodrigo, 2010	Y	N	N	P Y	N	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Rostami, 2019b	Y	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Coffey, 2018	Y	N	N	P Y	N	N	N	N	Y	N	N M C	N M C	N	Y	N M C	N
Ghiasvand, 2020	Y	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Cormier 2019	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Abraha, 2018	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	Y	N M C	N

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Adams, 2018	Y	Y	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	N
Aldridge, 2018	N	N	N	N	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Alividza, 2018	Y	N	N	P Y	Y	N	N	Y	Y	N	N M C	N M C	Y	N	N M C	Y
Arat, 2019	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	Y
Chan, 2017	Y	N	N	N	Y	Y	N	N	Y	N	Y	Y	Y	Y	N	Y
Chernet,2017	N	N	N	P Y	Y	N	N	N	N	N	N	N	N	Y	N	Y
Colledge, 2020	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Crichton,2015	Y	P Y	Y	P Y	N	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Eilami, 2019	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	Y	Y
Fakoya, 2015	Y	P Y	N	P Y	Y	N	N	P Y	N	N	N M C	N M C	Y	N	N M C	Y
Faustini, 2005	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y
Fernández, 2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	Y	Y	N	N M C	Y
Forshaw, 2017	Y	N	N	P Y	Y	N	N	Y	P Y	N	Y	N	Y	Y	Y	Y
Fisher, 2013	Y	N	N	P Y	N	N	N	Y	N	N	Y	Y	Y	Y	N	Y
Greenaway, 2015	Y	N	N	P Y	N	N	N	N	Y	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sandgren, 2014.	Y	N	N	P Y	Y	Y	N	Y	N	N	Y	N	N	Y	N	N
Schepisi, 2018.	Y	Y	N	P Y	Y	N	N	N	Y	N	Y	N	N	Y	N	Y
Suhrcke, 2011.	Y	N	N	Y	Y	Y	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Stockdale, 2020.	Y	Y	N	Y	Y	Y	N	N	P Y	N	Y	Y	Y	Y	N	Y
Tabacchi	Y	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y	Y	Y
Strifler	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	Y	N M C	N
Nagata, 2011	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Nellums, 2018	Y	Y	N	P Y	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	N	Y
Newman, 2015	Y	Y	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Oldenburg, 2014	Y	P Y	N	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y
Oldenburg_2015	Y	N	N	P Y	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Operario 2008	Y	N	N	Y	Y	Y	N	N	P Y	N	Y	N	N	Y	Y	N
Offer_2015	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	N
Mipatrini, 2017	N	N	Y	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Lucyk, 2019.	N	N	N	N	Y	N	N	P Y	P Y	N	N M C	N M C	Y	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
De Vito, 2017	Y	N	Y	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	N
Bocquier, 2017	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	Y	Y	N M C	Y
Morais, 2017	Y	Y	N	N	Y	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Spyromitrou-Xioufi, 2020	Y	N	N	N	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	Y	Y
Van Gerwen, 2020	Y	N	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Zamani, 2018.	N	N	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	Y
Jain, 2017	Y	N	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Kentikelenis, 2015	Y	N	N	Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Li, P. 2020	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Leung,2019	Y	Y	N	Y	N	N	N	P Y	N	N	Y	N	N	Y	N	Y
Lindsay,2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Salgado-Barreira	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Fournet, 2018.	N	N	N	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Bonten et al., 2020	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Chen et al., 2019	N	N	N	P Y	N	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Denning et al., 2018	N	N	N	Y	Y	N	N	P Y	P Y	N	Y	Y	N	N	N	Y
Falagas & Zarkadoulia, 2008	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	Y	N M C	N
Falla et al., 2018	N	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Hermann et al., 2019	Y	Y	N	Y	Y	N	N	N	Y	N	N M C	N M C	Y	Y	N M C	N
Millett et al., 2012	Y	N	N	Y	N	N	N	N	N	N	Y	N	Y	N	N	Y
Kawatsu, 2014	Y	N	N	N	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	Y
Possenti, 2016	N	N	N	P Y	N	Y	N	N	P Y	N	Y	Y	Y	Y	Y	Y
Richterman, 2018	Y	N	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Tauli, 2016	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Malerba, 2015	Y	N	N	Y	Y	Y	N	P Y	N	N	N M C	N M C	N	N	N M C	Y
Leumi, 2020	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Arum, 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Mirzadedh, 2021	Y	N	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Macina, 2021	Y	N	N	Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ly, 2021	Y	Y	N	Y	Y	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Lafond, 2021	Y	P Y	N	Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
McBride	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ding 2020	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Sultana 2021	Y	Y	N	N	Y	Y	P Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Whelan 2021	Y	N	N	N	Y	N	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Faria 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Jackson 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Badri 2021	Y	N	N	N	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Dugan 2021	Y	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	Y	N	N M C	Y
Kabapy 2020	Y	Y	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Dong 2020	Y	N	Y	N	Y	Y	N	N	Y	N	Y	N	Y	N	N	Y
Najafizada, 2020	N	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nurollahpour Shiadeh, 2020	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	N	Y
Pega 2021	Y	P Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N
Rostami 2021	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Song, 2021	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Wu 2021	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Okoli 2020	Y	N	N	N	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Roller-Wirnsberger 2021	Y	N	Y	P Y	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	N

Key: Y=Yes; N=No, P Y = Partial yes and N M C = No meta-analysis conducted

AMSTAR 2 Items:

1. Did the research questions and inclusion criteria for the review include the components of PICO?

2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?

3.Did the review authors explain their selection of the study designs for inclusion in the review?

4.Did the review authors use a comprehensive literature search strategy?

5.Did the review authors perform study selection in duplicate?

6.Did the review authors perform data extraction in duplicate?

7.Did the review authors provide a list of excluded studies and justify the exclusions?

8.Did the review authors describe the included studies in adequate detail?

9.Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?"

10. Did the review authors report on the sources of funding for the studies included in the review?

11.If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?"

12.If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

13.Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?"

14.Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?"

15.If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?"

16.Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?"

Characteristics of Included Reviews

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Abraha, 2018 [58]	Switzerland	AMR-Gonorrhoea	1946-2017	No	24 (unclear)	1989-2017	✓	✓	
Adams, 2018 [75]	UK	Gastrointestinal Infection	1980 - 2015	Yes	77 (unclear)	1995-2015	✓	✓	
Aldridge, 2018 [46]	UK	Not specified	2005- 2015	Yes	337 (unclear)	not reported	✓		✓
Alividza,2018 [47]	UK	AMR	no date limit	No	19 (at least 2)	1998 to 2015		✓	
Arat, 2019 [116]	Sweden	Vaccination	not reported	No	15 (2)	2007-2017		✓	
Arum, 2021 [50]	UK	HIV, HCV	2000 - 2017	Yes	37 (6)	2000 – 2019			✓
Badri, 2021 [93]	Iran	Ocular toxocariasis	1966 - 2019	Yes	101 (4)	1966 - 2020	✓		
Behera, 2018 [76]	India	HIV	Not reported	No	Not reported	1989 - 2017	✓		
Beijer, 2012 [48]	UK	TB, HCV virus, and HIV	1980 - 2012	Yes	43 (4)	1984 - 2011	✓	✓	✓
Bocquier 2017 [118]	France	Vaccination	2000 - 2016	No	43 (5)	Not reported		✓	
Bonten, 2020 [77]	Netherlands	*Escherichia coli bacteraemia*	2007- 2018	Yes	210 (21)	2007-2018	✓		
Chan, 2017 [18]	Australia	TB	Inception- 2017	Yes	20 (1)	1990-2015			✓
Chen, 2019 [70]	China	HIV disease	unclear - 2019	Yes	101 (1)	1984-2017	✓		
Chernet,2017 [14]	Switzerland	Six selected infectious diseases	not reported	Yes	96 (unclear)	2000-2017			✓
Coffey, 2018 [113]	Australia	Group A Streptococcal infection, acute rheumatic fever	Unclear - 2016	No	91 (unclear)	1944 - 2016		✓	
Colledge, 2020 [74]	Australia	HCV	not reported	No	223 (16)	2008 -2017	✓	✓	
Cormier, 2019 [44]	Canada	TB/HIV	1980 - 2017.	No	475 (0)	1984-2017	✓	✓	✓
Crichton, 2015 [78]	UK	Genital chlamydia infection	Inception - 2014	Yes	36 (3)	not reported	✓	✓	
De Vito, 2017 [19]	Denmark	Vaccination	2007- 2017	No	35 +21 (4)	not reported		✓	✓
Denning, 2018 [79]	UK	Vulvovaginal candidiasis	1985 - 2016	Yes	8 (2)	2000-2013	✓		
Di Gennaro, 2017 [120]	Mozambique	TB - MDR	Inception - 2016	Yes	50 (1)	1997 - 2016		✓	
Ding, 2020 [114]	China	HBV	Inception - 2020	Yes	10 (0)	1995 - 2019		✓	
Dong, 2020 [94]	China	Cryptosporidium Infection	1960 - 2018	Yes	221 (unclear)	Unclear	✓	✓	
Dugan, 2021 [95]	USA	HCV	2000 - 2018	No	41 (unclear)	Unclear	✓		
Eilami, 2019 [104]	Iran	HIV/AIDS	2010 - 2017	Yes	54 (unclear)	2010-2017	✓		
Fakoya, 2015 [71]	UK	HIV	2002- 2014	No	27 (9)	2003-2014	✓		
Falagas, 2008 [59]	Greece	Vaccination	Not reported	No	39 (1)	1979-2005	✓	✓	
Falla, 2018 [20]	Netherlands	Chronic HCV	2000-2015	No	Part 1: 18 (unclear) Part 2: 56 (1)				✓
Faria, 2021 [96]	Brazil	Vaccination	Inception-2020	Yes	31 (0)	2001 -2020	✓	✓	
Fauroux, 2017 [105]	Spain	Respiratory Syncytial Virus	1995 - 2015	No	74 (8)	Unclear	✓	✓	
Faustini, 2005 [21]	Italy	TB (MDR)	1993-2003	Yes	29 (3)	1995-2005	✓		✓
Fernández, 2015 [60]	Denmark	Vaccination: HPV	not reported	No	23(8)	2008-2014	✓	✓	
Fisher, 2013 [61]	UK	Vaccination: HPV	Inception- 2012	Yes	27(1)	2008-2012	✓	✓	
Forshaw, 2017 [117]	UK	Vaccination	1990 - 2016	Yes	37(0)	1990- 2015	✓	✓	
Fournet, 2018 [8]	Netherlands	Vaccination	1950- 2013	No	48/15 (at least 1)	not reported	✓		✓
Ghiasvand, 2020 [80]	Iran	HIV/AIDS	Inception - 2017	Yes	19 (0)	2005 - 2017	✓	✓	
Gorjana, 2017 [62]	Australia	HPV Vaccination	Unclear - 2015	No	18 (1)	2010 - 2015	✓		

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Greenaway, 2015 [22]	Canada	HCV	not reported	Yes	50(0)	1990-2013	✓	✓	✓
Hahne, 2013 [24]	The Netherlands	HBV and HCV	2000 - 2009	No	124 (9)	Unclear	✓		✓
Hermann, 2019 [81]	Canada	Vaccination	2000- 2017	No	33 (15)	2001-2016	✓		
Jackson, 2021 [38]	Ireland	Tuberculosis and MDR-TB	Unclear - 2020	Yes	32 (3)	2010 - 2018			✓
Jain, 2017 [25]	UK	Vaccination	not reported	Yes	35 (5)	1997 and 2015	✓	✓	✓
Jin, 2020 [72]	Australia	HCV	2000 - 2019	Yes	194 (at least 14)	Unclear			✓
Kabapy, 2020 [39]	Egypt	HIV	1982 - 2018	Yes	231 (unclear)	Unclear	✓	✓	✓
Kawatsu, 2014 [26]	Japan	TB	Not reported	No	18 (1)	1997 - 2012	✓	✓	✓
Kentikelenis, 2015 [27]	UK	Various	2007 - 2014	No	21 (unclear)	not reported		✓	✓
Lafond, 2021 [97]	USA	Influenza-associated lower	1996 –2016	Yes	75 (Unclear)	1996 - 2016	✓		
Larson, 2014 [115]	UK	Vaccination	unclear - 2012	No	1164 (at least one)	2007–2012		✓	
Leumi, 2020 [56]	Cameroon	Hepatitis B	1990 - 2017	Yes	358 (unclear)	Unclear	✓		✓
Leung,2019 [106]	Australia	HIV, HBV, HCV	2008 - 2017	Yes	104(unclear)	not reported	✓		
Li, P. 2020 [82]	Netherlands	HEV	inception - 2019	Yes	419(7)	not reported	✓	✓	
Lindsay,2015 [83]	Belgium	Norovirous disease	2003 - 2013	No	39 (4)	not reported	✓		
Lucyk, 2019 [119]	Canada	Vaccination- Influenza	2012 - 2017	No	42 (1)	2012- 2017		✓	
Ly, 2021 [51]	France	Various	1980 - 2020	No	81 (4)	Unclear	✓	✓	✓
Macina, 2021 [98]	France	Bordetella pertussis	1990 - 2019	No	88 (7)	Unclear	✓		
Malerba, 2015 [63]	Italy	Vaccination	2000 - 2014	No	11 (1)	2003-2014	✓	✓	
McBride, 2021 [40]	Canada	HIV/STI	2009 - 2019	No	29 (unclear)	Not reported	✓		✓
Millett, 2012 [64]	USA	HIV disease	1981 - 2011	Yes	194 (13)	1981-2011	✓	✓	
Mipatrini, 2017 [28]	Italy	Vaccination	2005-2016	No	58 (7)	not reported			✓
Mirzadeh, 2021 [99]	Iran	Trichomonas vaginalis	1985 - 2020.	Yes	85 (2)	1985 - 2020	✓		
Morais, 2017 [29]	Portugal	*Helicobacter pylori*	inception - 2015	No	28 (unclear)	1988-2014			✓
Nagata, 2013 [65]	Switzerland	vaccination- Influenza	1980 - 2011	No	80 (7)	not reported	✓	✓	
Najafizada, 2020 [121]	Canada	MDR-TB	1998-2018	No	15(4)	Not reported		✓	
Nava-Aguilera, 2009 [49]	Mexico	TB	unclear - 2005	Yes	30 (1)	1994 - 2008	✓	✓	✓
Nellums, 2018*b* [42]	UK	AMR	2000- 2017	Yes	23 (0)	2006-2016			✓
Newman, 2015 [111]	USA	Foodborne infectious diseases	1980 - 2013	No	16 (3)	not reported	✓	✓	
Nourollahpour Shiadeh, 2020 [110]	Iran	Toxoplasmosis	Inception -2020	Yes	14 (0)	2001- 2019	✓		
Offer, 2015 [66]	UK	TB	1990 - unclear	No	18 (18)	1999-2013	✓	✓	
Okoli, 2020 [30]	Canada	Influenza vaccination	Unclear - 2020	Yes	34 (1)	2004 - 2019	✓	✓	✓
Okoli, 2021 [69]	Canada	Influenza vaccination	2000 - 2020	Yes	36 (2)	2010-2020	✓	✓	
Oldenburg, 2014 [73]	USA	HIV	2004 - 2013	Yes	88 (1)	not reported	✓		✓
Oldenburg, 2015 [52]	USA	HIV	2004 - 2013,	Yes	33 (0)	2004-2013			✓
Operario, 2008 [53]	UK	HIV	1980 -2007	Yes	25 (0)	1988- 2006.	✓		✓
Pega 2021 [41]	Switzerland,	HIV	2010- 2020	Yes	19(1)	2010-2019			✓

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Platt, 2013a [31]	UK	HIV, STIs	Not reported	No	26 (1)	Not reported			✓
Platt, 2013b [32]	UK	HIV, STIs	2005 - 2011	No	73 (5)	Not reported			✓
Possenti, 2016 [84]	Italy	Cystic Echinococcosis	not reported	Yes	37(0)	1964-2014	✓	✓	
Prost, 2007 [33]	UK	HIV	Unknown - 2005	No	138 (unclear)	1996 -2005	✓		✓
Pulver, 2016 [107]	Canada	Vaccination	1980 - 2014	No	12 (1)	1993 - 2013	✓		✓
Richterman, 2018 [85]	USA	Cholera	not reported	Yes	110 (0)	1974-2017	✓	✓	
Rodrigo, 2010 [112]	Sri Lanka	HIV	1999 -2009	No	98 (unclear)	not reported		✓	
Roller-Wirnsberger, 2021 [100]	Austria	Influenza vaccination	2012- 2019	No	44 (at least 1)	2012-2018	✓	✓	
Rossi, 2012 [34]	Canada	HBV	Inception - 2011	Yes	110 (2)	1977 - 2011			✓
Rostami, 2019a [87]	Iran	Toxocariasis	1980 - 2019	Yes	250 (2)	1980 -2019	✓	✓	
Rostami, 2019b [86]	Iran	Acute Toxoplasma infection	1988 - 2018	Yes	217 (3)	1988 - 2018	✓		
Rostami, 2021 [101]	Iran	Toxoplasmosis	1980-2020	Yes	150 (2)	1987-2020	✓	✓	
Salgado-Barreira, 2014 [122]	Spain	HIV	unclear -2012	No	24 (1)	1983- 2010		✓	
Sandgren, 2014 [23]	Sweden	TB	1990- 2012	Yes	15 (1)	not reported			✓
Schepisi, 2018[88]	Italy	TB	unclear - 2017	Yes	74 (13)	1950-2017	✓		
Schierhout, 2020 [89]	Australia	HTLV-1	1910 - 2018	Yes	39 (0)	1991 - 2018	✓		
Song, 2021 [102]	China	Drug resistant TB (MDR-TB)	2000-2020	Yes	37 (2 at least)	2000-2019	✓		
Spyromitrou-Xioufi, 2020 [90]	Greece	Meningococcal Infection	2008 - 2018	Yes	6 (0)	1999-2017	✓	✓	
Stockdale, 2020 [54]	UK	HDV	1998 - 2019	Yes	282 (at least 1)	not reported			✓
Strifler, 2015 [91]	Canada	Meningococcal Infection	inception - 2013	No	17 (6)	1982-2012	✓		
Suhrcke, 2011 [35]	UK	Various	1947 - 2010	No	37 (2)	not reported		✓	✓
Sultana, 2021 [103]	Bangladesh	HIV and MDR-TB	2010 - 2020	Yes	54 (0)	2010 - 2020	✓		
Tabacchi, 2016 [67]	Italy	Vaccination- MMR	not reported	Yes	45 (19)	2000-2014	✓	✓	
Tauli, 2016 [36]	Brazil	Vaccination	1992- 2014	No	23(0)	not reported	✓	✓	✓
Tavares, 2017 [37]	Portugal	HIV-TB	2000 - 2016	No	27 (2)	2003 - 2016			✓
Tollefson, 2013 [45]	USA	TB	1990 – 2011	No	91 (0)	1990 - 2012			✓
Van Gerwen, 2020 [108]	USA	STI/HIV	1968 - 2018	Yes	25 (0)	not reported	✓		
Vet, 2015 [55]	The Netherlands	Vaccination	Inception-2014	No	18 (0)	not reported	✓	✓	✓
Vukovic,2019 [123]	Italy	Influenza vaccination	Unknown - 2017	No	12 (6)	2004 - 2017		✓	
Wayal, 2018 [68]	UK	STI	Unclear - 2016	No	15 (15)	2000 - 2017	✓		
Whelan, 2021 [109]	The Netherlands	Gonorrhoea	2010 - 2019	No	174 (1)	Unclear	✓		
Wu, 2021 [57]	China	HPV	1990-2019	Yes	107 (0)	1989-2019	✓		✓
Yu, 2020 [43]	USA	HIV/STI	Unclear - 2019	No	21 (0)	2008 -2017			✓
Zamani, 2018 [92]	Iran	*Helicobacter pylori*	2000 - 2017	Yes	183 (2)	not reported	✓		

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1, Page 4
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 3 - 4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 4
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6, Table 1
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 5 online supplemental appendix 1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 5
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 6-7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 6-7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 6-7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 7
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 7
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 7, Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 7
Study characteristics	17	Cite each included study and present its characteristics.	Table 2, Page 11-16
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 11, Figure 3, online supplementary appendix 4
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Table 2, Page 11-16, online supplemental appendix 2
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 11-16
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 16-17
	23b	Discuss any limitations of the evidence included in the review.	Page 17-18
	23c	Discuss any limitations of the review processes used.	Page 17-18
	23d	Discuss implications of the results for practice, policy, and future research.	Page 16-18
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 5
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 5

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 18
Competing interests	26	Declare any competing interests of review authors.	Page 18
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Online supplemental material

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Health Inequalities in Infectious Diseases: A Systematic Overview of Reviews

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ABSTRACT:

Objectives: The aim of this systematic overview of reviews was to synthesise available evidence on inequalities in infectious disease based on three dimensions of inequalities; inclusion health groups, protected characteristics, and socioeconomic inequalities.

Methods: We searched Medline, Embase, Web of Science and Open Grey databases in November 2021. We included reviews published from the year 2000 which examined inequalities in the incidence, prevalence or consequences infectious diseases based on the dimensions of interest. Our search focused on tuberculosis, human immunodeficiency virus, sexually transmitted infections, Hepatitis C, vaccination, and antimicrobial resistance. However, we also included eligible reviews of any other infectious diseases. We appraised the quality of reviews using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist. We conducted a narrative data synthesis.

Results: We included 108 reviews in our synthesis covering all the dimensions of inequalities for most of the infectious disease topics of interest, however the quality and volume of review evidence and consistency of their findings varied. The existing literature reviews provides strong evidence that people of inclusion health groups and lower socio-economic status are consistently at higher risk of infectious diseases, antimicrobial resistance, and incomplete/delayed vaccination. In the protected characteristics dimension, ethnicity and sexual orientation are important factors contributing to inequalities across the various infectious disease topics included in this overview of reviews.

Conclusion: We identified many reviews that provide evidence of various types of health inequalities in different infectious diseases, vaccination, and antimicrobial resistance. We also highlight areas where reviews may be lacking. The commonalities in the associations and their directions suggest it might be worth targeting interventions for some high risk-groups that may have benefits across multiple infectious disease outcomes rather than operating purely in infectious disease siloes.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The protocol used for this systematic overview of reviews was pre-designed and registered in advance.
- We had wide inclusion criteria including various dimensions of inequalities across several key infectious diseases, providing a broad overview of inequalities in infectious diseases, especially those relevant to high-income countries.
- This overview focussed on tuberculosis, human immunodeficiency virus, sexually transmitted infections, Hepatitis C, vaccination, and antimicrobial resistance, however, we also included evidence from other infectious diseases except COVID-19.
- We used AMSTAR2 to assess the methodological quality of each of the included reviews, however, some of the included reviews are not systematic reviews for which AMSTAR2 was designed.
- Because this is an overview of reviews, we are unable to incorporate evidence within primary studies that have not been synthesised in reviews, which means there may be evidence we are missing.

INTRODUCTION

The World Health Organisation regards experiencing the highest possible standard of health as a fundamental human right of every individual regardless of personal or social circumstances [1]. Nevertheless, avoidable inequalities exist in the prevalence of diseases and illnesses, general health status, and access to health care between various social groups [2]. A complex interaction between structural (for example, income and wealth distribution) and individual-level (for example, health behaviours and living conditions) determinants of health contributes to the increased vulnerability to poorer health among particular social groups [3, 4].

Infectious diseases pose a significant health burden with substantial health inequalities globally [5]. In the United Kingdom (UK), infectious diseases constitute 7% of deaths alongside 4% of lost life years [6]. The economic burden of infectious diseases in the UK is estimated to be around £30 billion per year [6]. Although infectious diseases impose substantial, negative health and economic consequences within populations, many infectious diseases are vaccine-preventable and avoidable through adequate control measures [7]. However, some groups remain under vaccinated [8] and other control measures may be difficult or impossible to implement for some, depending on circumstances [9]. Traditionally, policy makers often target infectious diseases individually, but it is known that specific groups are often at higher risks regardless of specific infectious diseases [10-14]. In efforts to tackle the observed disparities and to reduce the burden of infectious diseases, a strategic approach that tackles infectious diseases among high-risk groups is required [15]. To inform the development of needs-tailored public health policies and initiatives to achieve this goal, a comprehensive synthesis of evidence is required, highlighting the inequalities in infectious diseases according to varying personal and social characteristics.

This project was commissioned by Public Health England (PHE) to gain an overview of the available evidence on health inequalities relating to key infectious disease topics in the UK from a population perspective. PHE had specific interest in three dimensions of inequalities; inclusion health groups (socially excluded and vulnerable populations), protected characteristics, and socioeconomic inequalities. The infectious disease topics of interest were TB, HIV, STIs, HCV, vaccination, and antimicrobial resistance (AMR). Therefore, the aim of this systematic overview of reviews was to describe the existing literature, relevant to the UK, relating to inequalities in the prevalence/incidence of key infectious disease topics as specified by PHE.

METHODS

We conducted a systematic overview of reviews, pre-registered in PROSPERO, an international prospective register of systematic reviews (2020 CRD42020220203 https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020220203).

Patient and public involvement

This study had no direct patient or public engagement.

Search strategy and study selection

We developed a search strategy using synonyms and MeSH terms for inequalities, inclusion health groups, protected characteristics and socioeconomic factors which were combined with synonyms and MeSH terms for infectious diseases and synonyms for reviews (online supplemental file 1). We searched electronic databases from inception to November 2021; Medline, Embase, Web of Science and to identify relevant grey literature we searched Open Grey database (http://www.opengrey.eu/) and contacted experts in our network.

We exported citations into Endnote, removed duplicates and then exported them into a web-tool, Rayyan (https://www.rayyan.ai/) to facilitate citation screening. Articles were screened against pre-defined eligibility criteria (Table 1). Titles and abstracts were screened by a single reviewer and 10% were double screened by a second reviewer. Full texts of the potentially relevant articles were obtained and screened independently by two reviewers. Discrepancies were resolved by discussion.

Table 1: Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
Population: Review including studies from the UK population or other high-income countries. *Exposure*: • Socioeconomic status: this includes education, income, occupation, social class, and deprivation measured at individual or aggregated level. • Protected characteristics: age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation. • Inclusion health groups: vulnerable migrants, people experiencing homelessness and rough sleeping, people who engage in sex work, and Gypsy Roma and Traveller communities. *Outcome*: Inequalities relating to incidence, prevalence, and consequences of infectious diseases. Despite specific interest in TB, HIV, STIs, HCV, immunisation, and AMR, we included reviews relating to any infectious diseases, except reviews focused on COVID-19. *Types of reviews*: Any literature review which reports all the following (a) explicit objectives, (b) clear search strategies and (c) eligibility criteria. *Publication date*: Published from the year 2000 onwards. *Language*: No language restrictions.	We excluded reviews of qualitative studies and articles that are not systematic reviews as defined above. We excluded review protocols, but we searched the titles to check if the findings had been published. We excluded reviews on COVID-19, as advised by PHE, to avoid overlap with other reviews. We also excluded articles focussed on travel-related infections. Reviews which excluded the UK in their eligibility criteria or had not included populations relevant to the UK population (for example, papers where all results were from low-income countries) were excluded.

Data extraction

We designed and piloted a data extraction form in Microsoft Excel to extract information including: first author's last name, publication year, corresponding author's country, review methodology,

inclusion and exclusion criteria, infectious disease(s), population(s) included, dimension(s) of inequality, outcomes, conclusions, and strengths and limitations. Data extraction was performed by one reviewer and checked by another.

Quality assessment

Two reviewers independently assessed review quality using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist [16]. Disagreements were resolved by discussion. Due to the multidimensional nature of this overview of reviews, inclusion of various types of reviews with diverse aims and outcomes, we did not perform overall rating of confidence for each review. To provide a sense of overall quality of evidence, we calculated the proportion of reviews which fulfilled each AMSTAR-2 item.

Data synthesis

We tabulated the dimension of inequalities against the infectious disease topic to create an evidence matrix which was used to highlight areas where reviews already exist and where there may be gaps. Data were synthesised narratively based on the dimensions of inequalities.

RESULTS

Figure 1 shows the study selection. We retrieved 14713 citations from the electronic database searches and 11135 titles and abstracts were screened after the removal of duplicates. One of the experts we contacted sent an article which highlighted UK-based evidence for several inclusion health groups, but did not fulfil other criteria for inclusion [17]. After examining 437 full text articles against the eligibility criteria, 108 were included in our synthesis.

Characteristics of included reviews are summarised in online supplemental file 2. Included reviews were published between 2005-2020 with 95% published after 2010. Fifty-eight (54%) included meta-analysis while the remaining studies used narrative/descriptive synthesis approaches. The reviews covered the three dimensions of inequalities across various infectious disease topics. A summarised version of the evidence matrix, showing how many reviews were identified for each cell is presented in Figure 2. The full evidence matrix is presented in online supplemental file 3.

Methodological quality of included reviews

Assessment of the methodological quality of each included review is presented in online supplemental file 4 and the proportion of included reviews that met each AMSTAR2 Criteria are presented in Figure 3. Many reviews fulfilled criteria such as including components of PICOS in their research questions and inclusion criteria (87%), performing duplicate study selection (55%), discussing heterogeneity (70%) and disclosure of conflicts of interest (83%). Only a few of the reviews (19%) clearly indicated that the review methods were established *a priori* and 37% performed risk of bias assessment using satisfactory techniques. Although only 24% of the included reviews were judged to have comprehensive literature search, 59% were classed as "partial yes" for literature search often due to lack of grey literature searches. Justification of the exclusions for each excluded study were not presented and none reported funding sources for included studies. These two criteria are more common among Cochrane reviews of interventions and are generally omitted from most published non-Cochrane reviews.

Evidence Relating to Inclusion Health Groups

Of the 108 included reviews, 43 reported on inclusion health groups. The evidence is generally consistent across these groups showing that people who belong to inclusion health groups are often at higher risk of infectious diseases, AMR and under-vaccination. For example, many reviews reported on general migrants [14, 18-41], and vulnerable migrants such as asylum seekers, refugees, and trafficked sex workers [14, 19, 22, 28, 34, 42, 43]. The reviews often reported that migrants have a higher risk of infectious diseases than the host population, though the magnitude of the association may vary for different geographical regions and different infectious diseases. For example, in the UK, 35% of people with chronic HCV are migrants despite being just 9% of the general population [20]. Other reviews showed that HIV and STIs were more prevalent among migrants [31, 32]. The prevalence of HIV-TB co-infection was higher among immigrants compared with nationals in various countries including England and Wales although the immigrant group reported slightly better survival/lower mortality which authors commented may be due to the possible healthy migrant effect [37]. In another review, migrants were reported to be at higher risk of TB death [26]. Evidence from the UK showed an increasing number of migrants contracted HIV after they arrived in the UK between 2002-2011 suggesting that the higher prevalence of infectious diseases among migrants is not limited to pre-migration infection [27]. A meta-analysis showed that refugees were more likely to have chronic HBV compared to general migrants (Odds ratio (OR) 1.42 95% CI 1.01 to 1.99) [34].

Some reviews reported no clear evidence that immigrant sex workers had higher risk of HIV and STIs compared with non-migrant sex workers [40, 41]. However, one reported that trafficked sex workers were at a higher risk of HIV and STIs compared to female sex workers in general [43]. The prevalence of *Helicobacter pylori* among immigrants varied according to continent of origin and the prevalence is higher among migrants compared with their children [29].

Several reviews reported lower vaccination rates or delayed/incomplete vaccination among migrants and refugees in Europe [25, 28, 30, 36]. However, the association may vary depending on the type of migrant group. For example, authors have reported that the uptake of vaccination among refugees was lower compared with asylum seekers [19]. In a meta-analysis, migrants had increased odds of MDR-TB incidence compared to non-migrants (OR 3.91, 95% CI 2.98–5.14) [38]. In two other reviews, AMR carriage and infection were reported to be more prevalent among migrants in Europe [21, 42].

Three reviews examined Gypsy Roma and Traveller communities [8, 44, 45]. One showed that Roma and Irish Travellers in the UK were often under-vaccinated [8]. Another reported that Roma in Barcelona had a TB incidence 5.3 times greater than Spain's national TB incidence [45]. Higher prevalence of HIV has also been reported among Iranian, Roma, and Peruvian Indigenous populations compared to the general population [44]. We did not identify any reviews that examined the association between being from Gypsy Roma or Traveller communities and AMR.

We identified eight reviews which examined the association of homelessness with infectious diseases. They all reported a higher risk of various infectious diseases or AMR among people experiencing homelessness compared to those who were not homeless [26, 35, 46-51]. We did not identify any reviews that examined the association between vaccination and homelessness. Eight reviews explored infectious disease risks among those engaging in sex work compared to the general population [39, 43, 52-57]. The evidence suggests higher risks of various infectious diseases, such as HBV, HDV, HIV and HPV, among sex workers [39, 52-54, 56, 57]. A review which examined factors associated with HBV vaccination among MSM found mixed evidence relating to sexual risk-taking including involvement in sex trade [55]. We did not identify any reviews exploring the association of being a sex worker with AMR.

Evidence Relating to Protected Characteristics

Seventy-four reviews reported on protected characteristics, however, our synthesis only found clear evidence for inequalities by ethnicity and sexual orientation. Inequalities in infectious diseases relating to race and ethnicity were explored in 19 reviews [26, 30, 33, 36, 49, 51, 55, 58-69]. The available evidence suggests a higher rate of various infectious diseases such as TB, HIV, and STIs and under-vaccination in people who belong to an ethnic minority group. For example, a meta-analysis found that recent transmission of TB was associated with being of ethnic minority (OR 3.03, 95% CI 2.21- 4.16) [49]. A meta-analysis indicated that on average young Black women were less likely to initiate HPV vaccination than young White women (combined OR: 0.89, 95% CI: 0.82–0.97) [61]. In a meta-analysis of studies from Europe, children from parents of ethnic minorities (compared to the majority) were less likely to be vaccinated for measles, mumps and rubella (OR 0.89, CI 0.86–0.93 in a fixed effect model) [67]. However, the effect disappeared in the random effects model (OR 1.03, 95% CI 0.79–1.34), probably due to heterogeneity between studies [67]. Seasonal influenza vaccine uptake among older people was associated with being White (combined OR 1.30, 95% CI 1.14–1.49) [30]. Only one review on race and AMR was identified and it reported that people from some Black ethnic groups in the USA and Europe, and Aboriginal ethnic groups living in Canada and Australia are less likely to have AMR-Neisseria gonorrhoea (AMR-NG) than the White majority population [58]. Ten included reviews examined the association of sexual orientation with infectious disease topics, mostly focused on MSM [24, 51, 53, 54, 56, 58, 70-73]. In a review, MSM were found to be at risk of acquiring HIV post-migration [71]. However, in a network meta-analysis the highest risk of advanced HIV disease among people living with HIV was found in those with heterosexual contact compared with MSM as well as injection drug use [70]. Some reviews examined disparities of HIV in MSM but did not compare risk between MSM and other populations [33, 64]. Other infectious diseases such as HBV, HCV and HDV are also higher in MSM than in the general population [24, 54, 72]. AMR-NG was reported to be more common among MSM than heterosexual men in England and Wales (OR 5.47, 95% CI 3.99–7.48) [58]. We did not identify any reviews which assessed the association of sexual orientation with vaccination.

From the reviews identified, inequalities in infectious disease topics based on other protected characteristics, such as age and sex are mixed, and for other protected characteristics the synthesised evidence is scant and inconclusive. The association of infectious diseases with age has been reported in various reviews [21, 22, 30, 36, 49, 51, 55-60, 62, 63, 65, 67, 69, 74-103]. However, the association varied. Infectious diseases such as HIV, STIs, and TB have been reported to be

associated with younger age in some reviews [49, 58, 76, 79, 88], while HCV and Hepatitis E (HEV) were associated with older age [22, 82, 95]. Seasonal influenza vaccine uptake was higher in older age groups [30, 65, 69, 100]. A review reported that many studies found an association between HBV vaccination and younger age [55]. Suboptimal vaccination compliance was associated with mother's younger age [36, 63]. On the other hand, another review reported that HPV vaccine intention and initiation were positively associated with younger parent's age [62]. Four included reviews examined the association of AMR with age [21, 58, 102, 103]. In one review, MDR TB was associated with being younger than 65 years (pooled OR 2.53, 95% CI 1.74 – 4.83)[21] while another review reported that AMR-NG was more common in those 25 years or older than in younger adults [58]. Overall, age group classifications often varied between reviews which made it difficult to identify a clear pattern.

Twenty-eight reviews explored inequalities based on sex [21, 39, 40, 46, 48, 49, 51, 53, 58, 65, 67, 74, 78, 82, 84, 85, 87, 89, 90, 93, 96, 100, 104-109], but the findings varied depending on specific infectious disease. For example, TB transmission was reported to be associated with being male [48, 49] while the prevalence of chlamydia was slightly higher in females than in males [78]. Other reviews reported that seasonal influenza vaccine uptake is often higher in elderly men compared to elderly women, but the differences are not statistically significant in multivariate regression analysis [65]. A meta-analysis of studies from Europe showed that male patients were more likely to have MDR TB (OR 1.38, 95% CI 1.16 – 1.65) [21].

Six reviews described the influence of being married or in civil partnerships on vaccination [25, 30, 65, 67, 69, 96]. Generally, those who were married had higher vaccination uptake although some studies found no association or higher uptake among those who were never married. No included review examined inequalities in infectious disease prevalence or AMR based on marital status. Only four included reviews reported the prevalence of infectious diseases (HBV, HCV, latent or acute toxoplasma infection) in pregnant women compared with the general population and the findings were mixed [22, 24, 56, 110]. We found no reviews that examined the association of pregnancy with vaccination uptake or risk of AMR.

Six reviews reported on inequalities relating to religion and meningococcal disease, as well as vaccination [8, 25, 59, 61, 63, 90]. A recent meta-analysis of two studies showed that religious events attendance was significantly associated with a decreased risk of invasive meningococcal disease (OR 0.47 (95% CI, 0.28–0.79, p 0.0004) [90]. Meta-analyses showed no strong evidence

between various vaccination and religion including frequency of attendance at a place of worship [25, 61]. Jewish Orthodox people in the UK and Belgium and Orthodox Protestants in the Netherlands were described as being under-vaccinated [8]. We did not identify any studies on the association of religion with the risk of any of the key infectious diseases or AMR.

Two reviews examined the association between gender reassignment and the risk of infectious diseases (HIV and HBV) [53, 56]. The prevalence of HIV was significantly higher among transgender female sex workers compared with biologically female sex workers (RR = 4.02, 95% CI 1.60 - 10.11).[53] However, in another review, transgender persons had lower prevalence of HBV compared to other groups such as sex workers, injection drug users, MSM and pregnant women [56]. We did not identify any reviews examining the association of gender reassignment with other infectious diseases of interest, vaccination or AMR.

We did not identify any review that reported the association of disability with our key infectious diseases topics. However, we identified one review which reported that disability was associated with a higher incidence of listeriosis [111].

Evidence Relating to Socioeconomic Inequalities

Fifty reviews explored socioeconomic status. The evidence consistently shows that those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, or poor living situations are at higher risk of infectious diseases, AMR and lower vaccine uptake. For example, many reviews highlighted that low income, poverty and unemployment were associated with various infectious diseases including, HIV, STIs, TB, HBV and HCV among others [26, 27, 35, 39, 64, 75, 82, 84, 85, 90, 94, 111-114].

Level of education, income or occupation are often associated with vaccination uptake [19, 25, 30, 36, 55, 60, 61, 63, 65, 67, 69, 100, 115-119]. Reviews have also reported an association of MDR-TB and AMR with lower level of income or education [47, 120, 121]. Many reviews examined the association of infectious disease topics of interest with areal level socioeconomic status [25, 30, 36, 59, 60, 63, 65, 69, 100, 116, 119, 122], deprivation [61, 65, 66, 75, 78, 111, 119, 123], or living situation [30, 36, 44, 47, 49, 51, 60, 65, 67, 69, 84, 85, 87, 90, 94, 96, 101, 105, 113, 121]. One meta-analysis showed significant association between neighbourhood deprivation and chlamydia infection (pooled OR 1.76, 95 % CI: 1.14–1.49) [78]. In another meta-analysis, TB was associated with

residing in an urban area (OR 1.52, 95%CI 1.35–1.72) [49]. Those living in overcrowded or poor housing conditions had higher risk of TB [44]. AIDS mortality is significantly associated with lower socioeconomic status [122]. Group A Streptococcal infection, gastrointestinal infections and meningococcal disease were associated with poor living conditions [75, 84, 85, 90, 111, 113].

Two included reviews explored the association between AMR and areal level deprivation [47, 121]. Although the evidence is scant, the findings suggests that those living in deprived areas or poor living conditions may be at higher risk of AMR.

DISCUSSION

This overview of reviews provides a broad synopsis of three dimensions of inequalities (inclusion health groups, protected characteristics, and socio-economic inequalities) across several infectious disease topics. We synthesised the existing evidence based on the dimension of inequalities. Of the three dimensions of inequalities assessed, the evidence relating to people in the inclusion health groups is the most consistent although the volume of evidence identified for each group varied. Most of the reviews identified under this dimension were on migration status, with a higher prevalence of infectious diseases, AMR and lower vaccine uptake among migrants compared to non-migrants. Vulnerable migrants (such as refugees, asylum-seekers, and trafficked persons) are at higher risk when compared to general migrants and the size of inequalities varied depending on the country of origin. Although few reviews were identified for the remaining inclusion health groups, the evidence suggests that homelessness is associated with risk of infectious diseases and AMR; Gypsy Roma/ Traveller communities are often under vaccinated and are also at greater risk of infectious diseases; and people who engage in sex work are at greater risk of some infectious diseases.

There is a plethora of evidence from reviews showing higher prevalence of infectious diseases and under-vaccination among minority ethnic groups. We also identified several reviews suggesting higher prevalence of infectious diseases and AMR among MSM. These suggest that ethnicity and sexual orientation are important protected characteristics and targeting or tailoring interventions for such groups may be beneficial to reduce inequalities in infectious diseases. It is important to note that there is inequality in access to vaccinations as shown in reviews included in this overview of reviews and beyond. Since many infectious diseases are vaccine preventable, identified inequalities in infectious diseases that we have noted in this overview of reviews, may also be related to inequalities in access to vaccination.

Many reviews examined the association with age and sex, however, the identified associations varied depending on the specific infectious disease or type of vaccination. In addition, for most of the reviews, the comparator age groups were often unclear. Therefore, we are not able to identify specific age groups with higher risk across various infectious disease topics. Other factors besides equity issues may contribute significantly to associations with age. For example, people in the most sexually active age groups are more likely to contract STIs whereas people of older ages, where immunity is weaker, are more likely to get infectious diseases associated with low immunity. Also, vaccinations are often offered at specific ages so it is expected that uptake would be higher among those groups that are targeted. However, it is important to highlight that we found evidence suggesting that childhood vaccination compliance is lower for those with younger mothers/parents[36, 59, 63]. Based on this review, age and sex may be important for some infectious diseases but the group at higher risk may vary across diseases.

Reviews exploring marital status focused on vaccination, particularly seasonal influenza vaccine in older adults, tetanus vaccination among pregnant women and MMR vaccination in children. Reviews generally reported higher vaccination uptake among adults who are married and children whose parents are married. It is not possible to draw a conclusion regarding the association of religion, disability, transgenderism, and pregnancy with infectious diseases based on the findings of this review as the synthesised evidence is scant and often inconsistent. More evidence is therefore needed to be able to establish the presence and direction of any associations of these factors with infectious diseases.

Several reviews provide compelling evidence of higher risk of infectious diseases, AMR, and lower vaccination uptake among those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, and poor living situations. Although most of the evidence in this dimension is on vaccination, those of lower socioeconomic groups are often at higher risk from infectious diseases and should be targeted for intervention.

Strengths and limitations

The protocol used to guide the conduct of this review was designed a priori. We conducted a comprehensive literature search of four electronic databases with no language limits and searched for grey literature. Data extraction was checked by a second reviewer to improve accuracy and quality

assessments were performed by two reviewers independently. Due to the timeframe required for the work, we could not complete all the initial titles and abstract screening in duplicate, however, full texts of potentially relevant reviews were independently screened by two reviewers. Despite our best efforts, we acknowledge that some relevant reviews may have been missed in the study selection process. The lack of synthesised evidence observed in some areas does not necessarily mean a lack of evidence. This is because there may be primary studies in those areas which have not been synthesised in reviews and meta-analyses. Also, this project focussed on specific infectious disease topics and we included specific search terms for those topics in the search strategy and included broad terms for infectious diseases. This allowed us to include other infectious diseases that were identified in our search to capture evidence of health inequalities from various infectious diseases (excluding COVID-19). Therefore, this is not intended to provide a comprehensive overview of reviews in those topics which are not the focus of this project. Furthermore, some underserved populations (such as people who inject drugs and prisoners) are not covered in this overview as these are beyond the scope of the work. Notwithstanding, we believe this provides a useful summary of available evidence relating to inequalities in infectious diseases relevant to high-income countries and highlights areas where evidence may be lacking or minimal.

The quality of the included reviews varied significantly as we included various types of reviews, and some were not necessarily systematic reviews for which AMSTAR2 is designed. Heterogeneity between studies was a limitation reported in many of the included reviews where meta-analyses were performed, therefore, pooled estimates should be interpreted with caution.

Conclusion

Overall, we provide evidence from many papers with accordant findings, of groups consistently at higher risk of infectious diseases, AMR and under-vaccination. Developing targeted interventions for high-risk groups rather than focusing on individual infections could contribute significantly to reducing infectious disease burden. This reviews also highlights important evidence gaps that should be considered when commissioning future evidence syntheses or primary studies.

Figure Legends

Figure 1: PRISMA flow diagram for study selection.

Figure 2: Matrix showing the number of reviews identified for each dimension of inequality and infectious disease topic. Colour ranges from red which indicates where no review was identified, up to green for a maximum number of reviews (19).

Figure 3: AMSTAR2 results for included reviews

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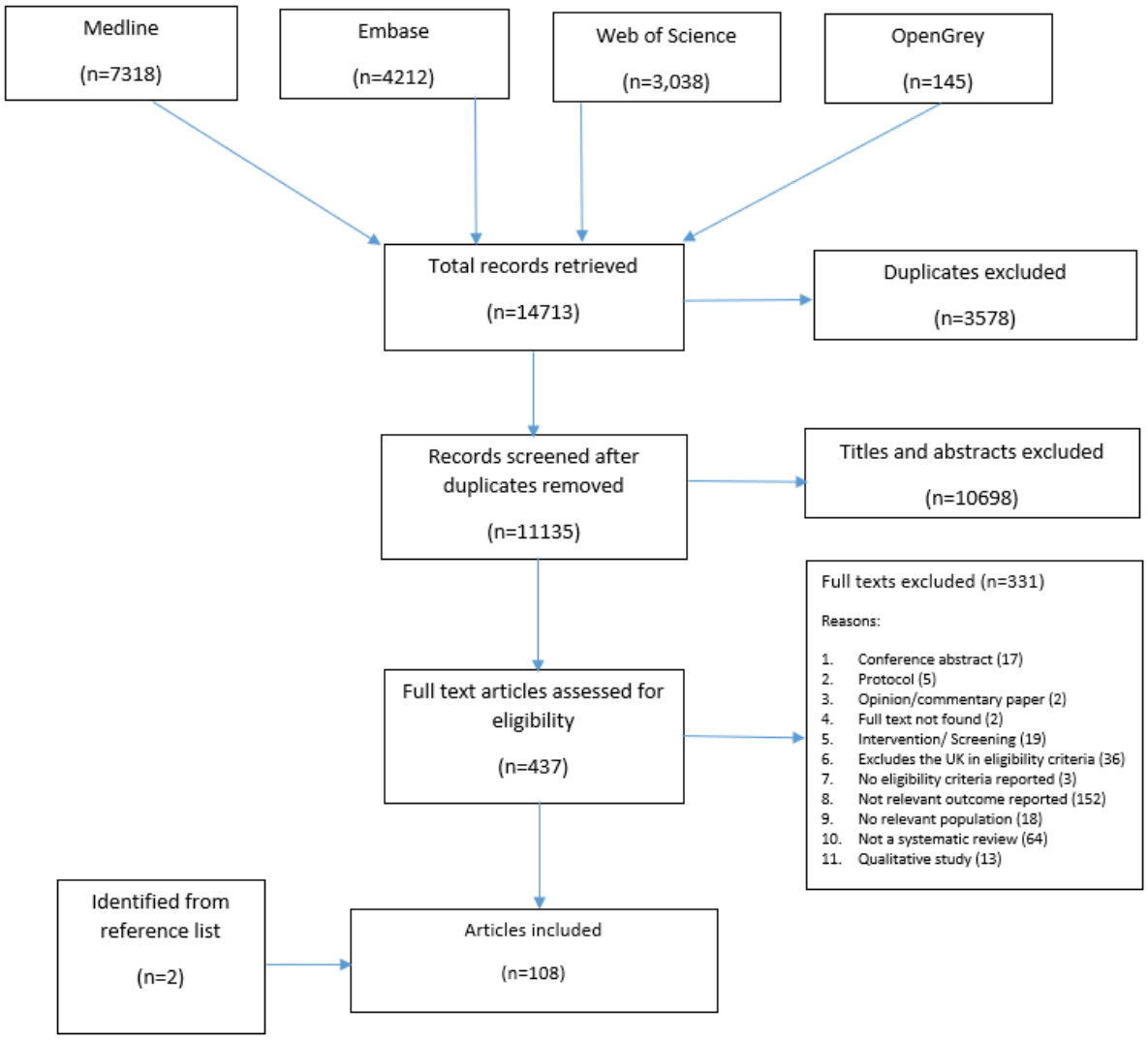
Figure 1: PRISMA flow diagram for study selection



Dimension of inequalities	Variables	Tuberculosis	HIV	STI	Hepatitis C	Vaccination	AMR/multi-drug resistance	Others
Protected characteristics	Age	2	3	4	3	13	4	19
	Sex	2	7	4	3	5	2	11
	Marriage and civil partnership	0	0	0	0	6	0	0
	Pregnancy and maternity	0	0	0	2	0	0	3
	Race (or ethnicity)	3	2	1	0	11	1	1
	Religion or belief	0	0	0	0	5	0	1
	Sexual orientation	0	4	0	2	0	1	4
	Gender reassignment	0	1	0	0	0	0	1
	Disability	0	0	0	0	0	0	1
Inclusion Health Groups	Vulnerable migrants	0	1	1	2	2	1	3
	General migrants	5	8	4	5	5	2	6
	People experiencing homelessness and rough sleeping	3	2	0	2	0	1	3
	People who engage in sex work	0	4	2	0	1	0	2
	Gypsy Roma/ Traveller communities/Indigenous people	2	0	0	0	1	0	0
Socioeconomic inequalities	Level of education/income	1	4	1	0	18	3	9
	Employment/occupation	1	2	2	1	10	0	5
	Social class/Area level socioeconomic status	0	1	0	0	11	0	1
	Deprivation	1	0	1	0	4	0	2
	Residence/living situation (e.g living in a home environment with moisture damage, house tenure)	2	0	0	0	7	2	10

Online supplemental file 1: SEARCH STRATEGY

Searched Ovid MEDLINE(R) ALL 1946 to November 23, 2021 on 24/11/2021

Search terms for systematic reviews found at http://extranet.santecom.qc.ca/wiki/!biblio3s/doku.php?id=concepts:revues-de-la-litterature-et-meta-analyses

	Search	Result
1	inequality.mp. or Socioeconomic Factors/	183584
2	inequalities.mp.	24364
3	protected characteristics.mp.	10
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12922
6	migrant$.mp. or "Transients and Migrants"/	26370
7	Sex Work/ or Sex Workers/ or sex work*.mp.	10781
8	Gypsy roma.mp.	18
9	Human immunodeficiency virus/	21059
10	acquired immune deficiency syndrome/	77137
11	infection/	40269
12	tuberculosis/	108757
13	parasitosis/	0
14	hepatitis/	22837
15	Vaccination/	90391
16	Immunization/	52361
17	Communicable Disease/	31146
18	infectious disease.ti,ab,kw.	39865
19	infection.ti,ab,kw.	1211775
20	tuberculosis.ti,ab,kw.	203159
21	hiv.ti,ab,kw.	331192
22	aids.ti,ab,kw.	156336
23	hepatitis.ti,ab,kw.	228655
24	"immuni*".ti,ab,kw.	342218
25	"vaccin*".ti,ab,kw.	354100
26	Communicable disease.ti,ab,kw.	4291

27 Parasitic disease.ti,ab,kw. 3780

28 infectious disease$.mp. or Communicable Diseases/ 145081

29 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or exp Review Literature as Topic/ or exp Review/ or Meta-Analysis as Topic/ or Meta-Analysis/ or "systematic review"/ 3165549

30 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 240954

31 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 2364192

32 30 and 31 32588

33 29 and 32 2822

34 social class.mp. or social class/ 48149

35 poverty.mp. or poverty/ 65773

36 income.mp. or income/ 162454

37 educational status.mp. or educational status/ 58473

38 economic status.mp. or economic status/ 15731

39 travellers.mp. 4716

40 rough sleeping.mp. 23

41 homelessness/ 8802

42 30 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 476015

43 sexually transmitted disease/ or STI.mp. 32214

44 AMR.mp. 5408

45 antimicrobial resistance.mp. or antibiotic resistance/ 85277

46 anti-microbial resistance.mp. 196

47 31 or 43 or 44 or 45 or 46 2444675

48 42 and 47 62612

49 29 and 48 8144

50 limit 49 to yr="2000 -Current" 7318

Embase Classic+Embase 1947 to 2021 November 23 searched on 24/11/2021

Searches		Results
1	inequality.mp. or Socioeconomic Factors/	159438
2	inequalities.mp.	26580
3	protected characteristics.mp.	18
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12270
6	migrant$.mp. or "Transients and Migrants"/	59556
7	Sex Work/ or Sex Workers/ or sex work*.mp.	14114
8	Gypsy roma.mp.	22
9	Human immunodeficiency virus/	125500
10	acquired immune deficiency syndrome/	136979
11	infection/	402825
12	tuberculosis/	162052
13	parasitosis/	24410
14	hepatitis/	67370
15	Vaccination/	179733
16	Immunization/	117275
17	Communicable Disease/	34287
18	infectious disease.ti,ab,kw.	50469
19	infection.ti,ab,kw.	1631799
20	tuberculosis.ti,ab,kw.	245043
21	hiv.ti,ab,kw.	426227
22	aids.ti,ab,kw.	190986
23	hepatitis.ti,ab,kw.	334114
24	"immuni*".ti,ab,kw.	440252
25	"vaccin*".ti,ab,kw.	438145
26	Communicable disease.ti,ab,kw.	5111
27	Parasitic disease.ti,ab,kw.	4822

28 infectious disease$.mp. or Communicable Diseases/ 150812

29 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 254578

30 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 3242281

31 29 and 30 37750

32 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or systematic review/ or "systematic review (topic)"/ or meta analysis/ or "meta analysis (topic)"/ 713296

33 31 and 32 1343

34 social class.mp. or social class/ 40328

35 poverty.mp. or poverty/ 64722

36 income.mp. or income/ 221004

37 educational status.mp. or educational status/ 90042

38 economic status.mp. or economic status/ 23383

39 travellers.mp. 6111

40 rough sleeping.mp. 30

41 homelessness/ 12187

42 29 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 588825

43 sexually transmitted disease/ or STI.mp. 62753

44 AMR.mp. 9242

45 antimicrobial resistance.mp. or antibiotic resistance/ 188533

46 anti-microbial resistance.mp. 289

47 30 or 43 or 44 or 45 or 46 3400990

48 32 and 42 and 47 4243

49 limit 48 to yr="2000 -Current" 4212

Searched Web of Science on 24/11/2021 (Web of Science Core Collection)

Inequalities related terms searched in topics and combined with title search for infectious diseases. This makes the search capture inequality related articles where inequalities are not necessarily mentioned in the title. Had to limit the infectious diseases to titles in order to focus on relevant papers.

#1	(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") (Topic) and Review (Document Type)	53,359
#2	("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance") (Title) and Review (Document Type)	64,026
#3	#1 AND #2 Timespan: 2000-01-01 to 2021-11-24 (Publication Date)	3,038

Searched Opengrey on 24112021

(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") AND ("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance")

145 articles retrieved with the search

Online supplementary file 2: Characteristics of Included Reviews

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Abraha, 2018 [58]	Switzerland	AMR-Gonorrhoea	1946-2017	No	24 (unclear)	1989-2017	✓	✓	
Adams, 2018 [75]	UK	Gastrointestinal Infection	1980 - 2015	Yes	77 (unclear)	1995-2015	✓	✓	
Aldridge, 2018 [46]	UK	Not specified	2005- 2015	Yes	337 (unclear)	not reported	✓		✓
Alividza,2018 [47]	UK	AMR	no date limit	No	19 (at least 2)	1998 to 2015		✓	
Arat, 2019 [116]	Sweden	Vaccination	not reported	No	15 (2)	2007-2017		✓	
Arum, 2021 [50]	UK	HIV, HCV	2000 - 2017	Yes	37 (6)	2000 – 2019			✓
Badri, 2021 [93]	Iran	Ocular toxocariasis	1966 - 2019	Yes	101 (4)	1966 - 2020	✓		
Behera, 2018 [76]	India	HIV	Not reported	No	Not reported	1989 - 2017	✓		
Beijer, 2012 [48]	UK	TB, HCV virus, and HIV	1980 - 2012	Yes	43 (4)	1984 - 2011	✓	✓	✓
Bocquier 2017 [118]	France	Vaccination	2000 - 2016	No	43 (5)	Not reported		✓	
Bonten, 2020 [77]	Netherlands	*Escherichia coli bacteraemia*	2007- 2018	Yes	210 (21)	2007-2018	✓		
Chan, 2017 [18]	Australia	TB	Inception- 2017	Yes	20 (1)	1990-2015			✓
Chen, 2019 [70]	China	HIV disease	unclear - 2019	Yes	101 (1)	1984-2017	✓		
Chernet,2017 [14]	Switzerland	Six selected infectious diseases	not reported	Yes	96 (unclear)	2000-2017			✓
Coffey, 2018 [113]	Australia	Group A Streptococcal infection, acute rheumatic fever	Unclear - 2016	No	91 (unclear)	1944 - 2016		✓	
Colledge, 2020 [74]	Australia	HCV	not reported	No	223 (16)	2008 -2017	✓	✓	
Cormier, 2019 [44]	Canada	TB/HIV	1980 - 2017.	No	475 (0)	1984-2017	✓	✓	✓
Crichton, 2015 [78]	UK	Genital chlamydia infection	Inception - 2014	Yes	36 (3)	not reported	✓	✓	
De Vito, 2017 [19]	Denmark	Vaccination	2007- 2017	No	35 +21 (4)	not reported		✓	✓
Denning, 2018 [79]	UK	Vulvovaginal candidiasis	1985 - 2016	Yes	8 (2)	2000-2013	✓		
Di Gennaro, 2017 [120]	Mozambique	TB - MDR	Inception - 2016	Yes	50 (1)	1997 - 2016		✓	
Ding, 2020 [114]	China	HBV	Inception - 2020	Yes	10 (0)	1995 - 2019		✓	
Dong, 2020 [94]	China	Cryptosporidium Infection	1960 - 2018	Yes	221 (unclear)	Unclear	✓	✓	
Dugan, 2021 [95]	USA	HCV	2000 - 2018	No	41 (unclear)	Unclear	✓		
Eilami, 2019 [104]	Iran	HIV/AIDS	2010 - 2017	Yes	54 (unclear)	2010-2017	✓		
Fakoya, 2015 [71]	UK	HIV	2002- 2014	No	27 (9)	2003-2014	✓		
Falagas, 2008 [59]	Greece	Vaccination	Not reported	No	39 (1)	1979-2005	✓	✓	
Falla, 2018 [20]	Netherlands	Chronic HCV	2000-2015	No	Part 1: 18 (unclear) Part 2: 56 (1)				✓
Faria, 2021 [96]	Brazil	Vaccination	Inception-2020	Yes	31 (0)	2001 -2020	✓	✓	
Fauroux, 2017 [105]	Spain	Respiratory Syncytial Virus	1995 - 2015	No	74 (8)	Unclear	✓	✓	
Faustini, 2005 [21]	Italy	TB (MDR)	1993-2003	Yes	29 (3)	1995-2005	✓		✓
Fernández, 2015 [60]	Denmark	Vaccination: HPV	not reported	No	23(8)	2008-2014	✓	✓	
Fisher, 2013 [61]	UK	Vaccination: HPV	Inception- 2012	Yes	27(1)	2008-2012	✓	✓	
Forshaw, 2017 [117]	UK	Vaccination	1990 - 2016	Yes	37(0)	1990- 2015	✓	✓	
Fournet, 2018 [8]	Netherlands	Vaccination	1950- 2013	No	48/15 (at least 1)	not reported	✓		✓
Ghiasvand, 2020 [80]	Iran	HIV/AIDS	Inception - 2017	Yes	19 (0)	2005 - 2017	✓	✓	
Gorjana, 2017 [62]	Australia	HPV Vaccination	Unclear - 2015	No	18 (1)	2010 - 2015	✓		

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Greenaway, 2015 [22]	Canada	HCV	not reported	Yes	50(0)	1990-2013	✓	✓	✓
Hahne, 2013 [24]	The Netherlands	HBV and HCV	2000 - 2009	No	124 (9)	Unclear	✓		✓
Hermann, 2019 [81]	Canada	Vaccination	2000- 2017	No	33 (15)	2001-2016	✓		
Jackson, 2021 [38]	Ireland	Tuberculosis and MDR-TB	Unclear - 2020	Yes	32 (3)	2010 - 2018			✓
Jain, 2017 [25]	UK	Vaccination	not reported	Yes	35 (5)	1997 and 2015	✓	✓	✓
Jin, 2020 [72]	Australia	HCV	2000 - 2019	Yes	194 (at least 14)	Unclear			✓
Kabapy, 2020 [39]	Egypt	HIV	1982 - 2018	Yes	231 (unclear)	Unclear	✓	✓	✓
Kawatsu, 2014 [26]	Japan	TB	Not reported	No	18 (1)	1997 - 2012	✓	✓	✓
Kentikelenis, 2015 [27]	UK	Various	2007 - 2014	No	21 (unclear)	not reported		✓	✓
Lafond, 2021 [97]	USA	Influenza-associated lower	1996 –2016	Yes	75 (Unclear)	1996 - 2016	✓		
Larson, 2014 [115]	UK	Vaccination	unclear - 2012	No	1164 (at least one)	2007–2012		✓	
Leumi, 2020 [56]	Cameroon	Hepatitis B	1990 - 2017	Yes	358 (unclear)	Unclear	✓		✓
Leung,2019 [106]	Australia	HIV, HBV, HCV	2008 - 2017	Yes	104(unclear)	not reported	✓		
Li, P. 2020 [82]	Netherlands	HEV	inception - 2019	Yes	419(7)	not reported	✓	✓	
Lindsay,2015 [83]	Belgium	Norovirous disease	2003 - 2013	No	39 (4)	not reported	✓		
Lucyk, 2019 [119]	Canada	Vaccination- Influenza	2012 - 2017	No	42 (1)	2012- 2017		✓	
Ly, 2021 [51]	France	Various	1980 - 2020	No	81 (4)	Unclear	✓	✓	✓
Macina, 2021 [98]	France	Bordetella pertussis	1990 - 2019	No	88 (7)	Unclear	✓		
Malerba, 2015 [63]	Italy	Vaccination	2000 - 2014	No	11 (1)	2003-2014	✓	✓	
McBride, 2021 [40]	Canada	HIV/STI	2009 - 2019	No	29 (unclear)	Not reported	✓		✓
Millett, 2012 [64]	USA	HIV disease	1981 - 2011	Yes	194 (13)	1981-2011	✓	✓	
Mipatrini, 2017 [28]	Italy	Vaccination	2005-2016	No	58 (7)	not reported			✓
Mirzadeh, 2021 [99]	Iran	Trichomonas vaginalis	1985 - 2020.	Yes	85 (2)	1985 - 2020	✓		
Morais, 2017 [29]	Portugal	*Helicobacter pylori*	inception - 2015	No	28 (unclear)	1988-2014			✓
Nagata, 2013 [65]	Switzerland	vaccination- Influenza	1980 - 2011	No	80 (7)	not reported	✓	✓	
Najafizada, 2020 [121]	Canada	MDR-TB	1998-2018	No	15(4)	Not reported		✓	
Nava-Aguilera, 2009 [49]	Mexico	TB	unclear - 2005	Yes	30 (1)	1994 - 2008	✓	✓	✓
Nellums, 2018*b* [42]	UK	AMR	2000- 2017	Yes	23 (0)	2006-2016			✓
Newman, 2015 [111]	USA	Foodborne infectious diseases	1980 - 2013	No	16 (3)	not reported	✓	✓	
Nourollahpour Shiadeh, 2020 [110]	Iran	Toxoplasmosis	Inception -2020	Yes	14 (0)	2001- 2019	✓		
Offer, 2015 [66]	UK	TB	1990 - unclear	No	18 (18)	1999-2013	✓	✓	
Okoli, 2020 [30]	Canada	Influenza vaccination	Unclear - 2020	Yes	34 (1)	2004 - 2019	✓	✓	✓
Okoli, 2021 [69]	Canada	Influenza vaccination	2000 - 2020	Yes	36 (2)	2010-2020	✓	✓	
Oldenburg, 2014 [73]	USA	HIV	2004 - 2013	Yes	88 (1)	not reported	✓		✓
Oldenburg, 2015 [52]	USA	HIV	2004 - 2013,	Yes	33 (0)	2004-2013			✓
Operario, 2008 [53]	UK	HIV	1980 -2007	Yes	25 (0)	1988- 2006.	✓		✓
Pega 2021 [41]	Switzerland,	HIV	2010- 2020	Yes	19(1)	2010-2019			✓

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Platt, 2013a [31]	UK	HIV, STIs	Not reported	No	26 (1)	Not reported			✓
Platt, 2013b [32]	UK	HIV, STIs	2005 - 2011	No	73 (5)	Not reported			✓
Possenti, 2016 [84]	Italy	Cystic Echinococcosis	not reported	Yes	37(0)	1964-2014	✓	✓	
Prost, 2007 [33]	UK	HIV	Unknown - 2005	No	138 (unclear)	1996 -2005	✓		✓
Pulver, 2016 [107]	Canada	Vaccination	1980 - 2014	No	12 (1)	1993 - 2013	✓		✓
Richterman, 2018 [85]	USA	Cholera	not reported	Yes	110 (0)	1974-2017	✓	✓	
Rodrigo, 2010 [112]	Sri Lanka	HIV	1999 -2009	No	98 (unclear)	not reported		✓	
Roller-Wirnsberger, 2021 [100]	Austria	Influenza vaccination	2012- 2019	No	44 (at least 1)	2012-2018	✓	✓	
Rossi, 2012 [34]	Canada	HBV	Inception - 2011	Yes	110 (2)	1977 - 2011			✓
Rostami, 2019a [87]	Iran	Toxocariasis	1980 - 2019	Yes	250 (2)	1980 -2019	✓	✓	
Rostami, 2019b [86]	Iran	Acute Toxoplasma infection	1988 - 2018	Yes	217 (3)	1988 - 2018	✓		
Rostami, 2021 [101]	Iran	Toxoplasmosis	1980-2020	Yes	150 (2)	1987-2020	✓	✓	
Salgado-Barreira, 2014 [122]	Spain	HIV	unclear -2012	No	24 (1)	1983- 2010		✓	
Sandgren, 2014 [23]	Sweden	TB	1990- 2012	Yes	15 (1)	not reported			✓
Schepisi, 2018[88]	Italy	TB	unclear - 2017	Yes	74 (13)	1950-2017	✓		
Schierhout, 2020 [89]	Australia	HTLV-1	1910 - 2018	Yes	39 (0)	1991 - 2018	✓		
Song, 2021 [102]	China	Drug resistant TB (MDR-TB)	2000-2020	Yes	37 (2 at least)	2000-2019	✓		
Spyromitrou-Xioufi, 2020 [90]	Greece	Meningococcal Infection	2008 - 2018	Yes	6 (0)	1999-2017	✓	✓	
Stockdale, 2020 [54]	UK	HDV	1998 - 2019	Yes	282 (at least 1)	not reported			✓
Strifler, 2015 [91]	Canada	Meningococcal Infection	inception - 2013	No	17 (6)	1982-2012	✓		
Suhrcke, 2011 [35]	UK	Various	1947 - 2010	No	37 (2)	not reported		✓	✓
Sultana, 2021 [103]	Bangladesh	HIV and MDR-TB	2010 - 2020	Yes	54 (0)	2010 - 2020	✓		
Tabacchi, 2016 [67]	Italy	Vaccination- MMR	not reported	Yes	45 (19)	2000-2014	✓	✓	
Tauli, 2016 [36]	Brazil	Vaccination	1992- 2014	No	23(0)	not reported	✓	✓	✓
Tavares, 2017 [37]	Portugal	HIV-TB	2000 - 2016	No	27 (2)	2003 - 2016			✓
Tollefson, 2013 [45]	USA	TB	1990 – 2011	No	91 (0)	1990 - 2012			✓
Van Gerwen, 2020 [108]	USA	STI/HIV	1968 - 2018	Yes	25 (0)	not reported	✓		
Vet, 2015 [55]	The Netherlands	Vaccination	Inception-2014	No	18 (0)	not reported	✓	✓	✓
Vukovic,2019 [123]	Italy	Influenza vaccination	Unknown - 2017	No	12 (6)	2004 - 2017		✓	
Wayal, 2018 [68]	UK	STI	Unclear - 2016	No	15 (15)	2000 - 2017	✓		
Whelan, 2021 [109]	The Netherlands	Gonorrhoea	2010 - 2019	No	174 (1)	Unclear	✓		
Wu, 2021 [57]	China	HPV	1990-2019	Yes	107 (0)	1989-2019	✓		✓
Yu, 2020 [43]	USA	HIV/STI	Unclear - 2019	No	21 (0)	2008 -2017			✓
Zamani, 2018 [92]	Iran	*Helicobacter pylori*	2000 - 2017	Yes	183 (2)	not reported	✓		

Online supplemental file 3: EVIDENCE MATRIX

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Protected characteristics	Age	Nava-Aguilera, 2009 (1) Schepisi, 2018 (13)	Ghiasvand, 2020 (0) Behera, 2018 (unclear) Sultana, 2021 (0)	Crichton,2015 (3) Denning, 2018 (2) Wu, 2021 (0) Mirzadeh, 2021 (2)	Colledge, 2020 (16) Greenaway, 2015 (0) Dugan, 2021 (unclear)	Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Hermann, 2019 (15) Tauli, 2016 (0) Malerba, 2015 (1) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3) Song, 2021 (at least 2) Sultana, 2021 (0)	Leumi, 2020 (unclear) Macina, 2021 (7) Lafond, 2021 (unclear) Dong, 2020 (unclear) Bonten, 2020 (21) Ly, 2021 (4) Li, 2020 (7) Rostami, 2019a (2) Rostami, 2019b (3) Rostami, 2021 (2) Badri, 2021 (4) Schierhout, 2020 (0) Adams, 2018 (unclear, at least 1) Zamani, 2018 (2) Lindsay, 2015 (4) Possenti, 2016 (0) Richterman, 2018 (0) Strifler, 2015 (6) Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sex	Beijer, 2012 (4) Nava-Aguilera, 2009 (1)	Beijer, 2012 (0) Operario, 2008 (0) Van Gerwen, 2020 (0) Leung, 2019 (unclear) Eilami, 2019 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)	Crichton,2015 (3) Van Gerwen, 2020 (0) Whelan, 2021 (1) McBride, 2021 (unclear)	Beijer, 2012 (1) Colledge, 2020 (16) Leung, 2019 (unclear)	Pulver, 2016 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3)	Leung, 2019 (unclear) Aldridge,2018 (unclear, at least 1) Ly, 2021 (4) Spyromitrou-Xioufi, 2020 (0) Possenti, 2016 (0) Richterman, 2018 (0) Rostami, 2021 (2) Schierhout, 2020 (0) Fauroux, 2017 (8) Rostami, 2019a (2) Badri, 2021 (4) Li, 2020 (7)
	Marriage and civil partnership					Okoli, 2020 (1) Nagata, 2013 (unclear, at least 1) Jain, 2017 (5) Tabacchi, 2016 (19) Okoli, 2021 (2) Faria, 2021 (0)		
	Pregnancy and maternity				Hahne, 2013 (9) Greenaway, 2015 (0)			Hahne, 2013 (9) Leumi, 2020 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
								Nourollahpour Shiadeh, 2020 (0)
	Race (or ethnicity)	Nava-Aguilera, 2009 (1) Offer, 2015 (18)[α] Kawatsu, 2014 (1)	Millett, 2012 (13) Prost, 2007 (unclear, at least 3)	Wayal, 2018 (15)[α]		Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2)	Abraha, 2018 (unclear, at least 1)	Ly, 2021 (4)
	Religion or belief					Fisher, 2013 (1) Jain, 2017 (5) Fournet, 2018 (unclear, at least 1) Malerba, 2015 (0) Falagas, 2008 (1)		Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sexual orientation		Fakoya, 2015 (9) Oldenburg, 2014 (1) Operario, 2008 (0) Chen, 2019 (1)		Hahne, 2013 (9) Jin, 2020 (at least 14)		Abraha, 2018 (unclear, at least 1)	Hahne, 2013 (9) Leumi, 2020 (unclear) Ly, 2021 (4) Stockdale, 2020 (unclear, at least 1)
	Gender reassignment		Operario, 2008 (0)					Leumi, 2020 (unclear)
	Disability							Newman, 2015 (3)
Inclusion Health Groups	Vulnerable migrants		Yu, 2020 (0)	Yu, 2020 (0)	Chernet,2017 (unclear) Greenaway, 2015 (0)	Mipatrini, 2017 (7) De Vito, 2017 (4)	Nellums, 2018 (0)	Rossi, 2012 (2) Chernet,2017 (unclear) Mipatrini, 2017 (7) Chernet,2017 (unclear)
	General migrants	Tavares, 2017 (2)[β] Chan, 2017 (1) Kawatsu, 2014 (1) Sandgren, 2014(1) Jackson, 2021 (3)	Tavares, 2017 (2)[β] Platt, 2013a (1) Platt, 2013b (5) Prost, 2007 (unclear, at least 3) Kentikelenis, 2015	Platt, 2011a (1) Platt, 2013b (5) Kentikelenis, 2015 (unclear) McBride, 2021 (unclear)	Hahne, 2013 (9) Chernet,2017 (unclear) Greenaway, 2015 (0) Kentikelenis, 2015 (unclear) Falla, 2018 (1)	Okoli, 2020 (1) Mipatrini, 2017 (7) De Vito, 2017 (4) Jain, 2017 (5) Tauli, 2016 (0)	Faustini, 2005 (3) Jackson, 2021 (3)	Rossi, 2012 (2) Hahne, 2013 (9) Chernet,2017 (unclear) Kentikelenis, 2015 (unclear) Suhrcke, 2011 (unclear) Morais, 2017 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
			(unclear) Pega 2021 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)					
	People experiencing homelessness and rough sleeping	Beijer, 2012 (4) Nava-Aguilera, 2009 (1) Kawatsu, 2014 (1)	Beijer, 2012 (0) Arum, 2021 (6)		Beijer, 2012 (1) Arum, 2021 (6)		Alividza, 2018 (unclear, at least 2)	Aldridge,2018 (unclear, at least 1) Suhrcke, 2011 (unclear) Ly, 2021 (4)
	People who engage in sex work		Yu, 2020 (0) Oldenburg, 2015 (0) Operario, 2008 (0) Kabapy, 2020 (unclear)	Yu, 2020 (0) Wu, 2021 (0)		Vet, 2015 (0)		Leumi, 2020 (unclear) Stockdale, 2020 (unclear, at least 1)
	Gypsy Roma/ Traveller communities /Indigenous people	Tollefson, 2013 (0) Cormier 2019 (0)				Fournet, 2018 (unclear, at least 1)		

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Socioeconomic inequalities	Level of education/income	Kawatsu, 2014 (1)	Rodrigo, 2010 (unclear) Ghiasvand, 2020 (0) Millett, 2012 (13) Kabapy, 2020 (unclear)	Crichton,2015 (3)		Vet, 2015 (0) Larson, 2014 (at least one) Okoli, 2020 (1) Arat, 2019 (2) Fernández, 2015 (8) Forshaw, 2017 (0) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Jain, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Di Gennaro, 2017 (1) Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ding, 2020 (0) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Spyromitrou-Xioufi, 2020 (0) Dong, 2020 (unclear) Suhrcke, 2011 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Employment /occupation	Kawatsu, 2014 (1)	Kentikelenis, 2015 (unclear) Millett, 2012 (13)	Crichton,2015 (3) Kentikelenis, 2015 (unclear)	Kentikelenis, 2015 (unclear)	Arat, 2019 (2) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Faria, 2021 (0)		Kentikelenis, 2015 (unclear) Li, 2020 (7) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Social class/Area level socioeconomic status		Salgado-Barreira, 2014 (1)[v]			Arat, 2019 (2) Okoli, 2020 (1) Fernández, 2015 (8) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) Jain, 2017 (5) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021		Salgado-Barreira, 2014 (1)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Deprivation	Offer, 2015 (18)[α]		Crichton,2015 (3)		Vukovic, 2019 (6) Fisher, 2013 (1) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1)		Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Residence/living situation (e.g urban vs rural, living in a home environment with moisture damage, house tenure)	Nava-Aguilera, 2009 (1) Cormier 2019 (0)				Okoli, 2020 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Tauli, 2016 (0) Okoli, 2021 (2) Faria, 2021 (0)	Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ly, 2021 (4) Dong, 2020 (unclear) Spyromitrou-Xioufi, 2020 (0) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Coffey, 2018 (unclear) Rostami, 2021 (2) Fauroux, 2017 (8) Rostami, 2019a (2)

Online supplemental file 4: ASSESSMENT OF INDIVIDUAL REVIEWS USING ASSESSMENT OF MULTIPLE SYSTEMATIC REVIEWS VERSION 2 (AMSTAR2) CHECKLIST

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tavares, 2017	Y	N	Y	P Y	N	N	N	Y	N	N	N M C	N M C	Y	N	N M C	Y
Tollefson, 2013	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Vet, 2015	Y	N	N	P Y	N	N	N	P Y	Y	N	N M C	N M C	Y	N	N M C	Y
Beijer 2012	Y	N	N	P Y	N	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Behera, 2018	Y	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Vukovic, 2019	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	N	N M C	Y
Platt, 2013a	Y	N	N	P Y	N	N	N	Y	P Y	N	N M C	N M C	Y	Y	N M C	Y
Platt, 2013b	Y	N	N	Y	N	N	N	N	P Y	N	N M C	N M C	Y	Y	N M C	Y
Prost, 2007	Y	N	N	Y	N	N	N	P Y	N	N	N M C	N M C	N	N	N M C	N
Pulver, 2016	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Rossi, 2012	Y	P Y	N	Y	Y	Y	N	P Y	N	N	Y	N	N	Y	N	Y
Rostami, 2019	Y	Y	N	P Y	N	Y	N	P Y	N	N	Y	N	Y	Y	Y	Y
Di Gennaro, 2017	Y	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Fauroux, 2017	Y	P Y	N	Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hahne, 2013	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Jin, 20	Y	Y	N	P Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Larson, 2014	N	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Nava-Aguilera, 2009	N	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Okoli, 2020	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Schierhout, 2020	N	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Wayal, 2018	Y	N	N	Y	N	Y	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Yu, 2020	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Gorjana, 2017	Y	N	N	P Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Rodrigo, 2010	Y	N	N	P Y	N	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Rostami, 2019b	Y	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Coffey, 2018	Y	N	N	P Y	N	N	N	N	Y	N	N M C	N M C	N	Y	N M C	N
Ghiasvand, 2020	Y	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Cormier 2019	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Abraha, 2018	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	Y	N M C	N

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Adams, 2018	Y	Y	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	N
Aldridge, 2018	N	N	N	N	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Alividza, 2018	Y	N	N	P Y	Y	N	N	Y	Y	N	N M C	N M C	Y	N	N M C	Y
Arat, 2019	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	Y
Chan, 2017	Y	N	N	N	Y	Y	N	N	Y	N	Y	Y	Y	Y	N	Y
Chernet,2017	N	N	N	P Y	Y	N	N	N	N	N	N	N	N	Y	N	Y
Colledge, 2020	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Crichton,2015	Y	P Y	Y	P Y	N	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Eilami, 2019	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	Y	Y
Fakoya, 2015	Y	P Y	N	P Y	Y	N	N	P Y	N	N	N M C	N M C	Y	N	N M C	Y
Faustini, 2005	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y
Fernández, 2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	Y	Y	N	N M C	Y
Forshaw, 2017	Y	N	N	P Y	Y	N	N	Y	P Y	N	Y	N	Y	Y	Y	Y
Fisher, 2013	Y	N	N	P Y	N	N	N	Y	N	N	Y	Y	Y	Y	N	Y
Greenaway, 2015	Y	N	N	P Y	N	N	N	N	Y	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sandgren, 2014.	Y	N	N	P Y	Y	Y	N	Y	N	N	Y	N	N	Y	N	N
Schepisi, 2018.	Y	Y	N	P Y	Y	N	N	N	Y	N	Y	N	N	Y	N	Y
Suhrcke, 2011.	Y	N	N	Y	Y	Y	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Stockdale, 2020.	Y	Y	N	Y	Y	Y	N	N	P Y	N	Y	Y	Y	Y	N	Y
Tabacchi	Y	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y	Y	Y
Strifler	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	Y	N M C	N
Nagata, 2011	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Nellums, 2018	Y	Y	N	P Y	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	N	Y
Newman, 2015	Y	Y	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Oldenburg, 2014	Y	P Y	N	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y
Oldenburg_2015	Y	N	N	P Y	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Operario 2008	Y	N	N	Y	Y	Y	N	N	P Y	N	Y	N	N	Y	Y	N
Offer_2015	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	N
Mipatrini, 2017	N	N	Y	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Lucyk, 2019.	N	N	N	N	Y	N	N	P Y	P Y	N	N M C	N M C	Y	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
De Vito, 2017	Y	N	Y	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	N
Bocquier, 2017	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	Y	Y	N M C	Y
Morais, 2017	Y	Y	N	N	Y	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Spyromitrou-Xioufi, 2020	Y	N	N	N	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	Y	Y
Van Gerwen, 2020	Y	N	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Zamani, 2018.	N	N	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	Y
Jain, 2017	Y	N	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Kentikelenis, 2015	Y	N	N	Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Li, P. 2020	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Leung,2019	Y	Y	N	Y	N	N	N	P Y	N	N	Y	N	N	Y	N	Y
Lindsay,2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Salgado-Barreira	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Fournet, 2018.	N	N	N	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Bonten et al., 2020	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Chen et al., 2019	N	N	N	P Y	N	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Denning et al., 2018	N	N	N	Y	Y	N	N	P Y	P Y	N	Y	Y	N	N	N	Y
Falagas & Zarkadoulia, 2008	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	Y	N M C	N
Falla et al., 2018	N	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Hermann et al., 2019	Y	Y	N	Y	Y	N	N	N	Y	N	N M C	N M C	Y	Y	N M C	N
Millett et al., 2012	Y	N	N	Y	N	N	N	N	N	N	Y	N	Y	N	N	Y
Kawatsu, 2014	Y	N	N	N	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	Y
Possenti, 2016	N	N	N	P Y	N	Y	N	N	P Y	N	Y	Y	Y	Y	Y	Y
Richterman, 2018	Y	N	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Tauli, 2016	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Malerba, 2015	Y	N	N	Y	Y	Y	N	P Y	N	N	N M C	N M C	N	N	N M C	Y
Leumi, 2020	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Arum, 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Mirzadedh, 2021	Y	N	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Macina, 2021	Y	N	N	Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ly, 2021	Y	Y	N	Y	Y	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Lafond, 2021	Y	P Y	N	Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
McBride	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ding 2020	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Sultana 2021	Y	Y	N	N	Y	Y	P Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Whelan 2021	Y	N	N	N	Y	N	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Faria 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Jackson 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Badri 2021	Y	N	N	N	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Dugan 2021	Y	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	Y	N	N M C	Y
Kabapy 2020	Y	Y	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Dong 2020	Y	N	Y	N	Y	Y	N	N	Y	N	Y	N	Y	N	N	Y
Najafizada, 2020	N	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nurollahpour Shiadeh, 2020	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	N	Y
Pega 2021	Y	P Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N
Rostami 2021	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Song, 2021	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Wu 2021	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Okoli 2020	Y	N	N	N	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Roller-Wirnsberger 2021	Y	N	Y	P Y	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	N

Key: Y=Yes; N=No, P Y = Partial yes and N M C = No meta-analysis conducted

AMSTAR 2 Items:

1. Did the research questions and inclusion criteria for the review include the components of PICO?

2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?

3.Did the review authors explain their selection of the study designs for inclusion in the review?

4.Did the review authors use a comprehensive literature search strategy?

5.Did the review authors perform study selection in duplicate?

6.Did the review authors perform data extraction in duplicate?

7.Did the review authors provide a list of excluded studies and justify the exclusions?

8.Did the review authors describe the included studies in adequate detail?

9.Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?"

10. Did the review authors report on the sources of funding for the studies included in the review?

11.If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?"

12.If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

13.Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?"

14.Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?"

15.If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?"

16.Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?"

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1, Page 4
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 4
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6, Table 1
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 5 online supplemental file 1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 5
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 6-7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 6-7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 6-7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8 - 13
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 7
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 7
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 7, Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 7
Study characteristics	17	Cite each included study and present its characteristics.	online supplemental file 2 and 3, Page 7-13
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 8, Figure 3, online supplemental file 4
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 7-13, online supplemental file 2 and 3
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 7-13
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 13-15
	23b	Discuss any limitations of the evidence included in the review.	Page 14-15
	23c	Discuss any limitations of the review processes used.	Page 14-15
	23d	Discuss implications of the results for practice, policy, and future research.	Page 13-15
OTHER INFORMATION			
Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 5

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
protocol	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 5
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 16
Competing interests	26	Declare any competing interests of review authors.	Page 16
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Online supplemental files

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

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Health Inequalities in Infectious Diseases: A Systematic Overview of Reviews

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ABSTRACT:

Objectives: The aim of this systematic overview of reviews was to synthesise available evidence on inequalities in infectious disease based on three dimensions of inequalities; inclusion health groups, protected characteristics, and socioeconomic inequalities.

Methods: We searched Medline, Embase, Web of Science and Open Grey databases in November 2021. We included reviews published from the year 2000 which examined inequalities in the incidence, prevalence or consequences infectious diseases based on the dimensions of interest. Our search focused on tuberculosis, human immunodeficiency virus, sexually transmitted infections, Hepatitis C, vaccination, and antimicrobial resistance. However, we also included eligible reviews of any other infectious diseases. We appraised the quality of reviews using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist. We conducted a narrative data synthesis.

Results: We included 108 reviews in our synthesis covering all the dimensions of inequalities for most of the infectious disease topics of interest, however the quality and volume of review evidence and consistency of their findings varied. The existing literature reviews provides strong evidence that people of inclusion health groups and lower socio-economic status are consistently at higher risk of infectious diseases, antimicrobial resistance, and incomplete/delayed vaccination. In the protected characteristics dimension, ethnicity and sexual orientation are important factors contributing to inequalities across the various infectious disease topics included in this overview of reviews.

Conclusion: We identified many reviews that provide evidence of various types of health inequalities in different infectious diseases, vaccination, and antimicrobial resistance. We also highlight areas where reviews may be lacking. The commonalities in the associations and their directions suggest it might be worth targeting interventions for some high risk-groups that may have benefits across multiple infectious disease outcomes rather than operating purely in infectious disease siloes.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The protocol used for this systematic overview of reviews was pre-designed and registered in advance.
- We had wide inclusion criteria including various dimensions of inequalities across several key infectious diseases, providing a broad overview of inequalities in infectious diseases, especially those relevant to high-income countries.
- This overview focussed on tuberculosis, human immunodeficiency virus, sexually transmitted infections, Hepatitis C, vaccination, and antimicrobial resistance, however, we also included evidence from other infectious diseases except COVID-19.
- We used AMSTAR2 to assess the methodological quality of each of the included reviews, however, some of the included reviews are not systematic reviews for which AMSTAR2 was designed.
- Because this is an overview of reviews, we are unable to incorporate evidence within primary studies that have not been synthesised in reviews, which means there may be evidence we are missing.

INTRODUCTION

The World Health Organisation regards experiencing the highest possible standard of health as a fundamental human right of every individual regardless of personal or social circumstances [1]. Nevertheless, avoidable inequalities exist in the prevalence of diseases and illnesses, general health status, and access to health care between various social groups [2]. A complex interaction between structural (for example, income and wealth distribution) and individual-level (for example, health behaviours and living conditions) determinants of health contributes to the increased vulnerability to poorer health among particular social groups [3, 4].

Infectious diseases pose a significant health burden with substantial health inequalities globally [5]. In the United Kingdom (UK), infectious diseases constitute 7% of deaths alongside 4% of lost life years [6]. The economic burden of infectious diseases in the UK is estimated to be around £30 billion per year [6]. Although infectious diseases impose substantial, negative health and economic consequences within populations, many infectious diseases are vaccine-preventable and avoidable through adequate control measures [7]. However, some groups remain under vaccinated [8] and other control measures may be difficult or impossible to implement for some, depending on circumstances [9]. Traditionally, policy makers often target infectious diseases individually, but it is known that specific groups are often at higher risks regardless of specific infectious diseases [10-14]. In efforts to tackle the observed disparities and to reduce the burden of infectious diseases, a strategic approach that tackles infectious diseases among high-risk groups is required [15]. To inform the development of needs-tailored public health policies and initiatives to achieve this goal, a comprehensive synthesis of evidence is required, highlighting the inequalities in infectious diseases according to varying personal and social characteristics.

This project was commissioned by Public Health England (PHE) to gain an overview of the available evidence on health inequalities relating to key infectious disease topics in the UK from a population perspective. PHE had specific interest in three dimensions of inequalities; inclusion health groups (socially excluded and vulnerable populations), protected characteristics, and socioeconomic inequalities. The infectious disease topics of interest were TB, HIV, STIs, HCV, vaccination, and antimicrobial resistance (AMR). Therefore, the aim of this systematic overview of reviews was to describe the existing literature, relevant to the UK, relating to inequalities in the prevalence/incidence of key infectious disease topics as specified by PHE.

METHODS

We conducted a systematic overview of reviews, pre-registered in PROSPERO, an international prospective register of systematic reviews (2020 CRD42020220203 https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020220203).

Patient and public involvement

This study had no direct patient or public engagement.

Search strategy and study selection

We developed a search strategy using synonyms and MeSH terms for inequalities, inclusion health groups, protected characteristics and socioeconomic factors which were combined with synonyms and MeSH terms for infectious diseases and synonyms for reviews (online supplemental file 1). We searched electronic databases from inception to November 2021; Medline, Embase, Web of Science and to identify relevant grey literature we searched Open Grey database (http://www.opengrey.eu/) and contacted experts in our network.

We exported citations into Endnote, removed duplicates and then exported them into a web-tool, Rayyan (https://www.rayyan.ai/) to facilitate citation screening. Articles were screened against pre-defined eligibility criteria (Table 1). Titles and abstracts were screened by a single reviewer and 10% were double screened by a second reviewer. Full texts of the potentially relevant articles were obtained and screened independently by two reviewers. Discrepancies were resolved by discussion.

Table 1: Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
Population: Review including studies from the UK population or other high-income countries. *Exposure*: • Socioeconomic status: this includes education, income, occupation, social class, and deprivation measured at individual or aggregated level. • Protected characteristics: age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation. • Inclusion health groups: vulnerable migrants, people experiencing homelessness and rough sleeping, people who engage in sex work, and Gypsy Roma and Traveller communities. *Outcome*: Inequalities relating to incidence, prevalence, and consequences of infectious diseases. Despite specific interest in TB, HIV, STIs, HCV, immunisation, and AMR, we included reviews relating to any infectious diseases, except reviews focused on COVID-19. *Types of reviews*: Any literature review which reports all the following (a) explicit objectives, (b) clear search strategies and (c) eligibility criteria. *Publication date*: Published from the year 2000 onwards. *Language*: No language restrictions.	We excluded reviews of qualitative studies and articles that are not systematic reviews as defined above. We excluded review protocols, but we searched the titles to check if the findings had been published. We excluded reviews on COVID-19, as advised by PHE, to avoid overlap with other reviews. We also excluded articles focussed on travel-related infections. Reviews which excluded the UK in their eligibility criteria or had not included populations relevant to the UK population (for example, papers where all results were from low-income countries) were excluded.

Data extraction

We designed and piloted a data extraction form in Microsoft Excel to extract information including: first author's last name, publication year, corresponding author's country, review methodology,

inclusion and exclusion criteria, infectious disease(s), population(s) included, dimension(s) of inequality, outcomes, conclusions, and strengths and limitations. Data extraction was performed by one reviewer and checked by another.

Quality assessment

Two reviewers independently assessed review quality using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR2) checklist [16]. Disagreements were resolved by discussion. Due to the multidimensional nature of this overview of reviews, inclusion of various types of reviews with diverse aims and outcomes, we did not perform overall rating of confidence for each review. To provide a sense of overall quality of evidence, we calculated the proportion of reviews which fulfilled each AMSTAR-2 item.

Data synthesis

We tabulated the dimension of inequalities against the infectious disease topic to create an evidence matrix which was used to highlight areas where reviews already exist and where there may be gaps. Data were synthesised narratively based on the dimensions of inequalities.

RESULTS

Figure 1 shows the study selection. We retrieved 14713 citations from the electronic database searches and 11135 titles and abstracts were screened after the removal of duplicates. One of the experts we contacted sent an article which highlighted UK-based evidence for several inclusion health groups, but did not fulfil other criteria for inclusion [17]. After examining 437 full text articles against the eligibility criteria, 108 were included in our synthesis.

Characteristics of included reviews are summarised in online supplemental file 2. Included reviews were published between 2005-2020 with 95% published after 2010. Fifty-eight (54%) included meta-analysis while the remaining studies used narrative/descriptive synthesis approaches. The reviews covered the three dimensions of inequalities across various infectious disease topics. A summarised version of the evidence matrix, showing how many reviews were identified for each cell is presented in Figure 2. The full evidence matrix is presented in online supplemental file 3.

Methodological quality of included reviews

Assessment of the methodological quality of each included review is presented in online supplemental file 4 and the proportion of included reviews that met each AMSTAR2 Criteria are presented in Figure 3. Many reviews fulfilled criteria such as including components of PICOS in their research questions and inclusion criteria (87%), performing duplicate study selection (55%), discussing heterogeneity (70%) and disclosure of conflicts of interest (83%). Only a few of the reviews (19%) clearly indicated that the review methods were established *a priori* and 37% performed risk of bias assessment using satisfactory techniques. Although only 24% of the included reviews were judged to have comprehensive literature search, 59% were classed as "partial yes" for literature search often due to lack of grey literature searches. Justification of the exclusions for each excluded study were not presented and none reported funding sources for included studies. These two criteria are more common among Cochrane reviews of interventions and are generally omitted from most published non-Cochrane reviews.

Evidence Relating to Inclusion Health Groups

Of the 108 included reviews, 43 reported on inclusion health groups. The evidence is generally consistent across these groups showing that people who belong to inclusion health groups are often at higher risk of infectious diseases, AMR and under-vaccination. For example, many reviews reported on general migrants [14, 18-41], and vulnerable migrants such as asylum seekers, refugees, and trafficked sex workers [14, 19, 22, 28, 34, 42, 43]. The reviews often reported that migrants have a higher risk of infectious diseases than the host population, though the magnitude of the association may vary for different geographical regions and different infectious diseases. For example, in the UK, 35% of people with chronic HCV are migrants despite being just 9% of the general population [20]. Other reviews showed that HIV and STIs were more prevalent among migrants [31, 32]. The prevalence of HIV-TB co-infection was higher among immigrants compared with nationals in various countries including England and Wales although the immigrant group reported slightly better survival/lower mortality which authors commented may be due to the possible healthy migrant effect [37]. In another review, migrants were reported to be at higher risk of TB death [26]. Evidence from the UK showed an increasing number of migrants contracted HIV after they arrived in the UK between 2002-2011 suggesting that the higher prevalence of infectious diseases among migrants is not limited to pre-migration infection [27]. A meta-analysis showed that refugees were more likely to have chronic HBV compared to general migrants (Odds ratio (OR) 1.42 95% CI 1.01 to 1.99) [34].

Some reviews reported no clear evidence that immigrant sex workers had higher risk of HIV and STIs compared with non-migrant sex workers [40, 41]. However, one reported that trafficked sex workers were at a higher risk of HIV and STIs compared to female sex workers in general [43]. The prevalence of *Helicobacter pylori* among immigrants varied according to continent of origin and the prevalence is higher among migrants compared with their children [29].

Several reviews reported lower vaccination rates or delayed/incomplete vaccination among migrants and refugees in Europe [25, 28, 30, 36]. However, the association may vary depending on the type of migrant group. For example, authors have reported that the uptake of vaccination among refugees was lower compared with asylum seekers [19]. In a meta-analysis, migrants had increased odds of MDR-TB incidence compared to non-migrants (OR 3.91, 95% CI 2.98–5.14) [38]. In two other reviews, AMR carriage and infection were reported to be more prevalent among migrants in Europe [21, 42].

Three reviews examined Gypsy Roma and Traveller communities [8, 44, 45]. One showed that Roma and Irish Travellers in the UK were often under-vaccinated [8]. Another reported that Roma in Barcelona had a TB incidence 5.3 times greater than Spain's national TB incidence [45]. Higher prevalence of HIV has also been reported among Iranian, Roma, and Peruvian Indigenous populations compared to the general population [44]. We did not identify any reviews that examined the association between being from Gypsy Roma or Traveller communities and AMR.

We identified eight reviews which examined the association of homelessness with infectious diseases. They all reported a higher risk of various infectious diseases or AMR among people experiencing homelessness compared to those who were not homeless [26, 35, 46-51]. We did not identify any reviews that examined the association between vaccination and homelessness. Eight reviews explored infectious disease risks among those engaging in sex work compared to the general population [39, 43, 52-57]. The evidence suggests higher risks of various infectious diseases, such as HBV, HDV, HIV and HPV, among sex workers [39, 52-54, 56, 57]. A review which examined factors associated with HBV vaccination among MSM found mixed evidence relating to sexual risk-taking including involvement in sex trade [55]. We did not identify any reviews exploring the association of being a sex worker with AMR.

Evidence Relating to Protected Characteristics

Seventy-four reviews reported on protected characteristics, however, our synthesis only found clear evidence for inequalities by ethnicity and sexual orientation. Inequalities in infectious diseases relating to race and ethnicity were explored in 19 reviews [26, 30, 33, 36, 49, 51, 55, 58-69]. The available evidence suggests a higher rate of various infectious diseases such as TB, HIV, and STIs and under-vaccination in people who belong to an ethnic minority group. For example, a meta-analysis found that recent transmission of TB was associated with being of ethnic minority (OR 3.03, 95% CI 2.21- 4.16) [49]. A meta-analysis indicated that on average young Black women were less likely to initiate HPV vaccination than young White women (combined OR: 0.89, 95% CI: 0.82–0.97) [61]. In a meta-analysis of studies from Europe, children from parents of ethnic minorities (compared to the majority) were less likely to be vaccinated for measles, mumps and rubella (OR 0.89, CI 0.86–0.93 in a fixed effect model) [67]. However, the effect disappeared in the random effects model (OR 1.03, 95% CI 0.79–1.34), probably due to heterogeneity between studies [67]. Seasonal influenza vaccine uptake among older people was associated with being White (combined OR 1.30, 95% CI 1.14–1.49) [30]. Only one review on race and AMR was identified and it reported that people from some Black ethnic groups in the USA and Europe, and Aboriginal ethnic groups living in Canada and Australia are less likely to have AMR-Neisseria gonorrhoea (AMR-NG) than the White majority population [58]. Ten included reviews examined the association of sexual orientation with infectious disease topics, mostly focused on MSM [24, 51, 53, 54, 56, 58, 70-73]. In a review, MSM were found to be at risk of acquiring HIV post-migration [71]. However, in a network meta-analysis the highest risk of advanced HIV disease among people living with HIV was found in those with heterosexual contact compared with MSM as well as injection drug use [70]. Some reviews examined disparities of HIV in MSM but did not compare risk between MSM and other populations [33, 64]. Other infectious diseases such as HBV, HCV and HDV are also higher in MSM than in the general population [24, 54, 72]. AMR-NG was reported to be more common among MSM than heterosexual men in England and Wales (OR 5.47, 95% CI 3.99–7.48) [58]. We did not identify any reviews which assessed the association of sexual orientation with vaccination.

From the reviews identified, inequalities in infectious disease topics based on other protected characteristics, such as age and sex are mixed, and for other protected characteristics the synthesised evidence is scant and inconclusive. The association of infectious diseases with age has been reported in various reviews [21, 22, 30, 36, 49, 51, 55-60, 62, 63, 65, 67, 69, 74-103]. However, the association varied. Infectious diseases such as HIV, STIs, and TB have been reported to be

associated with younger age in some reviews [49, 58, 76, 79, 88], while HCV and Hepatitis E (HEV) were associated with older age [22, 82, 95]. Seasonal influenza vaccine uptake was higher in older age groups [30, 65, 69, 100]. A review reported that many studies found an association between HBV vaccination and younger age [55]. Suboptimal vaccination compliance was associated with mother's younger age [36, 63]. On the other hand, another review reported that HPV vaccine intention and initiation were positively associated with younger parent's age [62]. Four included reviews examined the association of AMR with age [21, 58, 102, 103]. In one review, MDR TB was associated with being younger than 65 years (pooled OR 2.53, 95% CI 1.74 – 4.83) [21] while another review reported that AMR-NG was more common in those 25 years or older than in younger adults [58]. Overall, age group classifications often varied between reviews which made it difficult to identify a clear pattern.

Twenty-eight reviews explored inequalities based on sex [21, 39, 40, 46, 48, 49, 51, 53, 58, 65, 67, 74, 78, 82, 84, 85, 87, 89, 90, 93, 96, 100, 104-109], but the findings varied depending on specific infectious disease. For example, TB transmission was reported to be associated with being male [48, 49] while the prevalence of chlamydia was slightly higher in females than in males [78]. Other reviews reported that seasonal influenza vaccine uptake is often higher in elderly men compared to elderly women, but the differences are not statistically significant in multivariate regression analysis [65]. A meta-analysis of studies from Europe showed that male patients were more likely to have MDR TB (OR 1.38, 95% CI 1.16 – 1.65) [21].

Six reviews described the influence of being married or in civil partnerships on vaccination [25, 30, 65, 67, 69, 96]. Generally, those who were married had higher vaccination uptake although some studies found no association or higher uptake among those who were never married. No included review examined inequalities in infectious disease prevalence or AMR based on marital status. Only four included reviews reported the prevalence of infectious diseases (HBV, HCV, latent or acute toxoplasma infection) in pregnant women compared with the general population and the findings were mixed [22, 24, 56, 110]. We found no reviews that examined the association of pregnancy with vaccination uptake or risk of AMR.

Six reviews reported on inequalities relating to religion and meningococcal disease, as well as vaccination [8, 25, 59, 61, 63, 90]. A recent meta-analysis of two studies showed that religious events attendance was significantly associated with a decreased risk of invasive meningococcal disease (OR 0.47 (95% CI, 0.28–0.79, p 0.0004) [90]. Meta-analyses showed no strong evidence

between various vaccination and religion including frequency of attendance at a place of worship [25, 61]. Jewish Orthodox people in the UK and Belgium and Orthodox Protestants in the Netherlands were described as being under-vaccinated [8]. We did not identify any studies on the association of religion with the risk of any of the key infectious diseases or AMR.

Two reviews examined the association between gender reassignment and the risk of infectious diseases (HIV and HBV) [53, 56]. The prevalence of HIV was significantly higher among transgender female sex workers compared with biologically female sex workers (RR = 4.02, 95% CI 1.60 - 10.11) [53]. However, in another review, transgender persons had lower prevalence of HBV compared to other groups such as sex workers, injection drug users, MSM and pregnant women [56]. We did not identify any reviews examining the association of gender reassignment with other infectious diseases of interest, vaccination or AMR.

We did not identify any review that reported the association of disability with our key infectious diseases topics. However, we identified one review which reported that disability was associated with a higher incidence of listeriosis [111].

Evidence Relating to Socioeconomic Inequalities

Fifty reviews explored socioeconomic status. The evidence consistently shows that those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, or poor living situations are at higher risk of infectious diseases, AMR and lower vaccine uptake. For example, many reviews highlighted that low income, poverty and unemployment were associated with various infectious diseases including, HIV, STIs, TB, HBV and HCV among others [26, 27, 35, 39, 64, 75, 82, 84, 85, 90, 94, 111-114].

Level of education, income or occupation are often associated with vaccination uptake [19, 25, 30, 36, 55, 60, 61, 63, 65, 67, 69, 100, 115-119]. Reviews have also reported an association of MDR-TB and AMR with lower level of income or education [47, 120, 121]. Many reviews examined the association of infectious disease topics of interest with areal level socioeconomic status [25, 30, 36, 59, 60, 63, 65, 69, 100, 116, 119, 122], deprivation [61, 65, 66, 75, 78, 111, 119, 123], or living situation [30, 36, 44, 47, 49, 51, 60, 65, 67, 69, 84, 85, 87, 90, 94, 96, 101, 105, 113, 121]. One meta-analysis showed significant association between neighbourhood deprivation and chlamydia infection (pooled OR 1.76, 95 % CI: 1.15–2.71) [78]. In another meta-analysis, TB was associated with

residing in an urban area (OR 1.52, 95%CI 1.35–1.72) [49]. Those living in overcrowded or poor housing conditions had higher risk of TB [44]. AIDS mortality is significantly associated with lower socioeconomic status [122]. Group A Streptococcal infection, gastrointestinal infections and meningococcal disease were associated with poor living conditions [75, 84, 85, 90, 111, 113].

Two included reviews explored the association between AMR and areal level deprivation [47, 121]. Although the evidence is scant, the findings suggests that those living in deprived areas or poor living conditions may be at higher risk of AMR.

DISCUSSION

This overview of reviews provides a broad synopsis of three dimensions of inequalities (inclusion health groups, protected characteristics, and socio-economic inequalities) across several infectious disease topics. We synthesised the existing evidence based on the dimension of inequalities. Of the three dimensions of inequalities assessed, the evidence relating to people in the inclusion health groups is the most consistent although the volume of evidence identified for each group varied. Most of the reviews identified under this dimension were on migration status, with a higher prevalence of infectious diseases, AMR and lower vaccine uptake among migrants compared to non-migrants. Vulnerable migrants (such as refugees, asylum-seekers, and trafficked persons) are at higher risk when compared to general migrants and the size of inequalities varied depending on the country of origin. Although few reviews were identified for the remaining inclusion health groups, the evidence suggests that homelessness is associated with risk of infectious diseases and AMR; Gypsy Roma/ Traveller communities are often under vaccinated and are also at greater risk of infectious diseases; and people who engage in sex work are at greater risk of some infectious diseases.

There is a plethora of evidence from reviews showing higher prevalence of infectious diseases and under-vaccination among minority ethnic groups. We also identified several reviews suggesting higher prevalence of infectious diseases and AMR among MSM. These suggest that ethnicity and sexual orientation are important protected characteristics and targeting or tailoring interventions for such groups may be beneficial to reduce inequalities in infectious diseases. It is important to note that there is inequality in access to vaccinations as shown in reviews included in this overview of reviews and beyond. Since many infectious diseases are vaccine preventable, identified inequalities in infectious diseases that we have noted in this overview of reviews, may also be related to inequalities in access to vaccination.

Many reviews examined the association with age and sex, however, the identified associations varied depending on the specific infectious disease or type of vaccination. In addition, for most of the reviews, the comparator age groups were often unclear. Therefore, we are not able to identify specific age groups with higher risk across various infectious disease topics. Other factors besides equity issues may contribute significantly to associations with age. For example, people in the most sexually active age groups are more likely to contract STIs whereas people of older ages, where immunity is weaker, are more likely to get infectious diseases associated with low immunity. Also, vaccinations are often offered at specific ages so it is expected that uptake would be higher among those groups that are targeted. However, it is important to highlight that we found evidence suggesting that childhood vaccination compliance is lower for those with younger mothers/parents [36, 59, 63]. Based on this review, age and sex may be important for some infectious diseases but the group at higher risk may vary across diseases.

Reviews exploring marital status focused on vaccination, particularly seasonal influenza vaccine in older adults, tetanus vaccination among pregnant women and MMR vaccination in children. Reviews generally reported higher vaccination uptake among adults who are married and children whose parents are married. It is not possible to draw a conclusion regarding the association of religion, disability, transgenderism, and pregnancy with infectious diseases based on the findings of this review as the synthesised evidence is scant and often inconsistent. More evidence is therefore needed to be able to establish the presence and direction of any associations of these factors with infectious diseases.

Several reviews provide compelling evidence of higher risk of infectious diseases, AMR, and lower vaccination uptake among those with lower level of income, lower educational attainment, unemployment, higher area level deprivation, lower socioeconomic status, and poor living situations. Although most of the evidence in this dimension is on vaccination, those of lower socioeconomic groups are often at higher risk from infectious diseases and should be targeted for intervention.

Strengths and limitations

The protocol used to guide the conduct of this review was designed a priori. We conducted a comprehensive literature search of four electronic databases with no language limits and searched for grey literature. Data extraction was checked by a second reviewer to improve accuracy and quality

assessments were performed by two reviewers independently. Due to the timeframe required for the work, we could not complete all the initial titles and abstract screening in duplicate, however, full texts of potentially relevant reviews were independently screened by two reviewers. Despite our best efforts, we acknowledge that some relevant reviews may have been missed in the study selection process. The lack of synthesised evidence observed in some areas does not necessarily mean a lack of evidence. This is because there may be primary studies in those areas which have not been synthesised in reviews and meta-analyses. Also, this project focussed on specific infectious disease topics and we included specific search terms for those topics in the search strategy and included broad terms for infectious diseases. This allowed us to include other infectious diseases that were identified in our search to capture evidence of health inequalities from various infectious diseases (excluding COVID-19). Therefore, this is not intended to provide a comprehensive overview of reviews in those topics which are not the focus of this project. Furthermore, some underserved populations (such as people who inject drugs and prisoners) are not covered in this overview as these are beyond the scope of the work. Notwithstanding, we believe this provides a useful summary of available evidence relating to inequalities in infectious diseases relevant to high-income countries and highlights areas where evidence may be lacking or minimal.

The quality of the included reviews varied significantly as we included various types of reviews, and some were not necessarily systematic reviews for which AMSTAR2 is designed. Heterogeneity between studies was a limitation reported in many of the included reviews where meta-analyses were performed, therefore, pooled estimates should be interpreted with caution.

Conclusion

Overall, we provide evidence from many papers with accordant findings, of groups consistently at higher risk of infectious diseases, AMR and under-vaccination. Developing targeted interventions for high-risk groups rather than focusing on individual infections could contribute significantly to reducing infectious disease burden. This reviews also highlights important evidence gaps that should be considered when commissioning future evidence syntheses or primary studies.

Figure Legends

Figure 1: PRISMA flow diagram for study selection.

Figure 2: Matrix showing the number of reviews identified for each dimension of inequality and infectious disease topic. Colour ranges from red which indicates where no review was identified, up to green for a maximum number of reviews (19).

Figure 3: AMSTAR2 results for included reviews

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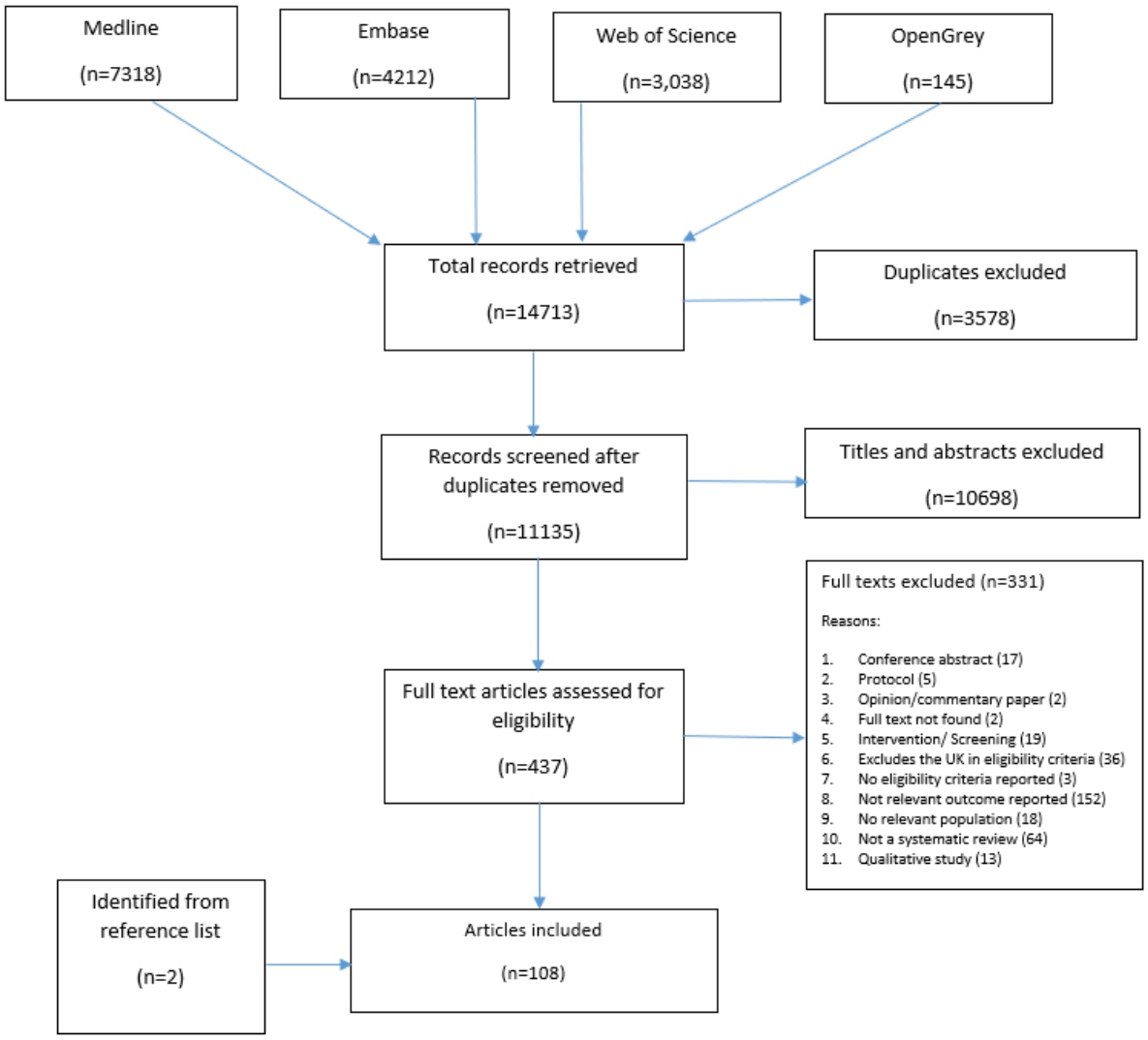
Figure 1: PRISMA flow diagram for study selection



Dimension of inequalities	Variables	Tuberculosis	HIV	STI	Hepatitis C	Vaccination	AMR/multi-drug resistance	Others
Protected characteristics	Age	2	3	4	3	13	4	19
	Sex	2	7	4	3	5	2	11
	Marriage and civil partnership	0	0	0	0	6	0	0
	Pregnancy and maternity	0	0	0	2	0	0	3
	Race (or ethnicity)	3	2	1	0	11	1	1
	Religion or belief	0	0	0	0	5	0	1
	Sexual orientation	0	4	0	2	0	1	4
	Gender reassignment	0	1	0	0	0	0	1
	Disability	0	0	0	0	0	0	1
Inclusion Health Groups	Vulnerable migrants	0	1	1	2	2	1	3
	General migrants	5	8	4	5	5	2	6
	People experiencing homelessness and rough sleeping	3	2	0	2	0	1	3
	People who engage in sex work	0	4	2	0	1	0	2
	Gypsy Roma/ Traveller communities/Indigenous people	2	0	0	0	1	0	0
Socioeconomic inequalities	Level of education/income	1	4	1	0	18	3	9
	Employment/occupation	1	2	2	1	10	0	5
	Social class/Area level socioeconomic status	0	1	0	0	11	0	1
	Deprivation	1	0	1	0	4	0	2
	Residence/living situation (e.g living in a home environment with moisture damage, house tenure)	2	0	0	0	7	2	10

Online supplemental file 1: SEARCH STRATEGY

Searched Ovid MEDLINE(R) ALL 1946 to November 23, 2021 on 24/11/2021

Search terms for systematic reviews found at http://extranet.santecom.qc.ca/wiki/!biblio3s/doku.php?id=concepts:revues-de-la-litterature-et-meta-analyses

	Search	Result
1	inequality.mp. or Socioeconomic Factors/	183584
2	inequalities.mp.	24364
3	protected characteristics.mp.	10
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12922
6	migrant$.mp. or "Transients and Migrants"/	26370
7	Sex Work/ or Sex Workers/ or sex work*.mp.	10781
8	Gypsy roma.mp.	18
9	Human immunodeficiency virus/	21059
10	acquired immune deficiency syndrome/	77137
11	infection/	40269
12	tuberculosis/	108757
13	parasitosis/	0
14	hepatitis/	22837
15	Vaccination/	90391
16	Immunization/	52361
17	Communicable Disease/	31146
18	infectious disease.ti,ab,kw.	39865
19	infection.ti,ab,kw.	1211775
20	tuberculosis.ti,ab,kw.	203159
21	hiv.ti,ab,kw.	331192
22	aids.ti,ab,kw.	156336
23	hepatitis.ti,ab,kw.	228655
24	"immuni*".ti,ab,kw.	342218
25	"vaccin*".ti,ab,kw.	354100
26	Communicable disease.ti,ab,kw.	4291

27 Parasitic disease.ti,ab,kw. 3780

28 infectious disease$.mp. or Communicable Diseases/ 145081

29 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or exp Review Literature as Topic/ or exp Review/ or Meta-Analysis as Topic/ or Meta-Analysis/ or "systematic review"/ 3165549

30 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 240954

31 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 2364192

32 30 and 31 32588

33 29 and 32 2822

34 social class.mp. or social class/ 48149

35 poverty.mp. or poverty/ 65773

36 income.mp. or income/ 162454

37 educational status.mp. or educational status/ 58473

38 economic status.mp. or economic status/ 15731

39 travellers.mp. 4716

40 rough sleeping.mp. 23

41 homelessness/ 8802

42 30 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 476015

43 sexually transmitted disease/ or STI.mp. 32214

44 AMR.mp. 5408

45 antimicrobial resistance.mp. or antibiotic resistance/ 85277

46 anti-microbial resistance.mp. 196

47 31 or 43 or 44 or 45 or 46 2444675

48 42 and 47 62612

49 29 and 48 8144

50 limit 49 to yr="2000 -Current" 7318

Embase Classic+Embase 1947 to 2021 November 23 searched on 24/11/2021

Searches		Results
1	inequality.mp. or Socioeconomic Factors/	159438
2	inequalities.mp.	26580
3	protected characteristics.mp.	18
4	inclusion health groups.mp.	3
5	Homeless Persons/ or homeless.mp.	12270
6	migrant$.mp. or "Transients and Migrants"/	59556
7	Sex Work/ or Sex Workers/ or sex work*.mp.	14114
8	Gypsy roma.mp.	22
9	Human immunodeficiency virus/	125500
10	acquired immune deficiency syndrome/	136979
11	infection/	402825
12	tuberculosis/	162052
13	parasitosis/	24410
14	hepatitis/	67370
15	Vaccination/	179733
16	Immunization/	117275
17	Communicable Disease/	34287
18	infectious disease.ti,ab,kw.	50469
19	infection.ti,ab,kw.	1631799
20	tuberculosis.ti,ab,kw.	245043
21	hiv.ti,ab,kw.	426227
22	aids.ti,ab,kw.	190986
23	hepatitis.ti,ab,kw.	334114
24	"immuni*".ti,ab,kw.	440252
25	"vaccin*".ti,ab,kw.	438145
26	Communicable disease.ti,ab,kw.	5111
27	Parasitic disease.ti,ab,kw.	4822

28 infectious disease$.mp. or Communicable Diseases/ 150812

29 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 254578

30 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 3242281

31 29 and 30 37750

32 (((systematic or state-of-the-art or scoping or literature or umbrella) adj (review* or overview* or assessment*)) or "review* of reviews" or meta-analy* or metaanaly* or ((systematic or evidence) adj1 assess*) or "research evidence" or metasynthe* or meta-synthe*).tw. or systematic review/ or "systematic review (topic)"/ or meta analysis/ or "meta analysis (topic)"/ 713296

33 31 and 32 1343

34 social class.mp. or social class/ 40328

35 poverty.mp. or poverty/ 64722

36 income.mp. or income/ 221004

37 educational status.mp. or educational status/ 90042

38 economic status.mp. or economic status/ 23383

39 travellers.mp. 6111

40 rough sleeping.mp. 30

41 homelessness/ 12187

42 29 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 588825

43 sexually transmitted disease/ or STI.mp. 62753

44 AMR.mp. 9242

45 antimicrobial resistance.mp. or antibiotic resistance/ 188533

46 anti-microbial resistance.mp. 289

47 30 or 43 or 44 or 45 or 46 3400990

48 32 and 42 and 47 4243

49 limit 48 to yr="2000 -Current" 4212

Searched Web of Science on 24/11/2021 (Web of Science Core Collection)

Inequalities related terms searched in topics and combined with title search for infectious diseases. This makes the search capture inequality related articles where inequalities are not necessarily mentioned in the title. Had to limit the infectious diseases to titles in order to focus on relevant papers.

#1	(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") (Topic) and Review (Document Type)	53,359
#2	("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance") (Title) and Review (Document Type)	64,026
#3	#1 AND #2 Timespan: 2000-01-01 to 2021-11-24 (Publication Date)	3,038

Searched Opengrey on 24112021

(inequalities OR inequality OR "Socioeconomic Factor" OR "protected characteristics" OR inclusion health groups OR "Homeless Person*" OR homelessness OR Transients OR Migrant* OR "Sex Work*" OR "Gypsy roma" OR "rough sleeping" OR traveller* OR "traveller community" OR "traveller communities" OR "economic status" OR "educational status" OR income OR poverty OR "social class") AND ("Human immunodeficiency virus" OR HIV OR "acquired immune deficiency syndrome" OR AIDS OR infection OR tuberculosis OR parasitosis OR hepatitis OR vaccination OR immunization OR "communicable disease*" OR "infectious disease*" OR "parasitic disease*" OR "sexually transmitted diseas*" OR STI OR AMR OR "antimicrobial resistance" OR "anti-microbial resistance" OR "antibiotic resistance")

145 articles retrieved with the search

Online supplementary file 2: Characteristics of Included Reviews

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Abraha, 2018 [58]	Switzerland	AMR-Gonorrhoea	1946-2017	No	24 (unclear)	1989-2017	✓	✓	
Adams, 2018 [75]	UK	Gastrointestinal Infection	1980 - 2015	Yes	77 (unclear)	1995-2015	✓	✓	
Aldridge, 2018 [46]	UK	Not specified	2005- 2015	Yes	337 (unclear)	not reported	✓		✓
Alividza,2018 [47]	UK	AMR	no date limit	No	19 (at least 2)	1998 to 2015		✓	
Arat, 2019 [116]	Sweden	Vaccination	not reported	No	15 (2)	2007-2017		✓	
Arum, 2021 [50]	UK	HIV, HCV	2000 - 2017	Yes	37 (6)	2000 – 2019			✓
Badri, 2021 [93]	Iran	Ocular toxocariasis	1966 - 2019	Yes	101 (4)	1966 - 2020	✓		
Behera, 2018 [76]	India	HIV	Not reported	No	Not reported	1989 - 2017	✓		
Beijer, 2012 [48]	UK	TB, HCV virus, and HIV	1980 - 2012	Yes	43 (4)	1984 - 2011	✓	✓	✓
Bocquier 2017 [118]	France	Vaccination	2000 - 2016	No	43 (5)	Not reported		✓	
Bonten, 2020 [77]	Netherlands	*Escherichia coli bacteraemia*	2007- 2018	Yes	210 (21)	2007-2018	✓		
Chan, 2017 [18]	Australia	TB	Inception- 2017	Yes	20 (1)	1990-2015			✓
Chen, 2019 [70]	China	HIV disease	unclear - 2019	Yes	101 (1)	1984-2017	✓		
Chernet,2017 [14]	Switzerland	Six selected infectious diseases	not reported	Yes	96 (unclear)	2000-2017			✓
Coffey, 2018 [113]	Australia	Group A Streptococcal infection, acute rheumatic fever	Unclear - 2016	No	91 (unclear)	1944 - 2016		✓	
Colledge, 2020 [74]	Australia	HCV	not reported	No	223 (16)	2008 -2017	✓	✓	
Cormier, 2019 [44]	Canada	TB/HIV	1980 - 2017.	No	475 (0)	1984-2017	✓	✓	✓
Crichton, 2015 [78]	UK	Genital chlamydia infection	Inception - 2014	Yes	36 (3)	not reported	✓	✓	
De Vito, 2017 [19]	Denmark	Vaccination	2007- 2017	No	35 +21 (4)	not reported		✓	✓
Denning, 2018 [79]	UK	Vulvovaginal candidiasis	1985 - 2016	Yes	8 (2)	2000-2013	✓		
Di Gennaro, 2017 [120]	Mozambique	TB - MDR	Inception - 2016	Yes	50 (1)	1997 - 2016		✓	
Ding, 2020 [114]	China	HBV	Inception - 2020	Yes	10 (0)	1995 - 2019		✓	
Dong, 2020 [94]	China	Cryptosporidium Infection	1960 - 2018	Yes	221 (unclear)	Unclear	✓	✓	
Dugan, 2021 [95]	USA	HCV	2000 - 2018	No	41 (unclear)	Unclear	✓		
Eilami, 2019 [104]	Iran	HIV/AIDS	2010 - 2017	Yes	54 (unclear)	2010-2017	✓		
Fakoya, 2015 [71]	UK	HIV	2002- 2014	No	27 (9)	2003-2014	✓		
Falagas, 2008 [59]	Greece	Vaccination	Not reported	No	39 (1)	1979-2005	✓	✓	
Falla, 2018 [20]	Netherlands	Chronic HCV	2000-2015	No	Part 1: 18 (unclear) Part 2: 56 (1)				✓
Faria, 2021 [96]	Brazil	Vaccination	Inception-2020	Yes	31 (0)	2001 -2020	✓	✓	
Fauroux, 2017 [105]	Spain	Respiratory Syncytial Virus	1995 - 2015	No	74 (8)	Unclear	✓	✓	
Faustini, 2005 [21]	Italy	TB (MDR)	1993-2003	Yes	29 (3)	1995-2005	✓		✓
Fernández, 2015 [60]	Denmark	Vaccination: HPV	not reported	No	23(8)	2008-2014	✓	✓	
Fisher, 2013 [61]	UK	Vaccination: HPV	Inception- 2012	Yes	27(1)	2008-2012	✓	✓	
Forshaw, 2017 [117]	UK	Vaccination	1990 - 2016	Yes	37(0)	1990- 2015	✓	✓	
Fournet, 2018 [8]	Netherlands	Vaccination	1950- 2013	No	48/15 (at least 1)	not reported	✓		✓
Ghiasvand, 2020 [80]	Iran	HIV/AIDS	Inception - 2017	Yes	19 (0)	2005 - 2017	✓	✓	
Gorjana, 2017 [62]	Australia	HPV Vaccination	Unclear - 2015	No	18 (1)	2010 - 2015	✓		

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Greenaway, 2015 [22]	Canada	HCV	not reported	Yes	50(0)	1990-2013	✓	✓	✓
Hahne, 2013 [24]	The Netherlands	HBV and HCV	2000 - 2009	No	124 (9)	Unclear	✓		✓
Hermann, 2019 [81]	Canada	Vaccination	2000- 2017	No	33 (15)	2001-2016	✓		
Jackson, 2021 [38]	Ireland	Tuberculosis and MDR-TB	Unclear - 2020	Yes	32 (3)	2010 - 2018			✓
Jain, 2017 [25]	UK	Vaccination	not reported	Yes	35 (5)	1997 and 2015	✓	✓	✓
Jin, 2020 [72]	Australia	HCV	2000 - 2019	Yes	194 (at least 14)	Unclear			✓
Kabapy, 2020 [39]	Egypt	HIV	1982 - 2018	Yes	231 (unclear)	Unclear	✓	✓	✓
Kawatsu, 2014 [26]	Japan	TB	Not reported	No	18 (1)	1997 - 2012	✓	✓	✓
Kentikelenis, 2015 [27]	UK	Various	2007 - 2014	No	21 (unclear)	not reported		✓	✓
Lafond, 2021 [97]	USA	Influenza-associated lower	1996 –2016	Yes	75 (Unclear)	1996 - 2016	✓		
Larson, 2014 [115]	UK	Vaccination	unclear - 2012	No	1164 (at least one)	2007–2012		✓	
Leumi, 2020 [56]	Cameroon	Hepatitis B	1990 - 2017	Yes	358 (unclear)	Unclear	✓		✓
Leung,2019 [106]	Australia	HIV, HBV, HCV	2008 - 2017	Yes	104(unclear)	not reported	✓		
Li, P. 2020 [82]	Netherlands	HEV	inception - 2019	Yes	419(7)	not reported	✓	✓	
Lindsay,2015 [83]	Belgium	Norovirous disease	2003 - 2013	No	39 (4)	not reported	✓		
Lucyk, 2019 [119]	Canada	Vaccination- Influenza	2012 - 2017	No	42 (1)	2012- 2017		✓	
Ly, 2021 [51]	France	Various	1980 - 2020	No	81 (4)	Unclear	✓	✓	✓
Macina, 2021 [98]	France	Bordetella pertussis	1990 - 2019	No	88 (7)	Unclear	✓		
Malerba, 2015 [63]	Italy	Vaccination	2000 - 2014	No	11 (1)	2003-2014	✓	✓	
McBride, 2021 [40]	Canada	HIV/STI	2009 - 2019	No	29 (unclear)	Not reported	✓		✓
Millett, 2012 [64]	USA	HIV disease	1981 - 2011	Yes	194 (13)	1981-2011	✓	✓	
Mipatrini, 2017 [28]	Italy	Vaccination	2005-2016	No	58 (7)	not reported			✓
Mirzadeh, 2021 [99]	Iran	Trichomonas vaginalis	1985 - 2020.	Yes	85 (2)	1985 - 2020	✓		
Morais, 2017 [29]	Portugal	*Helicobacter pylori*	inception - 2015	No	28 (unclear)	1988-2014			✓
Nagata, 2013 [65]	Switzerland	vaccination- Influenza	1980 - 2011	No	80 (7)	not reported	✓	✓	
Najafizada, 2020 [121]	Canada	MDR-TB	1998-2018	No	15(4)	Not reported		✓	
Nava-Aguilera, 2009 [49]	Mexico	TB	unclear - 2005	Yes	30 (1)	1994 - 2008	✓	✓	✓
Nellums, 2018*b* [42]	UK	AMR	2000- 2017	Yes	23 (0)	2006-2016			✓
Newman, 2015 [111]	USA	Foodborne infectious diseases	1980 - 2013	No	16 (3)	not reported	✓	✓	
Nourollahpour Shiadeh, 2020 [110]	Iran	Toxoplasmosis	Inception -2020	Yes	14 (0)	2001- 2019	✓		
Offer, 2015 [66]	UK	TB	1990 - unclear	No	18 (18)	1999-2013	✓	✓	
Okoli, 2020 [30]	Canada	Influenza vaccination	Unclear - 2020	Yes	34 (1)	2004 - 2019	✓	✓	✓
Okoli, 2021 [69]	Canada	Influenza vaccination	2000 - 2020	Yes	36 (2)	2010-2020	✓	✓	
Oldenburg, 2014 [73]	USA	HIV	2004 - 2013	Yes	88 (1)	not reported	✓		✓
Oldenburg, 2015 [52]	USA	HIV	2004 - 2013,	Yes	33 (0)	2004-2013			✓
Operario, 2008 [53]	UK	HIV	1980 -2007	Yes	25 (0)	1988- 2006.	✓		✓
Pega 2021 [41]	Switzerland,	HIV	2010- 2020	Yes	19(1)	2010-2019			✓

Study ID (Author, Year)	Corresponding Author's Country	Infectious diseases	Search period	Includes meta-analysis (Yes/No)	Number of studies included *(Number of UK studies)*	Publication year range for included studies	Protected characteristics	Socioeconomic inequalities	Inclusion health groups
Platt, 2013a [31]	UK	HIV, STIs	Not reported	No	26 (1)	Not reported			✓
Platt, 2013b [32]	UK	HIV, STIs	2005 - 2011	No	73 (5)	Not reported			✓
Possenti, 2016 [84]	Italy	Cystic Echinococcosis	not reported	Yes	37(0)	1964-2014	✓	✓	
Prost, 2007 [33]	UK	HIV	Unknown - 2005	No	138 (unclear)	1996 -2005	✓		✓
Pulver, 2016 [107]	Canada	Vaccination	1980 - 2014	No	12 (1)	1993 - 2013	✓		✓
Richterman, 2018 [85]	USA	Cholera	not reported	Yes	110 (0)	1974-2017	✓	✓	
Rodrigo, 2010 [112]	Sri Lanka	HIV	1999 -2009	No	98 (unclear)	not reported		✓	
Roller-Wirnsberger, 2021 [100]	Austria	Influenza vaccination	2012- 2019	No	44 (at least 1)	2012-2018	✓	✓	
Rossi, 2012 [34]	Canada	HBV	Inception - 2011	Yes	110 (2)	1977 - 2011			✓
Rostami, 2019a [87]	Iran	Toxocariasis	1980 - 2019	Yes	250 (2)	1980 -2019	✓	✓	
Rostami, 2019b [86]	Iran	Acute Toxoplasma infection	1988 - 2018	Yes	217 (3)	1988 - 2018	✓		
Rostami, 2021 [101]	Iran	Toxoplasmosis	1980-2020	Yes	150 (2)	1987-2020	✓	✓	
Salgado-Barreira, 2014 [122]	Spain	HIV	unclear -2012	No	24 (1)	1983- 2010		✓	
Sandgren, 2014 [23]	Sweden	TB	1990- 2012	Yes	15 (1)	not reported			✓
Schepisi, 2018[88]	Italy	TB	unclear - 2017	Yes	74 (13)	1950-2017	✓		
Schierhout, 2020 [89]	Australia	HTLV-1	1910 - 2018	Yes	39 (0)	1991 - 2018	✓		
Song, 2021 [102]	China	Drug resistant TB (MDR-TB)	2000-2020	Yes	37 (2 at least)	2000-2019	✓		
Spyromitrou-Xioufi, 2020 [90]	Greece	Meningococcal Infection	2008 - 2018	Yes	6 (0)	1999-2017	✓	✓	
Stockdale, 2020 [54]	UK	HDV	1998 - 2019	Yes	282 (at least 1)	not reported			✓
Strifler, 2015 [91]	Canada	Meningococcal Infection	inception - 2013	No	17 (6)	1982-2012	✓		
Suhrcke, 2011 [35]	UK	Various	1947 - 2010	No	37 (2)	not reported		✓	✓
Sultana, 2021 [103]	Bangladesh	HIV and MDR-TB	2010 - 2020	Yes	54 (0)	2010 - 2020	✓		
Tabacchi, 2016 [67]	Italy	Vaccination- MMR	not reported	Yes	45 (19)	2000-2014	✓	✓	
Tauli, 2016 [36]	Brazil	Vaccination	1992- 2014	No	23(0)	not reported	✓	✓	✓
Tavares, 2017 [37]	Portugal	HIV-TB	2000 - 2016	No	27 (2)	2003 - 2016			✓
Tollefson, 2013 [45]	USA	TB	1990 – 2011	No	91 (0)	1990 - 2012			✓
Van Gerwen, 2020 [108]	USA	STI/HIV	1968 - 2018	Yes	25 (0)	not reported	✓		
Vet, 2015 [55]	The Netherlands	Vaccination	Inception-2014	No	18 (0)	not reported	✓	✓	✓
Vukovic,2019 [123]	Italy	Influenza vaccination	Unknown - 2017	No	12 (6)	2004 - 2017		✓	
Wayal, 2018 [68]	UK	STI	Unclear - 2016	No	15 (15)	2000 - 2017	✓		
Whelan, 2021 [109]	The Netherlands	Gonorrhoea	2010 - 2019	No	174 (1)	Unclear	✓		
Wu, 2021 [57]	China	HPV	1990-2019	Yes	107 (0)	1989-2019	✓		✓
Yu, 2020 [43]	USA	HIV/STI	Unclear - 2019	No	21 (0)	2008 -2017			✓
Zamani, 2018 [92]	Iran	*Helicobacter pylori*	2000 - 2017	Yes	183 (2)	not reported	✓		

Online supplemental file 3: EVIDENCE MATRIX

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Protected characteristics	Age	Nava-Aguilera, 2009 (1) Schepisi, 2018 (13)	Ghiasvand, 2020 (0) Behera, 2018 (unclear) Sultana, 2021 (0)	Crichton,2015 (3) Denning, 2018 (2) Wu, 2021 (0) Mirzadeh, 2021 (2)	Colledge, 2020 (16) Greenaway, 2015 (0) Dugan, 2021 (unclear)	Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Hermann, 2019 (15) Tauli, 2016 (0) Malerba, 2015 (1) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3) Song, 2021 (at least 2) Sultana, 2021 (0)	Leumi, 2020 (unclear) Macina, 2021 (7) Lafond, 2021 (unclear) Dong, 2020 (unclear) Bonten, 2020 (21) Ly, 2021 (4) Li, 2020 (7) Rostami, 2019a (2) Rostami, 2019b (3) Rostami, 2021 (2) Badri, 2021 (4) Schierhout, 2020 (0) Adams, 2018 (unclear, at least 1) Zamani, 2018 (2) Lindsay, 2015 (4) Possenti, 2016 (0) Richterman, 2018 (0) Strifler, 2015 (6) Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sex	Beijer, 2012 (4) Nava-Aguilera, 2009 (1)	Beijer, 2012 (0) Operario, 2008 (0) Van Gerwen, 2020 (0) Leung, 2019 (unclear) Eilami, 2019 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)	Crichton,2015 (3) Van Gerwen, 2020 (0) Whelan, 2021 (1) McBride, 2021 (unclear)	Beijer, 2012 (1) Colledge, 2020 (16) Leung, 2019 (unclear)	Pulver, 2016 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Abraha, 2018 (unclear, at least 1) Faustini, 2005 (3)	Leung, 2019 (unclear) Aldridge,2018 (unclear, at least 1) Ly, 2021 (4) Spyromitrou-Xioufi, 2020 (0) Possenti, 2016 (0) Richterman, 2018 (0) Rostami, 2021 (2) Schierhout, 2020 (0) Fauroux, 2017 (8) Rostami, 2019a (2) Badri, 2021 (4) Li, 2020 (7)
	Marriage and civil partnership					Okoli, 2020 (1) Nagata, 2013 (unclear, at least 1) Jain, 2017 (5) Tabacchi, 2016 (19) Okoli, 2021 (2) Faria, 2021 (0)		
	Pregnancy and maternity				Hahne, 2013 (9) Greenaway, 2015 (0)			Hahne, 2013 (9) Leumi, 2020 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
								Nourollahpour Shiadeh, 2020 (0)
	Race (or ethnicity)	Nava-Aguilera, 2009 (1) Offer, 2015 (18)[α] Kawatsu, 2014 (1)	Millett, 2012 (13) Prost, 2007 (unclear, at least 3)	Wayal, 2018 (15)[α]		Vet, 2015 (0) Okoli, 2020 (1) Gorjana, 2017 (1) Fernández, 2015 (8) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2)	Abraha, 2018 (unclear, at least 1)	Ly, 2021 (4)
	Religion or belief					Fisher, 2013 (1) Jain, 2017 (5) Fournet, 2018 (unclear, at least 1) Malerba, 2015 (0) Falagas, 2008 (1)		Spyromitrou-Xioufi, 2020 (0)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Sexual orientation		Fakoya, 2015 (9) Oldenburg, 2014 (1) Operario, 2008 (0) Chen, 2019 (1)		Hahne, 2013 (9) Jin, 2020 (at least 14)		Abraha, 2018 (unclear, at least 1)	Hahne, 2013 (9) Leumi, 2020 (unclear) Ly, 2021 (4) Stockdale, 2020 (unclear, at least 1)
	Gender reassignment		Operario, 2008 (0)					Leumi, 2020 (unclear)
	Disability							Newman, 2015 (3)
Inclusion Health Groups	Vulnerable migrants		Yu, 2020 (0)	Yu, 2020 (0)	Chernet,2017 (unclear) Greenaway, 2015 (0)	Mipatrini, 2017 (7) De Vito, 2017 (4)	Nellums, 2018 (0)	Rossi, 2012 (2) Chernet,2017 (unclear) Mipatrini, 2017 (7) Chernet,2017 (unclear)
	General migrants	Tavares, 2017 (2)[β] Chan, 2017 (1) Kawatsu, 2014 (1) Sandgren, 2014(1) Jackson, 2021 (3)	Tavares, 2017 (2)[β] Platt, 2013a (1) Platt, 2013b (5) Prost, 2007 (unclear, at least 3) Kentikelenis, 2015	Platt, 2011a (1) Platt, 2013b (5) Kentikelenis, 2015 (unclear) McBride, 2021 (unclear)	Hahne, 2013 (9) Chernet,2017 (unclear) Greenaway, 2015 (0) Kentikelenis, 2015 (unclear) Falla, 2018 (1)	Okoli, 2020 (1) Mipatrini, 2017 (7) De Vito, 2017 (4) Jain, 2017 (5) Tauli, 2016 (0)	Faustini, 2005 (3) Jackson, 2021 (3)	Rossi, 2012 (2) Hahne, 2013 (9) Chernet,2017 (unclear) Kentikelenis, 2015 (unclear) Suhrcke, 2011 (unclear) Morais, 2017 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
			(unclear) Pega 2021 (1) Kabapy, 2020 (unclear) McBride, 2021 (unclear)					
	People experiencing homelessness and rough sleeping	Beijer, 2012 (4) Nava-Aguilera, 2009 (1) Kawatsu, 2014 (1)	Beijer, 2012 (0) Arum, 2021 (6)		Beijer, 2012 (1) Arum, 2021 (6)		Alividza, 2018 (unclear, at least 2)	Aldridge,2018 (unclear, at least 1) Suhrcke, 2011 (unclear) Ly, 2021 (4)
	People who engage in sex work		Yu, 2020 (0) Oldenburg, 2015 (0) Operario, 2008 (0) Kabapy, 2020 (unclear)	Yu, 2020 (0) Wu, 2021 (0)		Vet, 2015 (0)		Leumi, 2020 (unclear) Stockdale, 2020 (unclear, at least 1)
	Gypsy Roma/ Traveller communities /Indigenous people	Tollefson, 2013 (0) Cormier 2019 (0)				Fournet, 2018 (unclear, at least 1)		

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
Socioeconomic inequalities	Level of education/income	Kawatsu, 2014 (1)	Rodrigo, 2010 (unclear) Ghiasvand, 2020 (0) Millett, 2012 (13) Kabapy, 2020 (unclear)	Crichton,2015 (3)		Vet, 2015 (0) Larson, 2014 (at least one) Okoli, 2020 (1) Arat, 2019 (2) Fernández, 2015 (8) Forshaw, 2017 (0) Fisher, 2013 (1) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Jain, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021 (at least 1) Faria, 2021 (0)	Di Gennaro, 2017 (1) Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ding, 2020 (0) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Spyromitrou-Xioufi, 2020 (0) Dong, 2020 (unclear) Suhrcke, 2011 (unclear)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Employment /occupation	Kawatsu, 2014 (1)	Kentikelenis, 2015 (unclear) Millett, 2012 (13)	Crichton,2015 (3) Kentikelenis, 2015 (unclear)	Kentikelenis, 2015 (unclear)	Arat, 2019 (2) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) De Vito, 2017 (4) Bocquier, 2017 (5) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Faria, 2021 (0)		Kentikelenis, 2015 (unclear) Li, 2020 (7) Coffey, 2018 (unclear) Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Social class/Area level socioeconomic status		Salgado-Barreira, 2014 (1)[v]			Arat, 2019 (2) Okoli, 2020 (1) Fernández, 2015 (8) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1) Jain, 2017 (5) Falagas, 2008 (1) Tauli, 2016 (0) Malerba, 2015 (0) Okoli, 2021 (2) Roller-Wirnsberger, 2021		Salgado-Barreira, 2014 (1)

		Infectious diseases: Author, year (number of UK studies included)						
Dimension of inequalities	**Variables**	**Tuberculosis**	**HIV**	**STI**	**Hepatitis C**	**immunisation**	**AMR/multi-drug resistance**	**Other infectious diseases**
	Deprivation	Offer, 2015 (18)[α]		Crichton,2015 (3)		Vukovic, 2019 (6) Fisher, 2013 (1) Nagata, 2013 (unclear, at least 1) Lucyk, 2019 (1)		Adams, 2018 (unclear, at least 1) Newman, 2015 (3)
	Residence/living situation (e.g urban vs rural, living in a home environment with moisture damage, house tenure)	Nava-Aguilera, 2009 (1) Cormier 2019 (0)				Okoli, 2020 (1) Fernández, 2015 (8) Tabacchi, 2016 (19) Nagata, 2013 (unclear, at least 1) Tauli, 2016 (0) Okoli, 2021 (2) Faria, 2021 (0)	Alividza, 2018 (unclear, at least 2) Najafizada, 2020 (4)	Ly, 2021 (4) Dong, 2020 (unclear) Spyromitrou-Xioufi, 2020 (0) Newman, 2015 (3) Possenti, 2016 (0) Richterman, 2018 (0) Coffey, 2018 (unclear) Rostami, 2021 (2) Fauroux, 2017 (8) Rostami, 2019a (2)

Online supplemental file 4: ASSESSMENT OF INDIVIDUAL REVIEWS USING ASSESSMENT OF MULTIPLE SYSTEMATIC REVIEWS VERSION 2 (AMSTAR2) CHECKLIST

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Tavares, 2017	Y	N	Y	P Y	N	N	N	Y	N	N	N M C	N M C	Y	N	N M C	Y
Tollefson, 2013	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Vet, 2015	Y	N	N	P Y	N	N	N	P Y	Y	N	N M C	N M C	Y	N	N M C	Y
Beijer 2012	Y	N	N	P Y	N	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Behera, 2018	Y	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Vukovic, 2019	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	N	N M C	Y
Platt, 2013a	Y	N	N	P Y	N	N	N	Y	P Y	N	N M C	N M C	Y	Y	N M C	Y
Platt, 2013b	Y	N	N	Y	N	N	N	N	P Y	N	N M C	N M C	Y	Y	N M C	Y
Prost, 2007	Y	N	N	Y	N	N	N	P Y	N	N	N M C	N M C	N	N	N M C	N
Pulver, 2016	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Rossi, 2012	Y	P Y	N	Y	Y	Y	N	P Y	N	N	Y	N	N	Y	N	Y
Rostami, 2019	Y	Y	N	P Y	N	Y	N	P Y	N	N	Y	N	Y	Y	Y	Y
Di Gennaro, 2017	Y	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Fauroux, 2017	Y	P Y	N	Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hahne, 2013	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Jin, 20	Y	Y	N	P Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Larson, 2014	N	N	N	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Nava-Aguilera, 2009	N	N	N	P Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N
Okoli, 2020	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Schierhout, 2020	N	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Wayal, 2018	Y	N	N	Y	N	Y	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Yu, 2020	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Gorjana, 2017	Y	N	N	P Y	N	N	N	Y	Y	N	N M C	N M C	Y	Y	N M C	Y
Rodrigo, 2010	Y	N	N	P Y	N	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Rostami, 2019b	Y	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y
Coffey, 2018	Y	N	N	P Y	N	N	N	N	Y	N	N M C	N M C	N	Y	N M C	N
Ghiasvand, 2020	Y	N	N	P Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Cormier 2019	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Abraha, 2018	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	Y	N M C	N

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Adams, 2018	Y	Y	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	N
Aldridge, 2018	N	N	N	N	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Alividza, 2018	Y	N	N	P Y	Y	N	N	Y	Y	N	N M C	N M C	Y	N	N M C	Y
Arat, 2019	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	Y
Chan, 2017	Y	N	N	N	Y	Y	N	N	Y	N	Y	Y	Y	Y	N	Y
Chernet,2017	N	N	N	P Y	Y	N	N	N	N	N	N	N	N	Y	N	Y
Colledge, 2020	Y	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Crichton,2015	Y	P Y	Y	P Y	N	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
Eilami, 2019	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	Y	Y
Fakoya, 2015	Y	P Y	N	P Y	Y	N	N	P Y	N	N	N M C	N M C	Y	N	N M C	Y
Faustini, 2005	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y
Fernández, 2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	Y	Y	N	N M C	Y
Forshaw, 2017	Y	N	N	P Y	Y	N	N	Y	P Y	N	Y	N	Y	Y	Y	Y
Fisher, 2013	Y	N	N	P Y	N	N	N	Y	N	N	Y	Y	Y	Y	N	Y
Greenaway, 2015	Y	N	N	P Y	N	N	N	N	Y	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sandgren, 2014.	Y	N	N	P Y	Y	Y	N	Y	N	N	Y	N	N	Y	N	N
Schepisi, 2018.	Y	Y	N	P Y	Y	N	N	N	Y	N	Y	N	N	Y	N	Y
Suhrcke, 2011.	Y	N	N	Y	Y	Y	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Stockdale, 2020.	Y	Y	N	Y	Y	Y	N	N	P Y	N	Y	Y	Y	Y	N	Y
Tabacchi	Y	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y	Y	Y
Strifler	Y	N	N	P Y	Y	Y	N	Y	Y	N	N M C	N M C	N	Y	N M C	N
Nagata, 2011	Y	P Y	N	P Y	N	Y	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Nellums, 2018	Y	Y	N	P Y	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	N	Y
Newman, 2015	Y	Y	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Oldenburg, 2014	Y	P Y	N	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y
Oldenburg_2015	Y	N	N	P Y	N	Y	N	N	N	N	Y	N	N	Y	N	Y
Operario 2008	Y	N	N	Y	Y	Y	N	N	P Y	N	Y	N	N	Y	Y	N
Offer_2015	Y	N	N	P Y	Y	Y	N	Y	N	N	N M C	N M C	N	N	N M C	N
Mipatrini, 2017	N	N	Y	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Lucyk, 2019.	N	N	N	N	Y	N	N	P Y	P Y	N	N M C	N M C	Y	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
De Vito, 2017	Y	N	Y	P Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	N
Bocquier, 2017	Y	N	N	P Y	Y	N	N	N	N	N	N M C	N M C	Y	Y	N M C	Y
Morais, 2017	Y	Y	N	N	Y	Y	N	N	N	N	N M C	N M C	N	N	N M C	Y
Spyromitrou-Xioufi, 2020	Y	N	N	N	Y	Y	N	Y	P Y	N	Y	Y	Y	Y	Y	Y
Van Gerwen, 2020	Y	N	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Zamani, 2018.	N	N	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	Y
Jain, 2017	Y	N	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Kentikelenis, 2015	Y	N	N	Y	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Li, P. 2020	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Leung,2019	Y	Y	N	Y	N	N	N	P Y	N	N	Y	N	N	Y	N	Y
Lindsay,2015	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Salgado-Barreira	Y	N	N	P Y	Y	N	N	Y	N	N	N M C	N M C	Y	Y	N M C	N
Fournet, 2018.	N	N	N	N	Y	N	N	N	N	N	N M C	N M C	N	N	N M C	Y
Bonten et al., 2020	Y	N	N	P Y	N	N	N	N	N	N	Y	N	N	Y	N	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Chen et al., 2019	N	N	N	P Y	N	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Denning et al., 2018	N	N	N	Y	Y	N	N	P Y	P Y	N	Y	Y	N	N	N	Y
Falagas & Zarkadoulia, 2008	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	Y	N M C	N
Falla et al., 2018	N	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	N	Y	N M C	Y
Hermann et al., 2019	Y	Y	N	Y	Y	N	N	N	Y	N	N M C	N M C	Y	Y	N M C	N
Millett et al., 2012	Y	N	N	Y	N	N	N	N	N	N	Y	N	Y	N	N	Y
Kawatsu, 2014	Y	N	N	N	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	Y
Possenti, 2016	N	N	N	P Y	N	Y	N	N	P Y	N	Y	Y	Y	Y	Y	Y
Richterman, 2018	Y	N	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Tauli, 2016	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Malerba, 2015	Y	N	N	Y	Y	Y	N	P Y	N	N	N M C	N M C	N	N	N M C	Y
Leumi, 2020	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Arum, 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Mirzadedh, 2021	Y	N	N	Y	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Macina, 2021	Y	N	N	Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ly, 2021	Y	Y	N	Y	Y	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Lafond, 2021	Y	P Y	N	Y	Y	N	N	N	P Y	N	Y	Y	Y	Y	N	Y
McBride	Y	N	N	P Y	N	N	N	Y	N	N	N M C	N M C	N	N	N M C	Y
Ding 2020	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Sultana 2021	Y	Y	N	N	Y	Y	P Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Whelan 2021	Y	N	N	N	Y	N	N	Y	N	N	N M C	N M C	N	Y	N M C	Y
Faria 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Jackson 2021	Y	Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Badri 2021	Y	N	N	N	Y	N	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Dugan 2021	Y	N	N	P Y	N	N	N	N	P Y	N	N M C	N M C	Y	N	N M C	Y
Kabapy 2020	Y	Y	N	P Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
Dong 2020	Y	N	Y	N	Y	Y	N	N	Y	N	Y	N	Y	N	N	Y
Najafizada, 2020	N	N	N	N	N	N	N	N	N	N	N M C	N M C	N	N	N M C	Y

Study ID (Author, Year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nurollahpour Shiadeh, 2020	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	N	Y
Pega 2021	Y	P Y	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N
Rostami 2021	Y	N	N	P Y	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Song, 2021	Y	N	N	P Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y
Wu 2021	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Okoli 2020	Y	N	N	N	Y	Y	N	P Y	Y	N	Y	Y	Y	Y	Y	Y
Roller-Wirnsberger 2021	Y	N	Y	P Y	N	N	N	P Y	N	N	N M C	N M C	N	Y	N M C	N

Key: Y=Yes; N=No, P Y = Partial yes and N M C = No meta-analysis conducted

AMSTAR 2 Items:

1. Did the research questions and inclusion criteria for the review include the components of PICO?

2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?

3.Did the review authors explain their selection of the study designs for inclusion in the review?

4.Did the review authors use a comprehensive literature search strategy?

5.Did the review authors perform study selection in duplicate?

6.Did the review authors perform data extraction in duplicate?

7.Did the review authors provide a list of excluded studies and justify the exclusions?

8.Did the review authors describe the included studies in adequate detail?

9.Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?"

10. Did the review authors report on the sources of funding for the studies included in the review?

11.If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?"

12.If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

13.Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?"

14.Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?"

15.If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?"

16.Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?"

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Page 1, Page 4
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 4
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6, Table 1
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 5
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 5 online supplemental file 1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 5
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 6-7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 6-7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 6-7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8 - 13
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 7
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 7
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 7
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 7
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 7, Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 7
Study characteristics	17	Cite each included study and present its characteristics.	online supplemental file 2 and 3, Page 7-13
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 8, Figure 3, online supplemental file 4
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 7-13, online supplemental file 2 and 3
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 7-13
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 13-15
	23b	Discuss any limitations of the evidence included in the review.	Page 14-15
	23c	Discuss any limitations of the review processes used.	Page 14-15
	23d	Discuss implications of the results for practice, policy, and future research.	Page 13-15
OTHER INFORMATION			
Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Page 5

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
protocol	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Page 5
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 16
Competing interests	26	Declare any competing interests of review authors.	Page 16
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Online supplemental files

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

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