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The wider determinants of health

Relationships between housing and its surroundings and health, wellbeing and equity

**Technical report and narrative
summary of systematic evidence
mapping**

Publication details:

Title: The wider determinants of health. Relationships between housing and its surroundings and health, wellbeing and equity.

Publisher: Public Health Wales NHS Trust

Date: July 2020

ISBN: 978-1-78986-154-100

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Acknowledgements:

The authors would like to acknowledge Dr Ciaran Humphreys, Dr Kirsty Little, Sian King and Claire Morgan for their contribution to this work.

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Acknowledgement to Public Health Wales NHS Trust to be stated.

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2 Background and purpose

This document provides a narrative summary of the results of systematic evidence mapping. We used this to search and sort evidence from systematic reviews exploring the relationship between housing and its surroundings and health and wellbeing. This report provides a summary of high-level research in this area and points to; relationships between housing and its surroundings that have been systematically reviewed; interventions that may, or may not, be useful; relationships and interventions that need further research and evidence gaps.

This work supports strategic priority one of Public Health Wales long-term strategy. This priority aims to influence the wider determinants of health, the social, economic and environmental factors that influence health and wellbeing and inequalities.

Note that the referencing in this document reflects the order in which documents appear in the evidence map. This is not always the same as the order in this report. References in the footnotes are reviews included in the initial, but not the final, evidence map.

3 Method

3.1 Map questions

The questions for the map were:

Which relationships between housing and its surroundings and health, wellbeing and equity have been reviewed systematically?

What gaps exist in the systematic review evidence on potential relationships between housing and its surroundings and health, wellbeing and equity?

3.2 Map framework

The map framework in Table 1 outlines topic areas considered relevant to the map questions. It was developed in conjunction with stakeholders and used to structure the literature search and the map.

Table 1: Map framework

Physical infrastructure (nature and quality of housing – direct impacts)	Psychosocial impact (of housing and surroundings – indirect impacts)	Housing – impact on vulnerable groups
Cold, damp, mould, lead, radon, indoor air pollution	Neighbourhoods, neighbours, access to	Drug, alcohol and mental health problems, learning

Physical infrastructure (nature and quality of housing – direct impacts)	Psychosocial impact (of housing and surroundings – indirect impacts)	Housing - impact on vulnerable groups
(including tobacco smoke), contaminated land, house dust mites (infestations), energy inefficiency, fuel poverty	local amenities and facilities, 'quality' of local facilities and amenities	disability, vulnerable young people (care leavers), those with chronic physical health problems, ex-prisoners, refugees/asylum seekers, supported housing (housing models), recovery housing, housing led, housing first, foyers
Housing type, age (include mobile homes, houseboats etc.) building design, accessibility, adaptations, slips, trips, falls	Events affecting housing e.g. flood, fire	Those who are homeless, prevention of homelessness
Physical environment, estate design, immediate surroundings, neighbourhood, neighbourhood renewal, noise, technology/design to support those with additional needs. Local infrastructure and amenities, for example transport links, access to services, 'walkability'	Housing tenure, owned vs rented housing "residential sorting/segregation", alternative models for providing housing (social enterprise, community investment), security of tenure, impact of housing costs on family finances, impact of repossession (or any loss of housing), affordability	Affordability, stability, achieving and maintaining tenancies, impact of loss of housing (repossession),
Housing density, overcrowding	Other indirect impacts, e.g. educational outcomes	Older people, extra care, keeping older people in their own homes

3.3 Search strategy

Searches were conducted in August 2019, with some supplementary searching for the final map undertaken in February 2020. They included the year 2005 onwards and were limited to systematic reviews with English abstracts.

Details of the search strategy are available on request. There was no search of journal contents lists, no follow-up of reference lists or citation tracking of included studies.

We searched the following databases and websites:

CINAHL+	Centre for Housing Policy University of York
HMIC	UK Collaborative Centre for Housing Excellence
IDOX	What Works Centre for Local Economic Growth

Medline	Cochrane Reviews
NICE	Campbell Collaboration
PsycINFO	Centre for Homelessness Impact
AgeInfo	Herriot Watt Institute for Social Policy
EPPI-Centre	Criminal Justice database
College of Policing	Research in Urban Studies
Social Care Online	US Task Force Community Guides
What Works Centre for Wellbeing	

3.4 Reference management

References were recorded in a Reference Manager database.

3.5 Inclusion/exclusion criteria:

Types of studies/sources:

Include: Systematic reviews, meta-analyses and systematic reviews combined with modelling where the relationship between any aspect of housing and its surroundings and health, wellbeing or equity is considered

Exclude: Primary sources, secondary sources that are not based on a systematic review, qualitative systematic reviews

Setting: Housing and its surroundings

Population/perspective:

Include: Populations in developed countries OECD or EU 27

Exposure/intervention:

Include: housing and its surroundings (using framework)

Exclude: Other exposures

Evaluation:

Include: Any measures of health, wellbeing or equity. Any outcome measures relevant to framework content

3.6 Screening

An information specialist screened search results at title; there was no consistency check. Records remaining after title screening were screened at abstract and full text by two reviewers. First and second reviewer decisions, with reasons, were recorded in an inclusion/exclusion Table; any disagreements were resolved through discussion.

3.7 Critical appraisal

No critical appraisal of any systematic reviews included in the initial or final maps was undertaken. All studies described by the authors as a systematic review were included in the initial map. We noted in the data extraction whether the systematic review included critical appraisal.

3.8 Initial mapping – data extraction

Included reviews were categorised using the map framework by one reviewer with decisions checked by the second reviewer. Some reviews contained material that was relevant to more than one category. The full reference of each included source, review question, topic area and outcome measures, whether or not critical appraisal was undertaken, a brief summary of the findings, from the review abstract where this was available and review authors conclusions were captured in an excel spreadsheet. This initial mapping allowed gaps, (for which no relevant systematic reviews were found), to be identified.

3.9 Final mapping

The final map (available [here](#)) includes only systematic reviews that, without critical appraisal, were considered to have been produced by recognised expert bodies using a robust methodology (which adheres to systematic review principles and includes critical appraisal using a recognised tool, list of sources available [here](#)). A list of systematic reviews that were included in the initial mapping but not included in the final map is available in the appendix.

3.10 Evidence summaries

In the final map the evidence summaries were written by one reviewer and checked by the second. They are based on the findings and conclusions of the systematic review authors. Observatory Evidence Service reviewers have not assessed the quality, strength and direction of the evidence. The quality of included studies, their design and conduct, would need careful consideration before implementing actions or interventions based on this work.

Figure 1: Grading scheme for associations

The evidence suggests there may be an association	Systematic review where the majority of studies (more than 50%) or meta-analysis suggest that there is an association
Evidence is lacking or is inconsistent	<p>Evidence is lacking - systematic review that found one or no relevant studies</p> <p>Evidence is inconsistent - systematic review where there is no clear majority of studies (more than 50%) or meta-analysis suggesting either an association or no association</p>

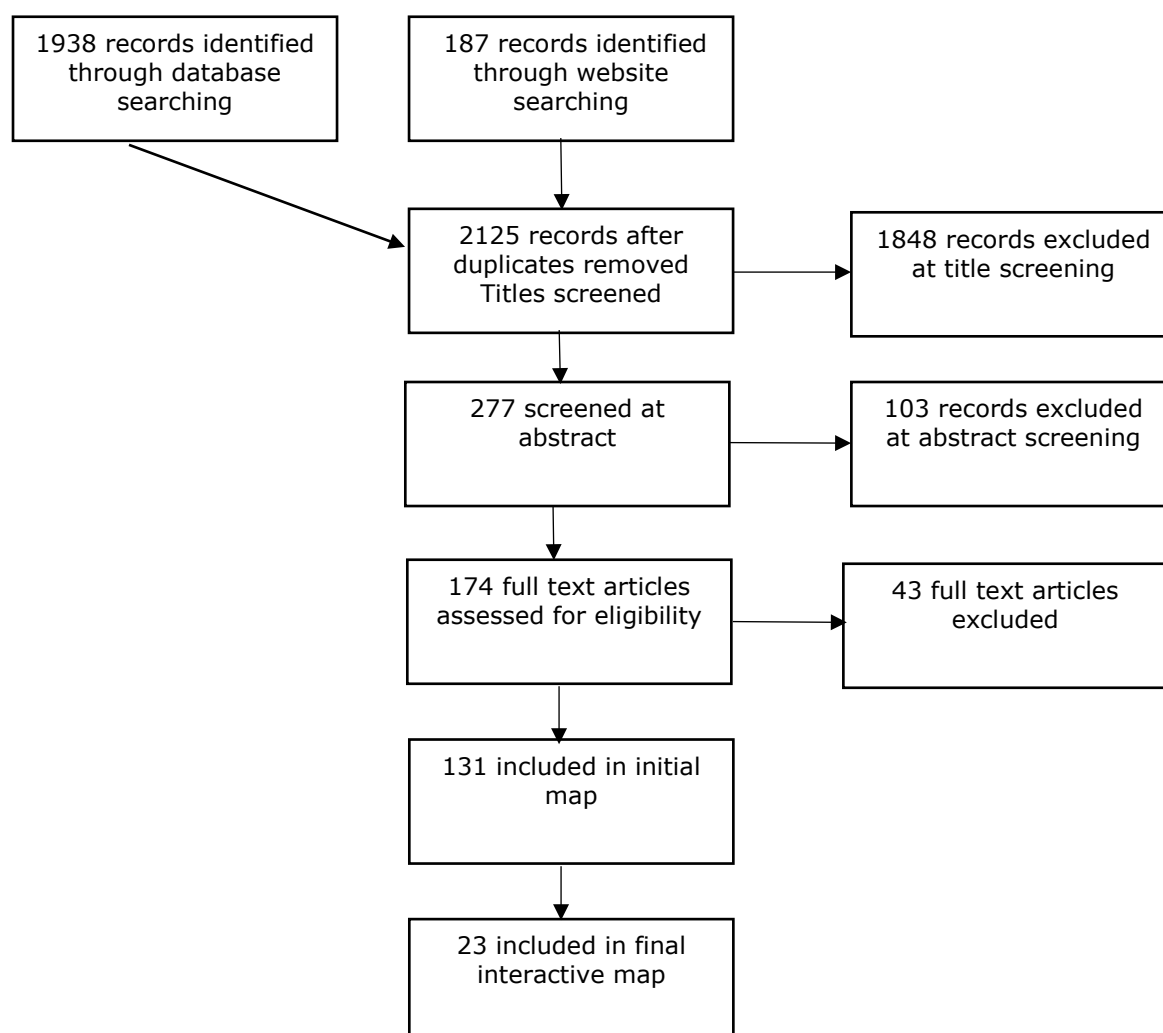
The evidence suggests that there is no association	Systematic review where the majority of studies (more than 50%) or meta-analysis suggest that there is no association
----------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------

Figure 2: Grading scheme for interventions

The evidence suggests the intervention may be effective	Systematic review where the majority of studies (more than 50%) or meta-analysis suggest that there is a positive effect
Evidence is lacking or is inconsistent	Evidence is lacking - systematic review that found one or no relevant studies. Evidence is inconsistent - systematic review where there is no clear majority of studies (more than 50%) or meta-analysis suggesting a positive effect or no effect
The evidence suggests that the intervention may not be effective	Systematic review where the majority of studies (more than 50%) or meta-analysis suggesting that there is no effect

4 Results

Figure 3: Flow of information through the mapping process



4.1 Initial evidence mapping – coverage and evidence gaps

One hundred and thirty one sources were included in the initial evidence mapping. These were categorised using the map framework. Some reviews included material that fell into more than one category. The majority of systematic reviews looked at physical infrastructure. The psychosocial impact of housing and its surroundings was the least well covered element of the map framework.

4.1.1 Physical infrastructure

Table 2 summarises the categories, interventions and associations that the retrieved systematic reviews covered. The most frequent type of review were those concerned with exposure to poor indoor air quality and allergens. We found no reviews looking at the relationship between health and wellbeing and local physical infrastructure and amenities (for example shops or medical facilities). Although one did look at community infrastructure in terms of physical places where people could meet. Few reviews had looked for outcomes relevant to equity.

Table 2: Physical infrastructure

Interventions/associations	No. of reviews
Exposure to poor indoor air quality (including radon, other gases e.g. from fuel source, tobacco smoke)	21
Exposure to allergens (dust mites, pets)	11
Falls, other injuries, fire, burns	11
Housing condition/housing improvement	8
Neighbourhood/surroundings	6
Mould and dampness	5
Indoor temperature, cold homes, energy efficiency	5
Noise	3
Accessible homes	2
Household size/overcrowding	1

4.1.2 Psychosocial impact

Table 3 summarises the categories, interventions and associations relating psychosocial impact of housing and its surroundings that the retrieved systematic reviews covered. We did not find any reviews that looked at impacts of the cost of housing or the impact of different forms of housing tenure.

We found no reviews that looked at the health impact of relationships with neighbours. We also found nothing on the impact of adverse events such as flooding or fires or anything that looked at indirect impacts such as educational outcomes. One review looked at childhood residential mobility

but did not report educational outcomes. A number of reviews looked for outcomes relevant to equity.

Table 3: The psychosocial impact

Interventions/associations	No. of reviews
Neighbourhood design (built)	5
Neighbourhood interventions	4
Impact of foreclosure/repossession/eviction	4
Surroundings (natural)	3
Housing tenure	2
Neighbourhood socioeconomic factors	1
Childhood residential mobility	1

4.1.3 Vulnerable groups

Table 4 summarises the categories and interventions the retrieved systematic reviews covered. Many of the included reviews included material relevant to more than one category. We found systematic reviews that covered all the topics in the map framework.

Table 4: Vulnerable groups

Interventions/associations	No. of reviews
Homeless or insecurely housed	11
People with mental illness	6
People with substance misuse problems	4
Older people	4
Offenders	2
Refugees	2
Veterans	1
People with learning difficulties	1
Housing assistance	1

4.1.4 Summary of evidence gaps

Evidence for a substantial number of the associations and interventions that had been included in systematic reviews was lacking or inconsistent. These are gaps in the evidence base at review level.

A number of systematic reviews looked at outcomes relevant to equity. Although some found studies reporting relevant outcomes, for most evidence was lacking^{1, i,ii}.

The main evidence gaps in relation to the map framework are summarised in Table 5. These suggest that there is a gap in review level evidence on the

ⁱ McCartney G et al. Regeneration and health: a structured, rapid literature review. *Public Health*. 2017; 148: 69-87

ⁱⁱ Milton B et al. The impact of community engagement on health and social outcomes: a systematic review. *Community Development Journal*. 2012; 47(3): 316-334

health and wellbeing impact of local infrastructure and amenities, relationships with neighbours, adverse events (for example fire, flood) type of tenure and cost of housing. We also found no reviews reporting on the relationship between housing and other outcomes such as education, although one review report that warm homes may reduce school absence¹².

Table 5: Evidence gaps summary

Physical infrastructure	Psychosocial impact
Health and wellbeing impact/relationship with local infrastructure and amenities	Health and wellbeing impact of relationships with neighbours, adverse housing events (e.g. flood, fire), type of tenure and cost of housing. Indirect impacts of housing e.g. education

5 Results - inclusions in final evidence map

Only 23 of the 131 systematic reviews (18 percent) included in the initial map were included in the final map. There was a reasonable match in coverage of topics between the initial and final maps for physical infrastructure and a good match for vulnerable groups. However, for psychosocial impact only two reviews could be included in the final map. This meant that important topics (impact of surroundings, area characteristics (for example crime), type of tenure, impact of foreclosure/eviction) were not included.

Table 6: Housing – final inclusions

Category	Source of review	No. of reviews
Physical infrastructure	National Institute for Health and Care Excellence	7
	US Preventative Services Task Force Community Guides	1
	Cochrane systematic reviews	6
	Campbell systematic reviews	1
	What Works Centre for Wellbeing	1
	What Works Centre for Local Economic Growth	1
Psychosocial impact	Cochrane systematic reviews	1
	What Works Centre for Wellbeing	1
Vulnerable groups	Cochrane systematic review	2
	Campbell systematic review	1
	What Works Centre for Wellbeing	1

5.1 Physical infrastructure

5.1.1 Indoor environment

5.1.1.1 Air quality

Table 7. Factors associated with exposure to poor indoor air quality

Association	Evidence summary
Population factors (gender, SES, age, household occupant density)	Evidence is lacking so it is not possible to tell which population factors are associated with exposure to poor indoor air quality in homes ¹
Lifestyle and behavioural factors (pet ownership, method of cooking, use of candles and air fresheners, vacuum cleaner motor power and frequency of use, method of clothes drying, allergen avoidance measures, use of wool bedding and mattress type and age)	Evidence is lacking so it is not possible to tell which lifestyle and behavioural factors are associated with exposure to poor indoor air quality in homes ¹
Building type (e.g. flat or house)	Evidence is lacking so it is not possible to tell if building type is associated with exposure to poor indoor air quality ¹
Building age	Evidence is lacking so it is not possible to tell whether building age is associated with exposure to poor indoor air quality at home ¹
Housing size	Evidence is lacking so it is not possible to tell if house size is associated with exposure to poor indoor air quality ¹
Tenancy agreement type	Evidence is lacking so it is not possible to tell if tenancy type is associated with exposure to poor indoor air quality ¹
Dwelling location (proximity to city centre, exposure to traffic)	Evidence is lacking so it is not possible to tell if dwelling location is associated with exposure to poor indoor air quality in homes ¹
Type of heating (gas, use of fireplaces, wood burning)	Evidence is lacking so it is not possible to tell whether type of heating is associated with exposure to poor indoor air quality in homes ¹
Recent refurbishment or DIY	Evidence is lacking so it is not possible to tell if recent refurbishment or DIY reduces the risk of exposure to poor indoor air quality in homes ¹
Integral garage	Evidence is lacking so it is not possible to tell if having an integral garage is associated with exposure to poor indoor air quality in homes ¹

Association	Evidence summary
Physical condition of dwelling	Evidence is lacking on the relationship between the physical condition of dwellings and exposure to poor indoor air quality ¹
Type of wall covering	Evidence is lacking so it is not possible to tell if there is a relationship between type of wall covering and exposure to poor indoor air quality in homes ¹
Method of water heating	Evidence is lacking so it is not possible to tell whether use of electricity to heat water is associated with a reduced risk of exposure to indoor air pollution when compared to other methods of heating water (oil/diesel or gas) ¹
Brick cladding	Evidence is lacking so it is not possible to tell if use of brick cladding is associated with exposure to poor indoor air quality ¹
Concrete basement floors	Evidence is lacking so it is not possible to tell if concrete basement floors are associated with exposure to poor indoor air quality in homes ¹
Type of flooring	Evidence is lacking so it is not possible to tell if there is a relationship between type of flooring (carpeting, wood, PVC) and exposure to poor indoor air quality ¹
Insulation	Evidence is lacking so it is not possible to tell whether insulation is associated with an increased risk of exposure to poor indoor air quality in homes ¹
Ventilation (double glazing, central air conditioning, mechanical ventilation, opening windows, extractor fan use, dehumidifier use, presence of moisture and high humidity)	Evidence is lacking on the relationship between ventilation related factors and exposure to poor indoor air quality ¹

Table 8: Interventions to prevent exposure to poor indoor air quality

Intervention	Evidence summary
To reduce exposure to particulate matter	Evidence is lacking so it is possible to tell whether interventions including use of low emission wood burning stoves, air filtration devices and HEPA air purifiers are effective in preventing or reducing particulate matter in indoor air or improving respiratory health ²
To reduce exposure to gases	Evidence is lacking so it is not possible to tell if measures including use of replacement heaters (heat pump, wood pellet burner or flued gas) or mechanical heat-recovery ventilation to reduce CO ₂ and NO ₂ in indoor air are effective or whether they have any impact on respiratory health ²

Intervention	Evidence summary
To reduce exposure to mould	Evidence is lacking so it is not possible to tell whether interventions to prevent or reduce mould are effective or whether they have an impact on respiratory health ²
To reduce exposure to pet dander	Evidence is lacking so it is not possible to tell whether the use of HEPA filter and vacuum cleaner to prevent/reduce prevent/reduce pet dander exposure are effective or improve respiratory health in children or adults with respiratory symptoms ²
Occupant behaviour change interventions	<p>Evidence is lacking so it is not possible to tell whether multicomponent interventions with two components to prevent/reduce aeroallergen or second-hand smoke exposure in children with asthma are effective³</p> <p>Evidence is inconsistent so it is not possible to tell whether multicomponent interventions with up to nine components are effective to prevent/reduce aeroallergen or second-hand smoke exposure in children with asthma are effective³</p>
Multicomponent interventions to prevent exposure to second-hand smoke	Evidence is lacking so it is not possible to tell whether multicomponent interventions with two components to prevent/reduce second hand smoke exposure increase the number of symptom free days for children with asthma ³
Ventilation strategies	Evidence is lacking so it is not possible to tell if ventilation to improve indoor air quality has an impact on health ⁴
Occupant behaviour change interventions	<p>The evidence suggests that multicomponent interventions with up to four components to prevent/reduce aeroallergen exposure and second-hand smoke exposure may not be effective in children and adults with asthma³</p> <p>The evidence suggests that multicomponent interventions, with up to nine components, to prevent/reduce aeroallergen and second-hand smoke exposure may not reduce the occurrence of atopy in children with asthma³</p> <p>The evidence suggests that multicomponent interventions, with up to three components, to prevent/reduce aeroallergen exposure and second-hand smoke exposure in children and adults with asthma may have no effect on health related quality of life³</p> <p>The evidence suggests that multicomponent interventions to prevent/reduce aeroallergen exposure and second-hand smoke exposure may have no effect on the respiratory health of children and adults with asthma³</p>

5.1.1.2 Allergens

Table 9: Interventions to reduce exposure to allergens

Intervention	Evidence summary
Home-based, multi-trigger, multicomponent interventions with an	The evidence suggests that home-based, multi-trigger, multicomponent

Intervention	Evidence summary
environmental focus (including use of allergen-impermeable covers and other measures to reduce triggers in the home, environmental education, asthma self-management education, home visits from health or social care professionals or community workers to change the home environment)	interventions with an environmental focus may be effective in improving overall quality of life and productivity in children and adolescents with asthma ⁵
Physical measures including intensive home cleaning, vinyl mattress covers, daily wet cleaning of floors, boiling of top bedding covers and removal of soft furnishing) and/or chemical measures	The evidence suggests that the use of physical measures may lead to a reduction in allergen load for those with house dust mite-provoked respiratory disease when combined with maintenance drug treatments. However, the magnitude of the effect cannot be reliably isolated from that of the maintenance drug treatment ⁷
House dust mite (HDM) control measures, including: <ul style="list-style-type: none"> • high efficiency particulate air filters • isolated use of acaricides • isolated use of barrier bedding • use of barrier bedding and acaricides 	The evidence suggests that acaricides and extensive bedroom-based environmental control programmes may reduce symptoms of allergic rhinitis for some people. However, isolated use of house mite impermeable bedding is unlikely to prove effective ⁹
Repairs to buildings with moisture or mould damage. e.g. cleaning, repairing all relevant causes of moisture damage, removing damaged materials and replacing them with new ones, or effectively drying construction materials that could not be replaced (for example, concrete)	The evidence suggests that repairing mould-damaged houses may reduce asthma-related symptoms and respiratory infections in adults ¹⁰
Home based environmental interventions (environmental assessment, remediation and education)	The evidence is inconsistent so it is not possible to tell whether home based environmental interventions are effective for adults with asthma ⁵
Chemical, physical (mattress covers, vacuum-cleaning, heating, ventilation, freezing, washing, air-filtration and ionisers) and combined methods of house dust mite control	Evidence is lacking so it is not possible to tell whether measures to reduce exposure to house dust mites are effective for treating eczema ^{2, 8}
Micro-level: physical changes or improvements to the infrastructure or indoor environment of the house, e.g. <ul style="list-style-type: none"> – Air filtration systems – Other physical measures including intensive home cleaning, vinyl mattress covers, daily wet cleaning of floors, boiling of top bedding covers and removal of soft furnishing) and/or chemical measures (air filters loaded with 	<p>Evidence is lacking so it is not possible to tell which material and structural interventions are effective in preventing or reducing house dust mites²</p> <p>Evidence is lacking so it is not possible to tell whether air filtration systems improve health outcomes in people with asthma⁷</p>

Intervention	Evidence summary
Enviracaire and acaracide spray and cleaning products	
Repairs to buildings with moisture or mould damage. e.g. cleaning, repairing all relevant causes of moisture damage, removing damaged materials and replacing them with new ones, or effectively drying construction materials that could not be replaced (for example, concrete)	Evidence is lacking so it is not possible to tell if interventions to remediate buildings damaged by mould or dampness are effective in reducing respiratory tract problems in children ¹⁰
Chemical, physical (mattress covers, vacuum-cleaning, heating, ventilation, freezing, washing, air-filtration and ionisers) and combined methods of house dust mite control	The evidence suggests that chemical and physical methods to reduce exposure to house dust mites may not be effective in the improving asthma symptoms ^{2, 6, 7}
Repairs to buildings with moisture or mould damage. e.g. cleaning, repairing all relevant causes of moisture damage, removing damaged materials and replacing them with new ones, or effectively drying construction materials that could not be replaced (for example, concrete)	The evidence suggests that repairing mould-damaged houses may reduce asthma-related symptoms and respiratory infections in adults ¹⁰

5.1.1.3 Indoor temperature

Table 10: Interventions for warm homes (reducing exposure to cold in the home)

Intervention	Evidence summary
Housing energy efficiency improvements	<p>The evidence suggests that housing energy efficiency interventions may improve health outcomes and health in those with respiratory and other chronic diseases^{7, 11, 12}</p> <p>The evidence suggests housing of an appropriate size for the household and that is affordable to heat may improve health outcomes and promote social relationships, affordable warmth may also reduce absences from school or work¹²</p>
Ventilation	Evidence on the impact of changes to ventilation in homes was not sufficient to allow any conclusions to be drawn ¹¹
Thermal clothing, anti-slip and gait stabilisation devices	Evidence on the effectiveness of anti-slip and gait-stabilisation devices and the thermal characteristics of clothing for reducing risks of slips, falls or cold exposure was insufficient to allow any conclusions to be drawn ¹¹

5.1.1.4 Unintentional injuries

Table 11: Interventions to reduce unintentional injuries

Intervention	Evidence summary
Home safety education, with or without provision of low cost or discounted safety equipment	The evidence suggests that home safety interventions involving the provision of home safety equipment may improve safety practice however, the evidence suggests that this may not lead to a reduction in injury rates ^{7, 13, 14}
Physical changes or improvements to infrastructure or indoor environment	The evidence suggests that removal and repair of safety hazards in homes may reduce falls in older people ⁷
Interventions to reduce fire related injuries	The evidence suggests that in the US smoke detector legislation may reduce the number of fire related deaths ⁷
Physical changes or improvements to infrastructure or indoor environment	Evidence is lacking so it is not possible to tell whether modification of the home environment reduces falls in older people ⁷ The evidence is inconsistent so it is not possible to tell if environmental modifications in the home reduce hazards, falls or injuries in children or older people ¹⁵
Interventions to reduce fire related injuries	Evidence is inconsistent it is not possible to tell whether education-based interventions combined with provision of discounted smoke detectors increases the proportion of people who install smoke detectors ⁷
Interventions to prevent burns and scalds	Evidence is lacking so it is not possible to tell whether community based injury or burn prevention education programmes are effective ⁷ Evidence is inconsistent so it is not possible to tell whether interventions comprising healthcare counselling or education, provision of safety information or free thermometers encourage people to use safe hot water temperatures ⁷
Home safety education, with or without provision of low cost or discounted safety equipment	The evidence suggests that home safety interventions involving the provision of home safety equipment may improve safety practice however, the evidence suggests that this may not lead to a reduction in injury rates ^{7, 13, 14}

5.1.2 Exterior environment

Table 12: Interventions to improve the exterior environment

Intervention	Evidence summary
Use of lockable gates across alleys	The evidence suggests that installation of lockable alley gates may reduce burglaries ¹⁶
Estate renewal (including: refurbish, demolish, demolish-and-rebuild or build properties, including but not limited to public housing estates; area-based interventions which included an element of physical regeneration)	Evidence is inconsistent so it is not possible to tell whether estate renewal improves health and wellbeing ¹⁷
Estate renewal (including: refurbish, demolish, demolish-and-rebuild or build properties, including but not limited to public housing estates; area-based interventions which included an element of physical regeneration)	The evidence suggests that estate renewal may not be effective in improving, employment, wages or deprivation in local economies ¹⁷

5.2 Psychosocial impact

Table 13: Interventions to improve communities

Intervention	Evidence summary
Changes to neighbourhood design	Evidence is lacking (study designs are inappropriate to assess the effectiveness of interventions) so it is not possible to tell whether changes to neighbourhood design have an impact on health and wellbeing ¹⁹
Community coalition strategies that target neighbourhood social conditions influencing health outcomes (e.g. access to healthy food, safe neighbourhood environments)	The evidence suggests that community coalition-driven interventions to improve the local environment may not be effective in improving health outcomes; evidence of their impact on perceptions of the local area is inconsistent ¹⁸

5.3 Vulnerable groups

Table 14: Housing interventions for vulnerable groups

Intervention	Evidence summary
Housing interventions designed to avoid homelessness or unstable housing	<p>The evidence suggests that Housing First (immediate access to housing with additional support, without preconditions) approaches may improve physical health and mental wellbeing and mental health and may increase housing stability^{20, 21}</p> <p>The evidence suggests that recovery housing (for alcohol or substance use problems) may improve wellbeing²⁰</p>

Intervention	Evidence summary
	<p>The evidence suggests that supported housing may improve housing stability and wellbeing²⁰</p> <p>The evidence suggests that housing interventions for ex-prisoners may reduce offending²⁰</p>
Interventions to reduce homelessness including case management and housing programmes or a combination of these	<p>The evidence suggests that case management may reduce homelessness²¹</p> <p>The evidence suggests that the use of housing vouchers (subsidised housing) may reduce homelessness and improve housing stability²¹</p> <p>The evidence suggests that residential treatment (for those with mental illness or substance abuse) may reduce homelessness and improve housing stability²¹</p>
Housing interventions designed to avoid homelessness or unstable housing	Evidence is lacking on housing interventions for vulnerable young people ²⁰
Supported housing schemes, outreach support schemes for people with severe mental disorders	Evidence is lacking on the effectiveness of supported housing schemes for adults with severe mental disorders ²²
Smart home technologies for health and social care support	Evidence is lacking so it is not possible to tell whether the use of smart home technologies has a beneficial impact on health status ²³

6 Discussion

This section considers the extent to which the sources retrieved and included in the map are able to address the map questions. The questions were:

Which relationships between housing and its surroundings and health, wellbeing and equity have been reviewed systematically?

What gaps exist in the systematic review evidence on potential relationships between housing and its surroundings and health, wellbeing and equity?

6.1 Which relationships between housing and its surroundings and health, wellbeing and equity have been reviewed systematically?

6.1.1 Physical infrastructure

Reviews included in the final map covered exposure to poor indoor air quality and interventions to reduce this, interventions to reduce unintentional injuries, warm homes and improvements to the exterior environment. The overlap between initial and final maps was reasonable. Included in the initial but not final map were reviews on:

Housing quality

The immediate physical surroundings (green and built environment)

Accessible homes for people with functional limitations

Exposure to noise

Reviews included in the final map reported that evidence was lacking on factors associated with exposure to poor indoor air quality¹. For the most part evidence was lacking on interventions to reduce or prevent exposure to poor indoor air quality^{2, 3, 4}. However, a number of reviews included in the final map provide evidence on interventions that may or may not help to reduce exposure to poor indoor air quality for people with asthma and other respiratory problems^{2, 3, 5, 6, 7, 9, 10}. Evidence was lacking on interventions for people with eczema^{2, 8}.

A number of reviews in the final map included evidence on interventions to reduce exposure to cold homes^{7, 11, 12}. There were also a number of reviews with evidence on reducing unintentional injuries^{7, 13-15}. However, evidence was lacking or inconsistent on modifying the home environment, education based intervention programmes and community based injury or burn prevention programmes⁷.

Only two reviews in the final map looked specifically at surroundings. The first found that lockable gates installed across alleys may help to reduce burglaries¹⁶. The second looked at whether estate renewal, this included refurbishing, demolishing and building properties¹⁷. Evidence for the impact of this on health and wellbeing was inconsistent.

Equity

Also lacking were reviews relevant to the relationship between housing and equity. One, a NICE review included in the final map, attempted to explore the relationship between exposure to poor indoor air quality and factors relevant to equity. These included tenancy agreement type, socio-economic

status, household occupant density and dwelling location (proximity to city centre, exposure to traffic) and the physical condition of the dwelling¹. The review authors found only one relevant study. This looked at the relationship with household occupant density. The study reported on exposure to formaldehyde, hexanal and acetyl-aldehyde and house dust mite allergens.

A review of reviews (not included in the final map) looked at the impact of regeneration on health or the socioeconomic determinants of healthⁱ. Review authors reported mixed impact on socioeconomic outcomes and noted that relevant studies were generally weak. However, they did find that moving people of low socio-economic status from more to less deprived communities might be beneficial. They also reported that some regeneration initiatives result in *gentrification* leading to increased costs (higher rents). The net effect was that people of lower socioeconomic status move out and those of higher socioeconomic status move in.

A review from the What Works Centre for Local Economic Growth, included in the final map also looked at regeneration¹⁷. Local economic impact was the outcome relevant to equity. This reported that in terms of employment, wages or deprivation impacts were small and often zero. Two studies looked at wages and both found these increased but this might have been the impact of changes in neighbourhood composition. Five studies looked at employment, only one found consistently positive effects. Of two studies looking at deprivation, neither reported a positive effect.

6.2 Psychosocial impact

We found very few reviews on the psychosocial impact of housing and its surroundings. Fifteen were included in the initial map but only two in the final. The reviews in the final map looked at community coalitions targeting neighbourhood social conditions and changes in neighbourhood design^{18, 19}. The review on community coalitions was interested in their impact on health disparities¹⁸. This found only two studies, looking at environmental changes, relevant to our questions. Findings suggest that environmental changes delivered via community coalitions may have no impact on health outcomes. Evidence of their influence on perceptions of the local area was inconsistent¹⁸. The review on neighbourhood design found only qualitative studies so evidence is lacking of impact on health and wellbeing¹⁹.

The reviews included in the initial but not final map were on:

- Mental health impact of housing and surrounding environment (neighbourhood regeneration, violence, disorder, fear of crime)

- Foreclosure and eviction

- Housing condition and tenure

Equity

Two reviews not included in the final map looked for studies reporting outcomes relevant to equity^{i, ii}. One, a review of reviews, looking at regeneration found that mixed tenure approaches had unclear impacts on health and might disrupt social networksⁱ. The other review looked at community engagement methods to plan, design and deliver interventions to address the social determinants of healthⁱⁱ. This reported positive impacts on crime, social capital and community empowerment.

6.3 Vulnerable groups

We found 31 reviews on vulnerable groups four of which were included in the final map. There was good overlap between initial and final maps. Topics in the initial but not final map were:

Housing for people who are HIV positive

Older people

Refugees and asylum seekers

Reviews included in the final map reported evidence of effective interventions reducing homelessness and unstable housing and improving health and wellbeing for a range of vulnerable groups^{20, 21}. Evidence was lacking on interventions for vulnerable young people²⁰, supported housing for adults with severe mental disorders²² and the use of smart home technologies for health and social care support²³.

7 Limitations

The method used to produce this map has a number of limitations:

- The strength, quality and direction of evidence has not been assessed by Observatory Evidence Service reviewers
- The evidence summaries may over simplify the findings of the included systematic reviews. The evidence map and the full reports of the included reviews should be consulted for complete information
- Findings from the included systematic reviews were considered separately and the overall strength, quality and direction of the body of evidence has not been assessed. The overlap of studies across the included reviews has not been explored

- Limiting the final map to systematic reviews that were considered to have been well conducted without appraising is likely to have missed well conducted reviews that covered additional topics
- Only including systematic reviews means that new and emerging evidence is likely to have been excluded and topics that have not been systematically reviewed will have been missed.

8 References

1. National Institute for Health and Care Excellence. *Evidence review for associations between individual or building characteristics and exposure levels*. London: NICE; 2020.
2. National Institute for Health and Care Excellence. *Indoor air quality at home. 3.1 Evidence review for material and structural interventions*. London: NICE; 2020.
3. National Institute for Health and Care Excellence. *Indoor air quality at home. 3.2. Evidence review for occupant behaviour interventions*. London: NICE; 2020.
4. National Institute for Health and Care Excellence. *Indoor air quality at home. 3.3 Evidence review for ventilation design and use*. London: NICE; 2020.
5. Crocker DD et al. Effectiveness of home-based multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity: a community guide systematic review. *Am J Prev Med*. 2011; 41(2S1): S5-S32.
6. Gøtzsche PC, Johansen HK. House dust mite control measures for asthma. *Cochrane Database Syst. Rev*. 2008; (2): CD001187. DOI: 10.1002/14651858.CD001187.pub3.
7. Taske N et al. *Housing and public health. A review of reviews of interventions for improving health*. London: NICE; 2005.
8. Nankervis H et al. House dust mite reduction and avoidance measures for treating eczema. *Cochrane Database Syst. Rev*. 2015; (1): CD008426. DOI:10.1002/14651858.CD008426.pub2.
9. Sheikh A et al. House dust mite avoidance measures for perennial allergic rhinitis. *Cochrane Database Syst. Rev*. 2010; (7): CD001563. DOI: 10.1002/14651858.CD001563.pub3.
10. Sauni R et al. Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma. *Cochrane Database Syst. Rev*. 2015; (2): CD007897.DOI:10.1002/14651858.CD007897.pub3.
11. London School of Hygiene, Public Health England, University of London. *Evidence review and economic analysis of excess winter deaths. Review 2. Interventions and economic studies*. London: NICE; 2015.

12. Thomson H et al. Housing Improvements for Health and Associated Socio-Economic Outcomes: A Systematic Review. *Campbell Systematic Reviews* 2013; 9: 1-348.
13. Kendrick D et al. Home safety education and provision of safety equipment for injury prevention. *Cochrane Database Syst. Rev.* 2012; (9): CD005014. DOI:10.1002/14651858.CD005014.pub3.
14. Pearson M et al. *Preventing unintentional injuries among under 15s in the home report 1: Systematic reviews of effectiveness and cost-effectiveness of home safety equipment and risk assessment schemes*. Exeter: University of Exeter; 2009.
15. Turner S et al. Modification of the home environment for the reduction of injuries. *Cochrane Database Syst. Rev.* 2011; (2): CD003600.DOI: 10.1002/14651858.CD003600.pub3.
16. Sidebottom A et al. *Gating alleys to reduce crime. A meta-analysis and realist synthesis*. London: What Works Centre for Crime Reduction; 2015.
17. What Works Centre for Local Economic Growth. *Estate Renewal: evidence review*. London: What Works Centre for Local Economic Growth; 2015.
18. Anderson LM et al. Community coalition-driven interventions to reduce health disparities among racial and ethnic minority populations. *Cochrane Database Syst. Rev.* 2015; (6): CD009905. DOI: 10.1002/14651858.CD009905.pub2.
19. Bagnall AM et al. *A systematic review of interventions to boost community relations through improvements infrastructure (places and spaces)*. London: What Works Centre for Wellbeing; 2018.
20. Chambers D et al. *Housing for vulnerable people. Systematic review of the evidence for 'housing vulnerable' adults and its relationship to wellbeing*. London: What Works Centre for Wellbeing; 2018.
21. Munthe-Kaas H, Berg RC, Blaasv  r N. Effectiveness of interventions to reduce homelessness: a systematic review. *Campbell Systematic Reviews* 2018; 3: DOI: 10.4073/csr.2018.3.
22. Chilvers R, Macdonald G, Hayes A. Supported housing for people with severe mental disorders. *Cochrane Database Syst. Rev.* 2006; (4): CD000453. DOI: 10.1002/14651858.CD000453.pub2.
23. Martin S et al. Smart home technologies for health and social care support. *Cochrane Database Syst. Rev.* 2008; (4): CD006412. DOI: 10.1002/14651858.CD006412.pub2.

9 Appendix

Systematic reviews meeting the inclusion criteria but not included in the final evidence map

PHYSICAL ENVIRONMENT

Ajrouché R et al. Quantitative health risk assessment of indoor radon: A systematic review. *Radiat Prot Dosimetry* 2017; 177(1-2): 69-77. Available [here](#)

Amegah AK, Quansah R, Jaakkola JJ. Household air pollution from solid fuel use and risk of adverse pregnancy outcomes: A systematic review and meta-analysis of the empirical evidence. *PLOS One* 2014; 9(12): e113920. Available [here](#)

Arroyave WD et al. Impermeable mattress covers in the primary and tertiary prevention of allergic disease: a meta-analysis. *Ann Allergy Asthma Immunol.* 2014; 112: 237-248. Available [here](#)

Barnard LF et al. Excess winter morbidity and mortality: Do housing and socio-economic status have an effect? *Rev Environ Health* 2008; 23(3): 203-221. Available [here](#)

Baxter S et al. The effectiveness of interventions to establish smoke-free homes in pregnancy and in the neonatal period: a systematic review. *Health Educ Res.* 2011; 26(2): 265-282. Available [here](#)

Brown N et al. Interventions to reduce harm from smoking with families in infancy and early childhood: A systematic review. *Int J Environ Res Public Health* 2015; 12: 3091-3119. Available [here](#)

Brown N et al. Family-focussed interventions to reduce harm from smoking in primary school-aged children: A systematic review. *Prev Med.* 2017; 101: 117-125. Available [here](#)

Browning M, Lee K. Within what distance does "greenness" best predict physical health? A systematic review of articles with GIS buffer analyses across the lifespan. *Int J Environ Res Public Health* 2017; 14: 675. Available [here](#)

Bruce N et al. Does household use of biomass fuel cause lung cancer? A systematic review and evaluation of the evidence for the GBD 2010 study. *Thorax* 2015; 70: 433-441. Available [here](#)

Chase CA. Systematic review of the effect of home modification and fall prevention programs on falls and the performance of community-dwelling older adults. *Am J Occup Ther.* 2012; 66(3): 284-291. Available [here](#)

Cho HY et al. Accessible home environments for people with functional limitations. *Int J Environ Res Public Health* 2016; 13: 826. Available [here](#)

Colosia AD et al. Residential crowding and severe respiratory syncytial virus among infants and young children: A systematic literature review. *BMC Infect. Dis.* 2012; 12: 95. Available [here](#)

Cooper NJ et al. Network meta-analysis to evaluate the effectiveness on interventions to increase the uptake of smoke alarms. *Epidemiol Rev.* 2012; 34: 32-45. Available [here](#)

Dick S et al. A systematic review of associations between environmental exposures and development of asthma in children aged up to 9 years. *BMJ Open* 2014; 4:11. Available [here](#)

DiGiuseppi C et al. Housing interventions and control of injury-related structural deficiencies: A review of the evidence. *J Public Health Manag Pract.* 2010; 16(5 Suppl): S34-S43. Available [here](#)

Dzhambov AM. Long-term noise exposure and the risk of type 2 diabetes: A meta-analysis. *Noise Health.* 2015; 17(74): 23-33. Available [here](#)

Dzhambov AM, Dimitrova DD. Children's blood pressure and its association with road traffic noise exposure - A systematic review with meta-analysis. *Environ. Res.* 2017; 152: 244-255. Available [here](#)

Fatmi Z, Coggon D. Coronary heart disease and household air pollution from use of solid fuel: a systematic review. *Br Med Bull.* 2016; 118(1): 91-109. Available [here](#)

Fisk WJ, Eliseeva EA, Mendell MJ. Association of residential dampness and mold with respiratory tract infections and bronchitis: a meta-analysis. *Environ Health* 2010; 9:72. Available [here](#)

Gibson M et al. Housing and health inequalities: a synthesis of systematic reviews of interventions aimed at different pathways linking housing and health. *Health Place* 2011. 17(1): 175-184. Available [here](#)

Gotzsche PC, HK Johansen. House dust mite control measures for asthma: systematic review. *Allergy* 2008; 63:646-659. Available [here](#)

Guo JL et al. Interventions to reduce the number of falls among older adults with/without cognitive impairment. *Int J Geriatr Psychiatry* 2014; 29(7): 661-669. Available [here](#)

Hosgood HD et al. Household coal use and lung cancer: systematic review and meta-analyses of case-control studies, with an emphasis on geographic variation. *Int J Epidemiol.* 2011; 40(3): 719-728. Available [here](#)

Jaakkola MS et al. Association of indoor dampness and molds with rhinitis risk: a systematic review and meta-analysis. *J Allergy Clin Immunol.* 2013; 132(5): 1099-1110. Available [here](#)

Jensen L, Padilla R. Effectiveness of environment based interventions that address behaviour, perception and falls in people with Alzheimers disease and related major neurocognitive disorders: A systematic review. *Am J Occup Ther.* 2017; 71(5): 1-10. Available [here](#)

Jary H et al. Household air pollution and acute lower respiratory infections in adults: A systematic review. *PLoS ONE* 2016; 11(12): e0167656. Available [here](#)

Jevons R et al. Minimum indoor temperature threshold recommendations for English homes in winter - A systematic review. *Public Health* 2016; 136: 4-12. Available [here](#)

Jones LL et al. Parental and household smoking and the increased risk of bronchitis, bronchiolitis and other lower respiratory infections in infancy: systematic review and meta-analysis. *Respir Res.* 2011; 12: 5. Available [here](#)

Josyula S et al. Household air pollution and cancers other than lung: a meta-analysis. *Environ Health* 2015; 14: 24. Available [here](#)

Kendrick D et al. Preventing childhood falls at home: a meta-analysis and meta-regression. *Am J Prev Med*. 2008; 35(4): 370-379. Available [here](#)

Kendrick D et al. The effect of education and home safety equipment on childhood thermal injury prevention: meta-analysis and meta-regression. *Inj Prev*. 2009; 15(3): 197-204. Available [here](#)

Khambalia A et al. Risk factors for unintentional injuries due to falls in children aged 0-6 years: a systematic review. *Inj Prev*. 2006; 12(6): 378-381. Available [here](#)

Krieger J et al. Housing interventions and control of asthma-related indoor biologic agents: a review of the evidence. *J Public Health Manag Pract*. 2010; 16(5:Suppl): S11-20. Available [here](#)

Kumar S, Kroon J, Lalloo R. A systematic review of the impact of parental socio-economic status and home environment characteristics on children's oral health related quality of life. *Health Qual Life Outcomes* 2014; 12:4. Available [here](#)

Kurmi OP et al. Lung cancer risk and solid fuel smoke exposure: a systematic review and meta-analysis. *Eur Respir J*. 2012; 40(5): 1228-1237. Available [here](#)

Kurmi OP et al. Tuberculosis risk from exposure to solid fuel smoke: a systematic review and meta-analysis. *J Epidemiol Community Health* 2014; 68(12): 1112-1118. Available [here](#)

Letts L et al. The physical environment as a fall risk factor in older adults: Systematic review and meta-analysis of cross sectional and cohort studies. *Aust Occup Ther J*. 2010; 57(1): 51-64. Available [here](#)

Lin HH et al. Indoor air pollution from solid fuel and tuberculosis: a systematic review. *Int J Tuberc Lung Dis*. 2014; 18(5): 613-621. Available [here](#)

McDonald C, Sternberg A, Hunter PR. A systematic review and meta-analysis of interventions used to reduce exposure to house dust and their effect on the development and severity of asthma. *Environ Health Perspect*. 2007; 115(2): 1691-1695. Available [here](#)

McCartney G et al. Regeneration and health: a structured, rapid literature review. *Public Health* 2017; 148: 69-87. Available [here](#)

Monson E, Arsenault N. Effects of enactment of legislative (public) smoking bans on voluntary home smoking restrictions: A review. *Nicotine Tob. Res*. 2017; 19(2): 141-148. Available [here](#)

Nanninga S, Lhachimi SK, Bolte G. Impact of public smoking bans on children's exposure to tobacco smoke at home: a systematic review and meta-analysis. *BMC Public Health* 2018; 18(1): 749. Available [here](#)

Nurmagambetov TA et al. Economic value of home-based multi-trigger multicomponent interventions with an environmental focus for reducing asthma morbidity. A Community Guide systematic review. *Am J Prev Med*. 2011; 41(2:Suppl1): S33-47. Available [here](#)

Nowak AL, Giurgescu C. The Built Environment and Birth Outcomes: A Systematic Review. *MCN Am J Matern Child Nurs* 2017;42 (1): 14-20. Available [here](#)

Patra J et al. Exposure to second-hand and the risk of tuberculosis in children and adults: a systematic review. *PLoS Med* 12(6): e1001835. Available [here](#)

Pearson M et al. Preventing unintentional injuries to children in the home: a systematic review of the effectiveness of programmes supplying and/or installing home safety equipment. *Health Promot Int* 2011; 26(3): 376-392. Available [here](#)

Pfadenhauer LM et al. Effectiveness of interventions to reduce exposure to lead through consumer products and drinking water: A systematic review. *Environ. Res.* 2016; 147: 525-536. Available [here](#)

Quansah R et al. Residential dampness and molds and risks of developing asthma. A systematic review and meta-analysis. *PLoS ONE* 2012; 7(11): e47526. Available [here](#)

Rosen LJ et al. Effectiveness of interventions to reduce tobacco smoke pollution in homes: A systematic review and meta-analysis. *Int J Environ Res Public Health* 2015; 12: 16043-16059. Available [here](#)

Shokouhi M et al. Preventive measures for fire-related injuries and their risk factors in residential buildings: a systematic review. *J Inj Violence Res* 2019; 11(1): 1-14. Available [here](#)

Song Y, van der Cammen TJM. Electronic assistive technology for community-dwelling solo-living older adults: A systematic review. *Maturitas* 2019; 125: 50-60. Available [here](#)

Tanner LM et al. Socioeconomic and behavioural risk factors for adverse winter health and social outcomes in economically developed countries: a systematic review of quantitative observational studies. *J Epidemiol Community Health* 67(12): 1061-1067. Available [here](#)

Taske N et al. *Housing and public health. A review of reviews of interventions for improving health. Evidence briefing summary.* London: NICE; 2005.

Thomson H et al. The health impacts of housing improvement: a systematic review of intervention studies from 1887 to 2007. *Am. J. Public Health* 2009; 99: S681-92. Available [here](#)

Tischer C, Chen CM, Heinrich J. Association between domestic mould and mould components, and asthma and allergy in children: a systematic review. *Eur Respir J* 2011; 38(4): 812-824. Available [here](#)

Tong VT et al. Clinical interventions to reduce second hand smoke exposure among pregnant women: a systematic review. *Tob Control* 2015; 24(3): 217-223. Available [here](#)

Trecartin SM, Cummings SM. Systematic review of the physical home environment and the relationship to psychological wellbeing among community dwelling older adults. *J Gerontol Soc Work* 2018; 61(5): 567-582. Available [here](#)

Turner MC, Wigle DT, Krewski D. Residential pesticides and childhood leukaemia: a systematic review and meta-analysis. *Environ Health Perspect* 2010; 118(1): 33-41. Available [here](#)

Turner SL et al. Risk factors associated with unintentional house fire incidents, injuries and deaths in high-income countries: a systematic review. *Inj Prev.* 2017; 23(2): 131-137. Available [here](#)

van Kempen E, Babisch W. The quantitative relationship between road traffic noise and hypertension: a meta-analysis. *J Hypertens* 2012; 30(6): 1075-1086. Available [here](#)

van Maele-Fabry G et al. Residential exposure to pesticides and childhood leukaemia: a systematic review and meta-analysis. *Environ. Int.* 2011; 37(1): 280-291. Available [here](#)

Vork KL et al. Developing asthma in childhood from exposure to second hand tobacco smoke: insights from a meta-regression. *Environ Health Perspect* 2007;115 (10): 1394-1400. Available [here](#)

Willand N, Ridley I, Maller C. Towards explaining the health impacts of residential energy efficiency interventions - A realist review. Part 1. *Soc. Sci. Med.* 2015; 33:191-201. Available [here](#)

Young B et al. Preventing childhood falls within the home: Overview of systematic reviews and a systematic review of primary studies. *Accid Anal Prev* 2013; 60: 158-171. Available [here](#)

PSYCHOSOCIAL ENVIRONMENT

Clark C et al. A systematic review of the evidence on the effect of the built and physical environment on mental health. *J Public Ment Health* 2007; 6(2): 14-27. Available [here](#)

Downing J. The health effects of the foreclosure crisis and unaffordable housing. *Soc. Sci. Med.* 2016; 162: 88-96. Available [here](#)

Gibson M et al. Housing and health inequalities: a synthesis of systematic reviews of interventions aimed at different pathways linking housing and health. *Health Place* 2011. 17(1): 175-184. Available [here](#)

Jelleyman T, Spencer N. Residential mobility and health outcomes: a systematic review. *J Epidemiol Community Health* 2008; 62(7): 584-592. Available [here](#)

Lorenc T et al. Environmental interventions to reduce fear of crime: systematic review of effectiveness. *Systematic Reviews* 2013; 2: 30. Available [here](#)

McCartney G et al. Regeneration and health: a structured, rapid literature review. *Public Health* 2017; 148: 69-87. Available [here](#)

Milton B et al. The impact of community engagement on health and social outcomes: a systematic review. *Community Dev. J.* 2012; 47(3): 316-334. Available [here](#)

Pillas D et al. Social inequalities in early childhood health and development: a European-wide systematic review. *Pediat Res* 2014;76 (5): 418-424. Available [here](#)

Rautio N et al. Living environment and its relationship to depressive mood: A systematic review. *Int J Soc Psychiatry* 2018; 64(1): 92-103. Available [here](#)

Sautkina P, Bond L, Kearns A. Mixed evidence on mixed tenure effects: Findings from a systematic review of UK studies, 1995-2009. *Hous Stud* 2012; 27(6): 748-782. Available [here](#)

Tsai AC. Home foreclosure, health and mental health: a systematic review of individual, aggregate and contextual associations. *PLoS ONE* 2015; 10(4): e0123182. Available [here](#)

Tsai J, Huang M. Systematic review of psychosocial factors associated with evictions. *Health Soc Care Community* 2019; 27(3): e1-e9. Available [here](#)

Vasquez-Vera H et al. The threat of home eviction and its effects on health through the equity lens: A systematic review. *Soc. Sci. Med.* 2017; 175: 199-208. Available [here](#)

VULNERABLE GROUPS

Adams-Guppy JR, Guppy A. A systematic review of interventions for homeless alcohol abusing adults. *Drugs (Abingdon Engl)* 2016; 23(1): 15-30. Available [here](#)

Aidala AA et al. Housing status, medical care and health outcomes among people living with HIV/AIDS: A systematic review. *Am J Public Health* 2016; 106(1): e1-e23. Available [here](#)

Altena AM, Brilleslijper-Kater SN, Wolf JRLM. Effective interventions for homeless youth. *Am J Prev Med.* 2010; 38(6): 637-645. Available [here](#)

Bassuuk EL et al. The effectiveness of housing interventions and housing and service interventions for ending family homelessness: A systematic review. *Am J Orthopsychiatry* 2014; 84(5): 457-474. Available [here](#)

Baxter AJ et al. Effects of Housing First approaches on health and wellbeing of adults who are homeless or at risk of homelessness: systematic review and meta-analysis of randomised controlled trials. *J Epidemiol Community Health* 2019; 73: 379-387. Available [here](#)

Beswick AD et al. Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis. *Lancet* 2008; 371: 72-35. Available [here](#)

Fitzpatrick-Lewis D et al. Effectiveness of interventions to improve the health and housing status of homeless people: a rapid systematic review. *BMC Public Health* 2011; 11: 638. Available [here](#)

Graybill EM, McMeekin P, Wildman J. Can aging in place be cost effective? A systematic review. *PLOS One* 2014; 9(7): e102705. Available [here](#)

Growns B et al. A systematic review of supported accommodation programs for people released from custody. *Int J Offender Ther Comp Criminol* 2018; 62(8): 2174-2194. Available [here](#)

Harris RA, Xue X, Selwyn PA. Housing stability and medication adherence among HIV positive individuals in antiretroviral therapy: A meta-analysis of observational studies in the United States. *J Acquir Immune Defic Syndr.* 2017; 74(3): 309-317. Available [here](#)

Holl M, van den Dries L, Wolf JR. Interventions to prevent tenant evictions: a systematic review. *Health Soc Care Community* 2016; 24(5): 532-546. Available [here](#)

Kyle T, Dunn JR. Effects of housing circumstances on health, quality of life and healthcare use for people with severe mental illness. *Health Soc Care Community* 2008; 16(1): 1-15. Available [here](#)

Leaver CA et al. The effects of housing on health-related outcomes in people living with HIV: a systematic review of the literature. *AIDS Behav* 2007; 11(6:Suppl): 85-100. Available [here](#)

LeClair MC et al. The impact of Housing First on criminal justice outcomes among homeless people with mental illness: A systematic review. *Can J Psychiatry* 2018; 64(8): 525-530. Available [here](#)

Leff HS et al. Does one size fit all? What can and can't we learn from a meta-analysis of housing models for persons with mental illness. *Psychiatr Serv* 2009; 60(4): 473-482. Available [here](#)

Liu L. Smart homes and home health monitoring technologies for older adults: A systematic review. *Int J Med Inform* 2016; 91: 44-59. Available [here](#)

Ly A, Latimer E. Housing First impact on costs and associated cost offsets: a review of the literature. *Can J Psychiatry* 2019; 60(11): 475-487. Available [here](#)

Mansell J, Beadle-Brown J. Dispersed or clustered housing for adults with intellectual disability. *J Intellect Dev Disabil*. 2009; 34(4): 313-323. Available [here](#)

McPherson P, Krotofil J, Killaspy H. Mental health supported accommodation services: a systematic review of mental health and psychosocial outcomes. *BMC Psych* 2018; 18(1): 128. Available [here](#)

Morris ME et al. Smart technologies to enhance social connectedness in older people who live at home. *Australas J Ageing* 2014; 33(3): 142-152. Available [here](#)

O'Higgins A, OTT EM, Shea MW. What is the impact of placement type on educational and health outcomes of unaccompanied refugee minors? A systematic review of the evidence. *Clin Child Fam Psychol Rev* 2018; 21(3): 354-365. Available [here](#)

Richter D and Hoffman H. Independent housing and support for people with severe mental illness: Systematic review. *Acta Psychiatr Scand* 2017; 136(3): 269-279. Available [here](#)

Slopen N et al. Housing Assistance and Child Health: A Systematic Review. *Pediatrics*. 2018; 141(6): 1-14. Available [here](#)

Tsai J, Rosenheck RA. Risk factors for homelessness among US veterans. *Epidemiologic Reviews*. 2015; 37: 177-195. Available [here](#)

Trecartin SM, Cummings SM. Systematic review of the physical home environment and the relationship to psychological wellbeing among community dwelling older adults. *J Gerontol Soc Work* 2018; 61(5): 567-582. Available [here](#)

Woodhall-Melnik JR, Dunn JR. A systematic review of outcomes associated with participation in Housing First programs. *Hous Stud* 2016; 31 (3): 287-304. Available [here](#)

Xiu-Ying H et al. Living arrangements and risk for late life depression: a meta-analysis of published literature. *Int J Psychiatry Med* 2012; 43(1): 19-34. Available [here](#)

Ziersch A, Due C. A mixed methods systematic review of studies examining the relationship between housing and health for people from refugee and asylum seeking backgrounds. *Soc. Sci. Med.* 2018; 213: 199-219. Available [here](#)