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Acknowledgements:


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1 Introduction

This literature review was commissioned by the Centre for Health Equity training Research and Evaluation (CHETRE) as part of a Health Impact Assessment (HIA) on the Master Plan being developed for the Villawood East housing estate in South Western Sydney, NSW, Australia. The review was undertaken by Ben Cave Associates.

Villawood East is a public housing estate in Western Sydney, established during the early 1950s and in need of improvement. The housing is of a low standard and requires upgrading. It is considered unsuitable for the current and future population and although the greenspace is a highly valued community asset, it is not currently utilised to its potential. The Master Plan is being developed to guide the potential regeneration of the estate. The Master Plan contains options for development that includes improving housing quality and urban design, increasing housing density, reducing concentrations of public housing, improving access to services and high quality urban design and green space. As part of the Master planning process a HIA has been carried out. The literature review was commissioned specifically for the HIA with the intention of it informing this HIA and also providing an evidence base for future work.

The review covers three categories of evidence: scientific evidence from systematic reviews; evidence from other published literature sources (including grey literature); and the health impacts identified during previous similar HIAs. The review is structured around the themes of general health impacts, mental health, social cohesion, access to services and access to good quality space/urban design. A special focus is given to effects on vulnerable groups.

2 Method

Scope

The review focused on the potential health effects that may result from the implementation of regeneration in the Villawood East Estate, including changing housing density and a shift in the proportions of private and public housing. The scope excluded the decanting or enabling process and the wider implications of state wide master planning.

It is noted that this focus inevitably results in a greater emphasis on the generally positive health outcomes associated with improved housing conditions and does not go into detail on the generally adverse health outcomes associated with displacing deprived populations (either due to relocation or though new accommodation becoming less affordable).

The review was divided into four topics, namely:

- mental health;
- social cohesion;
- access to services; and
- access to good quality space/urban design.

Within each of these topics consideration was given to certain population groups. These included:

- people currently living in Villawood East;
- the elderly;
- children;
- single parents;
- single men with complex needs (including ex-offenders); and
- people living with multiple issues.

The review provides information on these populations groups where this was identified in the article under review. We did not seek to comprehensively cover all population groups for all issues.

Search strategy

We searched the following databases:

- PubMed;
- NHS Evidence;
- Cochrane Library;
- AMED;
- CINAHL;
- HMIC;
- Embase;
- Medline; and
- PsycINFO.

In addition a more general search of grey literature was made particularly around the health effects associated with the built environment.

The review was undertaken in two stages. Stage one involved an initial high level scan of the literature to identify the level of evidence in each topic. The aim of Stage one was to identify recent systematic reviews in each topic. Stage two involved a more detailed search of databases and sources.

Stages one and two aimed to identify approximately 10 relevant peer reviewed articles per topic. Where appropriate the reference lists of selected high quality recent studies were reviewed and selected citations followed up.
Evidence classification

In reviewing sources of information to include, the following hierarchical evidence classification system was used based on the quality of the study design:

- systematic reviews;
- individual randomised controlled trials;
- quasi-experimental studies;
- controlled observational studies;
- observational studies without control group; and
- grey literature.

Quality of studies

We have classified the quality of the studies in this review according to the Scottish Intercollegiate Guidelines Network (SIGN) methodology. SIGN work in collaboration with the National Institute of Clinical Excellence (NICE) to develop evidence based clinical practice guidelines for the National Health Service (NHS).

SIGN has in part based its assessments on the MERGE (Method for Evaluating Research and Guideline Evidence) checklists developed by the New South Wales Department of Health.

This review does not include a full systematic assessment of study quality, rather a professional judgement was made in relation to perceived levels of bias and probabilities of causal relationships. This was based on a rapid assessment of each source's methodology. Scorings are therefore indicative rather than definitive. Table 1 sets out the rankings and definitions used in scoring study quality.

The SIGN methodology is tailored towards the development of evidence-based clinical guidelines. It is not developed for reviewing sociological papers that, for example, examine the ways in which particular concepts such as social exclusion are constructed. These studies have not been classified according to the SIGN methodology.

Table 1 Quality of studies rankings and definitions

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1++</td>
<td>High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.</td>
</tr>
<tr>
<td>1+</td>
<td>Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.</td>
</tr>
<tr>
<td>1-</td>
<td>Meta-analyses, systematic reviews, or RCTs with a high risk of bias.</td>
</tr>
<tr>
<td>2++</td>
<td>High quality systematic reviews of case control or cohort studies.</td>
</tr>
<tr>
<td>2+</td>
<td>High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.</td>
</tr>
<tr>
<td>2-</td>
<td>Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.</td>
</tr>
<tr>
<td>3</td>
<td>Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.</td>
</tr>
<tr>
<td>4</td>
<td>Non-analytic studies, e.g. case reports, case series.</td>
</tr>
<tr>
<td></td>
<td>Expert opinion</td>
</tr>
</tbody>
</table>

Source: Annex B: SIGN

Strength of evidence

The strength of evidence reported for each source has been scored using a simplified version of the Cochrane GRADE approach. This scoring reflects how complete the scientific literature is in relation to an issue, not the quality of the reporting review study. There are four ratings: ‘high’, ‘moderate’, ‘low’ and ‘very low’.

‘High’ signifies the strongest evidence and ‘very low’ the weakest. Where appropriate a range of ratings have been used. Scorings for strength of evidence used professional judgement based on an assessment of the overall quality and weight of evidence reported in the selected systematic reviews or evidence summaries. This review has not exhaustively examined the primary sources for each population, intervention or outcome subcategory within each topic. Scorings are therefore indicative rather than definitive. Factors taken into consideration in scoring the strength of evidence are listed in Table 2.

Table 2 Strength of evidence ranking and scoring system

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High quality studies identifying that the strength of evidence is moderate, low or very low.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Limitations in the design and implementation of available studies suggesting high likelihood of bias.</td>
</tr>
<tr>
<td>Low</td>
<td>Indirectness of evidence (indirect population, intervention, control, outcomes), Unexplained heterogeneity or inconsistency of results (including problems with subgroup analyses).</td>
</tr>
<tr>
<td>Very low</td>
<td>Imprecision of results (wide confidence intervals).</td>
</tr>
<tr>
<td></td>
<td>High probability of publication bias.</td>
</tr>
</tbody>
</table>

Table 3 Recommendation grade rankings and definitions

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results.</td>
</tr>
<tr>
<td>B</td>
<td>A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+.</td>
</tr>
<tr>
<td>C</td>
<td>A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+.</td>
</tr>
</tbody>
</table>

Search criteria

The search was not restricted to a definitive list of pre-agreed search terms. The review took an iterative approach. Stage 1 used search terms based on the topic titles. Stage 2 expanded this list based on key terms used in the literature identified during Stage 1.

Medical Subject Headings (MeSH) is a system used by the U.S. National Library of Medicine to give uniformity and consistency to the indexing and cataloguing of biomedical literature. Terms are arranged in a hierarchical manner called a MeSH Tree Structure. MeSH is an effective means of identifying the most appropriate search terms to use, particularly when accessing MEDLINE/PubMed.

In addition to the MeSHs other subsidiary search terms based on the project scope were used to refine results. These search terms were limited to titles, abstracts or described publication type.
Table 4 Search terms used

<table>
<thead>
<tr>
<th>Search terms used</th>
<th>Code</th>
<th>Review stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence Characteristics</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Housing</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Housing for the Elderly</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Public Housing</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Independent Living</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Residential Mobility</td>
<td>MeSH</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Health</td>
<td>ti,ab</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Mental health</td>
<td>ti,ab</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Social cohesion</td>
<td>ti,ab</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Access to service*</td>
<td>ti,ab</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Regeneration</td>
<td>ti,ab</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Dwelling*</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Bedsit* or bed sit*</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>New South Wales or NSW</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Australia*</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Built environment*</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Socio-economic or socio economic</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Green space*</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Urban design</td>
<td>ti,ab</td>
<td>2</td>
</tr>
<tr>
<td>Systematic review</td>
<td>pt</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>Meta analysis</td>
<td>pt</td>
<td>2</td>
</tr>
<tr>
<td>Randomized controlled trial</td>
<td>pt</td>
<td>2</td>
</tr>
<tr>
<td>Clinical trial</td>
<td>pt</td>
<td>2</td>
</tr>
<tr>
<td>Journal article</td>
<td>pt</td>
<td>2</td>
</tr>
</tbody>
</table>

Key: MeSH: Medical Subject Heading; ti: title; ab: abstract; pt: publication type; *: truncation

The following database filters were used:
- publication data range of 2002 - 2012 (i.e. the last 10 years);
- English language;
- human species studies;
- where abstracts available; and
- where full text available.

Search record

As this review does not follow a full systematic approach only summary search records are presented for the total number of sources included at each stage.

Table 5 Summary database search record

<table>
<thead>
<tr>
<th>Database portal</th>
<th>Stage</th>
<th>Titles reviewed</th>
<th>Abstracts or full text reviewed</th>
<th>Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed</td>
<td>1</td>
<td>138</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>PubMed, NHS Evidence and WHO</td>
<td></td>
<td>67</td>
<td>38</td>
<td>10</td>
</tr>
<tr>
<td>HIA Gateway</td>
<td>2</td>
<td>51</td>
<td>43</td>
<td>10</td>
</tr>
<tr>
<td>WHIASU UCLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIA-CLIC Health Impact Projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIA Connect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Full text of three reviews unavailable.

Selection of grey literature

In addition to the grey literature sources identified during stage 2 using the above search method, CHETRE supplied a selection of additional sources based on their own review of Australian grey literature.
- Ruming KJ, Mee KJ, McGuirk PM. Questioning the rhetoric of social mix: courteous community or hidden hostility?
- Darcy M. De-concentration of disadvantage and mixed income housing: a critical discourse approach.
- Darcy, M. and Gwyther, G. ‘There goes the neighbourhood’: recasting ‘neighbourhood effects’ and disadvantaged places’ using collaborative ‘emergence’ methodology.
- Randolph B, Ruming KJ, Murray D. Unpacking social exclusion in Western Sydney: exploring the role of place and tenure.
- Arthuson, Kathy. Neighbourhood effects and social mix policies, Australian efforts at urban renewal.
- Hulse, K. et al. At home and in place? The role of housing in social inclusion.
- Pawson, H., Davison, G., and Wiesel, I. Addressing concentrations of disadvantage: policy, practice and literature review.
- Haigh, F., Ng Chok, H., and Harris, P. Housing density and health: a review of the literature and Health Impact Assessments.

Selection of previous HIAs

Published HIAs were reviewed from the following online resources:
- Health Impact Projects http://www.healthimpactproject.org/resources#reports
- UCLA HIA-CLIC http://www.hiaguide.org/hias
- HIA Connect http://www.hiaconnect.edu.au/completed_hia.htm

The following ten HIAs were selected in collaboration with CHETRE based on their relevance to the Villawood development:
- Marsh Farm Central Area Regeneration Masterplanning HIA, 2009.
- Regeneration of Kipling & Blackmore on the South Acton Estate MWIA, 2008.
- HIA of social housing redevelopment in Devonport, 2008.
- Dove Gardens HIA, Derry, 2005.
- 29th St./ San Pedro St. Area Health Impact Assessment, 2009.
- San Francisco Housing Authority Flooring Policy HIA, 2009.
3 Discussion

Interpretation

The following sections set out the results of the literature review. The discussion has been divided into four sections based on the type of evidence that is presented. The first section sets out the evidence from systematic reviews of the scientific literature. This is the strongest evidence. The second notes evidence from other sources, which although less robust, may provide some insight on topics where there is not review level evidence. The third section examines the experiences of previous HIAs of housing development or regeneration. The final section notes vulnerable populations that have been identified in the literature.

In addition to the referenced citation within the discussion there is also a note of the publication year, and indication of the study’s quality and a coded link to a tabulated summary of the review, study or report, which is found in the appendices. For example [1+] indicates the study is 1+ (a well-conducted meta-analysis, systematic review, or RCTs with a low risk of bias).

The evidence in each section has been further subdivided in to discussions of:

• general health effects of housing improvement;
• improvements that have specific import for mental health;
• improvements that address issues of social cohesion; and
• improvements that concern access to space or urban design.

In some cases issues will overlap between these categories, they are therefore not mutually exclusive.

What do systematic reviews tell us?

General

In the WHO publication Environmental Burden of Disease associated with Inadequate Housing Braubach et al[21] provide the most up-to-date wide-ranging review of the health impacts associated with housing. Braubach et al note that the link between poor housing and poor health is well established. Many cross-sectional studies have reported consistent and statistically significant associations between poor housing conditions and poor health.

Braubach et al identify that there is ‘high’ strength evidence that improved warmth in the home may produce long-term positive socioeconomic health benefits, such as less time off work/school, and increased social and educational opportunities. Sauni et al[22] [1+] identify mould infestation as a problem in houses, apartments, buildings, office buildings and schools. Sauni et al found ‘moderate’ strength evidence that remediation of mould in houses decreases asthma-related symptoms and decreases respiratory infections. The evidence suggest that mould damaged houses should be remediated to decrease asthma-related symptoms. Such remediation methods may vary from complete rebuilding to improving heating and ventilation. Fisk et al[23] [1++] support this view with ‘high’ strength evidence that residential dampness and mould are associated with increases in both respiratory infections and bronchitis. The review also notes that dampness and mould in buildings is consistently associated with asthma exacerbation. The study concludes that preventing or remediating dampness and mould in residences may substantially reduce the burden of respiratory infections on healthcare services. Gibson et al[24] [1++] and Thomson et al[25] [1+] also find strong evidence that warmth and energy efficiency interventions have positive impacts on health, although they note that the evidence on other improvements to housing conditions remains unclear.

Beyond the fabric of houses themselves, the community context can also be an important determinant of health. Miller et al[26] [2++] and Anderson et al[27] [1+] report that the physical, social, and economic environments of local communities affect residents’ health and exacerbate health disparities. These reviews note that lack of affordable housing has been linked to:

• decreased spending on health and health care;
• delays in seeking preventive and routine medical care;
• medication non-adherence; and
• increased emergency department utilisation.

The reviews also find that higher utility bills (e.g. following redevelopment) can place an additional burden on lower-income families, forcing trade-offs among housing, heating, food, medical care, and other basic needs. Lack of affordable housing can also undermine the benefits of a stable family home, as families are forced to move frequently, live with other families in overcrowded conditions, or experience periods of homelessness. Such disruption may affect schooling, health care, and social networks.

Addressing housing problems that affect whole communities can be problematic. Gibson et al[28] [1++] find that there is ‘low’ strength evidence to support the use of area effects interventions designed to improve high poverty areas. The review notes that whilst focusing investment on deprived areas to improve area characteristics or internal housing conditions may assist all of the residents and thus be more cost-effective than identifying and targeting individuals, any positive effects may be hard to detect as they are diluted by benefiting many who were not disadvantaged. Gibson et al recommend that multiple level housing interventions (i.e. those that simultaneously target individuals, households, housing and neighbourhoods) are most likely to be successful.

The Villawood development sits within a policy context that aims to facilitate de-concentration of public housing. Increase tenure mix and social diversity and provide additional affordable housing for low and moderate income families. However Gibson et al[29] [1+] note that there is a significant evidence gap in the scientific literature with regards of housing interventions that alter housing tenure. Consequently the health implications of changing the mix of tenure types (e.g. from state leases to private ownership) on a housing development are unknown. Some potential for positive effects is hinted at in Anderson et al[30] [1+-], where there was ‘moderate’ strength evidence for the use of tenant-based rental assistance programs (which subsidize the cost of housing secured by low-income households within the private rental market through the use of vouchers or direct cash subsidies) are effective in improving household safety (reduced exposure to crime and neighbourhood social disorder). However Anderson et al note that there was only ‘very low’ strength evidence for the effectiveness of mixed-income housing (publicly subsidised multifamily rental housing developments) in improving family health and safety while providing affordable housing.

In the recent WHO review, the conclusion drawn by Braubach et al for general health impacts associated with housing is that although poor housing, poverty, and poor health are inextricably linked, housing improvements alone may be insufficient to lead to measurable health improvements, especially in the short term.22 Furthermore, although a possibility, there is very limited evidenced that improved housing has long-term health impacts or prevents poor health in future generations.

Mental health

In terms of specific impacts on mental health that are associated with housing improvements, Truong et al[31] [1-] found ‘moderate’ strength evidence of an overall association between mental health and neighbourhood characteristics, after adjusting for individual factors. More specifically Braubach et al[32] [1+] provide ‘moderate’ strength evidence that although it is unlikely that housing itself will precipitate serious mental disorder, there are two ways in which housing may contribute to mental health:

• One, it can directly affect chronic stress which is known to affect nonclinical symptoms of anxiety, depression, and hostility and frustration.
• Two, poor quality housing may be an additional risk factor that often co-varies with poverty and thus is associated with other physical (e.g. pollution or toxins) and social (e.g. family instability or violence) risk factors. The review notes that exposure to multiple risk factors dramatically escalates the probability of psychological distress.

There is limited causal evidence that particular types of housing give rise to mental health problems; however Braubach et al identify that living in multiple family housing or on the upper floors of high rise buildings is associated with greater mental health problems. Whilst the review identifies that such effects are likely to be larger.
for women with young children, the review is clear that there are methodological problems with quantification of mental health impacts at population level.

Other community attributes may also act to mediate mental health. McCormack et al. found ‘moderate’ strength evidence that access to nearby parks and natural settings is associated with improved mental health and reduced anxiety. Whilst Kim et al. found ‘moderate’ strength evidence for an association between high levels of neighbourhood social disorder and depression. Although specific remediating interventions were not apparent in the literature, Kim et al. found ‘low’ strength evidence that higher neighbourhood-level socio-economic status may protect against depression. Supporting this association between mental health and socio-economic position, Rehkop et al. found ‘moderate’ strength evidence that suicide rates increase as socio-economic levels in an area decrease. Furthermore results did not vary significantly by gender and the highest area suicide rates were associated with the residents living below the poverty level (or similar measures of economic deprivation). Rehkop et al. conclude that these findings are consistent with a contextual explanation where area suicide rates are driven by social and economic isolation of neighbourhoods with higher levels of deprivation. The findings suggest that in order to alleviate depression and reduce suicide rates, regeneration should target the most deprived areas with interventions that bolster, not only housing quality, but also socio-economic drivers (such as employment).

In the recent WHO review, Braubach et al. conclude that although mental health outcomes are often hard to quantify in practice, mental health should be included as a separate outcome in assessing the health impacts of housing. This is consistent with the approach being adopted in the Villawood HIA.

Social cohesion

The literature on social cohesion is complex. The term itself has different definitions and there is debate surrounding ways to measure its outcomes.

However Carter et al. found ‘moderate’ strength evidence that high social capital (as measured by ‘low social disorder’ or a ‘high level of belief in the capabilities of the community to collectively achieve social and political outcomes’) protect against increased obesity. As obesity is a major and still growing public health challenge, residential development that optimises opportunities to reduce social disorder (e.g. through street lighting and layout) and promote community participation (e.g. through successful engagement and consultation events) could make an important contribution to wider strategies aimed at tackling obesity.

Although there is mixed evidence to support the view that favourable psychosocial environments are linked to better health, Egan et al. found ‘moderate’ strength evidence that some favourable psychosocial environments are associated with better health outcomes. In particular the review notes that effective social support or large social networks are associated with lower risk of coronary heart disease and cancer (particularly breast cancer). Egan et al. also found that poor psychosocial environments (including exposure to community violence, anti-social behaviour, or discrimination) may reduce health outcomes and contribute to health inequalities.

In conclusion, health improvements from residential planning can be achieved not only from aspects of build quality, but also by designing community layouts and land use mixes that promote positive social interactions.

Access to services

Residential developments should not be considered in isolation. Miller et al. provide ‘moderate’ strength evidence that access to goods and services within one’s community can promote and sustain health. Specifically the review reports that:

- The presence of sidewalks and crosswalks, bike paths, playing fields, parks, shopping accessible on foot, and public transportation, along with the perception that it is safe to be outside, contribute substantially to the average amount of regular physical activity that residents of a neighbourhood achieve.
- Education and employment opportunities influence health by providing the means to achieve an adequate standard of living now and in the future.
- Neighbourhoods with better access to supermarkets and other retail outlets with minimally processed foods tend to eat a healthier diet than their counterparts in neighbourhoods with less access to these goods.
- The density of fast food outlets and preponderance of energy-dense foods in convenience stores and other small markets has been linked with higher prevalence of obesity and higher BMI. Similarly, liquor stores are more likely to be located in low-income and more heavily minority communities and their greater density is associated with adverse community-level consequences.

Miller et al. conclude that parks, green spaces and recreational facilities, high-quality schools, competitively priced supermarkets and other commercial services, and zoning that keeps industrial sites and pollutants at a distance from residential areas contribute to an environment that is conducive to the achievement and maintenance of good health. These local assets reduce adverse environmental exposures, promote opportunities for self-development, and allow individuals and families to engage in health-promoting activities.

Access to good quality space/urban design

The quality of housing design and surrounding space is a key issue that will be relevant to all the previous areas of discussion. However in terms of specific spatial or design characteristics of housing that improve health outcomes the literature is unable to provide a robust evidence base. For example Braubach et al. note that with respect to noise impacts, although effective measures to reduce noise may reduce disturbance and annoyance, there is little evidence of health impacts associated with such changes in exposure in a housing context.

With respect to broader design interventions in the surrounding use of space and integration with other land uses, there is more support from the literature. McCormack et al. note that physical activity participation provides mental and physical health benefits and can also reduce the risk of many chronic diseases. The review finds ‘moderate’ strength evidence that the built environment can both enable and limit physical activity participation. Specifically, neighbourhood characteristics such as the proximity and mix of land uses, pedestrian connectivity, aesthetics and interesting scenery, and traffic and personal safety are important correlates of physical activity. Physical activity opportunities are not however confined to green space. Renolds et al. found ‘moderate’ strength evidence that neighbourhoods that are characterized as more walkable, either leisure-oriented or destination-driven, are associated with increased physical activity, increased social capital, fewer overweight people, lower reports of depression, and less reported alcohol abuse. This evidence suggests that designing the layout of residential developments to incorporate a mix of desirable leisure, retail and employment opportunities may improve residents’ health.

Despite some evidence that the wider setting of a residential development can affect health outcomes, the overall conclusion from Braubach et al. in the WHO review is that there is little evidence of improvements or deteriorations in health (physical or mental) associated with major improvements to housing and the outdoor housing environment as a result of programmes of housing-led renewal.

What do other literature sources add?

General

In a report for the WHO Thompson et al. finds ‘moderate’ strength evidence that the housing health issues which remain despite strict building regulations are hazards linked to:

- poor air quality;
- inadequate heat;
- dampness;
- radon;
- trips and falls;
- noise;
- house dust mites;
The report found that the most important housing issues for health related to maintaining appropriate indoor temperatures and reducing mould and dust mite allergens.

Although clear health benefits are identified in the systematic review arising from improved warmth in homes, Milner et al \(^{[4]}\) [2+] raises the issue of also maintaining adequate ventilation. The article makes the point that homes are becoming increasingly airtight under moves designed to provide thermal comfort and to reduce energy consumption. Furthermore changes in the lifestyles of an aging population is causing people are spending ever greater proportions of their time indoors. Milner et al argue that in order to reduce concentrations of harmful indoor air pollutants, there is a need to strike a balance between improving building energy efficiency and maintaining adequate ventilation. The article notes that indoor air pollutants may be combustion related (e.g. PM10 and PM2.5, CO, NOX and VOC) or may include other indoor pollutants (such as mould, radon and chemicals from household products).

Collaborative work systematically reviewing UK policy interventions within government reports Petticrew and Thomson \(^{[2]+}\) [2+] identify that despite significant public investment in urban regeneration programmes there is little evidence (in either systematic or non-systematic reviews) to demonstrate impacts on socioeconomic or health outcomes. However the report advocates that the absence of impact data does not provide grounds for inaction, but rather that urban regeneration decisions must be based on the ‘best available evidence’. The report concludes that the available evidence suggests that regeneration programmes may lead to some small positive impacts on health and socioeconomic circumstances, though adverse impacts are also a possibility. This view is consistent with work by Thompson et al for the WHO \(^{[4]}\) [4], which found ‘moderate’ strength evidence that although housing improvement has the potential to generate health improvement, this cannot be considered separately from other changes that residents may experience as part of housing improvement, such as increased housing costs, relocation and more general neighbourhood changes. Some of these may have additional health impacts, either negative or positive. More recent work by Petticrew et al \(^{[2]}\) [2+] confirms the difficulties in linking housing interventions to measurable changes in health outcomes. In their controlled observational study for the Scottish Housing Health and Regeneration Project (SHARP) they note ‘moderate’ strength evidence that whilst social housing renewal may bring positive psychosocial benefits to tenants; such benefits may not be accompanied by significant changes in health, at least in the short term. Consequently although there are well-documented associations between poor housing and poor health, housing investment may not be a major tool for improving health and reducing health inequalities.

In a report based on finding a pragmatic way to make best use the limited available scientific evidence linking health and housing during HIAs, Thomson et al \(^{[2003,2++]}\) [2003,2++] present ‘low’ strength evidence that home ownership is associated with improved health. However the report warns that the trend does not hold for those people who are living on the margins of home ownership where mortgage arrears increase insecurity and are detrimental to mental health. This tentative evidence supports the scoping of the Villawood HIA to include consideration of the impacts of housing affordability following a change in the ratio of public/private housing ownership. Thomson et al also advance ‘low’ strength evidence for links between health and house type (e.g. flat or house). The limited evidence is insufficient to confirm causal relationships; however there are associations between flat dwelling and stressful living conditions such as increased social isolation, crime, reduced privacy and reduced opportunities for safe play for children. Such evidence, weak as it is, should be considered in any decision to increase housing density in Villawood using blocks of flats. These messages on the associations of health with home ownership and housing type are also reported by Douglas et al \(^{[4]}\) [4] in a guide for HIAs of housing improvements. That guide includes a literature review of all studies which have monitored health change following housing improvement since 1930 and 2000.

Mental health

In a controlled observational study Bond et al \(^{[2]}\) [2+] found ‘low’ strength evidence that the residential and environmental aspects of people’s houses and neighbourhoods were significantly associated with positive mental wellbeing. Key residential issues were whether:

- living in a house or flat;
- living in an area perceived as having attractive buildings;
- living in an attractive, quiet and peaceful environment.

Key environmental issues were:

- an area was perceived to have a good reputation by its resident; or
- if residents were satisfied with their house and landlord; or if residents felt that both their home and the neighbourhood contribute to a sense of doing well.

Douglas et al \(^{[4]}\) [4] in a guide for HIAs of housing improvements find ‘high’ strength evidence that regeneration and medical priority rehousing improve mental health. The guidance also notes that there is no evidence that mental health improvements arise following improved energy efficiency interventions.

Social cohesion

We look first at some of the ‘grey literature’ on social exclusion and social capital. These studies are predominantly sociological and they look at the ways in which the terms are constructed and at the implications of these findings for public policy and research. We then look at some of the findings from the review.

Darcy shows us that the term social exclusion suggests a boundary and focuses attention on those outside it rather than on the features of society which systematically generate widespread poverty and disadvantage.\(^{[5]}\) Darcy quotes from the study of the redevelopment of Minto Public Housing Estate.\(^{[2]}\) This found that the unit of scale employed to describe and analyse disadvantage in the community obscures differences between areas. It recommended that future research on housing estates should employ smaller geographic areas than whole estates as their units of analysis. Darcy\(^{[2]}\) also observed that little is known about the fate of people who have to move out of areas as a result of regeneration. The research solution to this would be to establish a longitudinal study of residents involved in all stages of a regeneration scheme.\(^{[2]}\) A service-based approach would involve establishing links with areas into which residents move and also developing good information on the needs of people moving into and out of housing developments.

Randolph et al\(^{[2]}\) find that the incidence of multiple social exclusion differentiates the experience of social exclusion in areas of public housing. Policy proscriptions to address exclusion [in these areas in western Sydney] need to address the complicating difficulties that poor accessibility and high levels of income poverty generate for these communities.

Arthurson\(^{[2]}\) questions the aspirations for integration and social cohesion given that the target groups entering social housing are no longer predominantly low income working families but mostly people on government pensions often with complex social and behavioural issues, including ex-prisoners, drug addicts and people with mental health issues being rehabilitated in the community.

Arthurson\(^{[2]}\) notes that communication technology such as mobile phones, the internet and social media, along with more general motor vehicle access means that for many residents life is no longer bound to the specific geographical space of the neighbourhood in which they were raised. Arthurson does not substantiate this claim for the effect of communication technology nor does she extend it to the whole population: the National Travel Survey in Great Britain found that members of car-owning households made 39% more trips than people living in non-car-owning households, and travelled over twice as far per year.\(^{[2]}\) Is there a similar finding for Australia? What do people who live in non-car-owning households miss out on by making 39% less trips? Pawson et al\(^{[2]}\) also discuss the importance of mobility. They state that the notion of place-based disadvantage has been based on the idea that individuals who are sufficiently mobile can avoid many of the negative outcomes associated with living in a disadvantaged place.\(^{[2]}\) It is therefore important, when measuring place-based disadvantage, to also recognise and measure various forms of mobility that are available to individuals as balancing factors. Research, and indeed impact assessments, could focus on:
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The extent to which interventions succeeded in maximising local policy coordination;
how far resources were used effectively;
what factors could help address the negative consequences of locational disadvantage for disadvantaged people; and
which demographic groups could and should be targeted for programs and interventions.

Pawson et al. observe that there is currently a policy zeitgeist around public participation. They recommend establishing the extent to which disadvantaged communities have been actively involved in shaping interventions and establishing what gap there is (if any) in the level of public service provision between disadvantaged places and their wealthier neighbours.

Coutts et al. looked at indicators for social capital. Social capital is a complex concept which must be understood as a combination of both structural and cognitive elements in a community. These elements reinforce each other to generate the stream of outcomes that has been associated with the concept. Thus, the structures of social capital (ie social networks) must not be disassociated from the cognitive elements (ie trust, attitudes, etc). It is the cognitive elements which are more commonly measured by surveys. A multi-level approach to social capital measurement enables the distinction between the effects of context and those of social capital. Coutts et al. also note the distinction between bonding and bridging social capital whereby bonding social capital refers to the relations within homogeneous groups. These are the strong ties that connect family members, neighbours, and close friends and colleagues. Bridging social capital refers to heterogeneous relations, ones that exist between groups: these are the weak ties, including formal or informal social interactions that link people and communities of different ethnic, occupational and socio-economic backgrounds. Bonding and bridging social capital are inter-related and can at different times and in different contexts be seen as either protective or harmful to health. Any intervention to strengthen social capital within communities is likely to be associated with both risks and benefits to different groups.

Hulse et al. also pick up the importance of examining the people who are involved in the housing development and the wider context within which the development is taking place. They state that the most effective programs are those that have a dual focus on people and also on the wider systemic processes that maintain inequality. Yet they caution that maintaining a dual focus requires sufficient resources streams and political commitment. Area-based interventions alone are incapable of addressing the wider systemic problems that arise from fiscal policies that sustain economic inequality. Any effective ‘narrowing of the gap’ requires sustained investment in locations and the wider context within which the development is taking place. They state that the most effective programs are those that have a dual focus on people and also on the wider systemic processes that maintain inequality. Yet they caution that maintaining a dual focus requires sufficient resources streams and political commitment. Area-based interventions alone are incapable of addressing the wider systemic problems that arise from fiscal policies that sustain economic inequality. Any effective ‘narrowing of the gap’ requires sustained investment in locations and the wider context within which the development is taking place.

The guidance also notes that moving and relocation can lead to loss of social networks, stress and uncertainty and lack of control over changes and living circumstances. Furthermore, original residents may be displaced and not benefit from the housing improvement; or residents in neighbouring areas not part of a regeneration program may feel excluded resulting in community divisions between improved and non-improved areas.

In an Australian controlled observational study Kelaher et al. examined a neighbourhood renewal intervention that used cooperation between local agencies, government and residents (50% resident membership) to:
- increase community pride and participation;
- enhance housing and environment;
- improve employment, learning and local economic activity;
- decrease levels of crime and improve personal safety;
- better health and wellbeing; and
- increase access to services and improve government responsiveness.

The study demonstrates a neighbourhood renewal intervention can be particularly effective in improving health and life satisfaction among disadvantaged people living in the target areas if there is effective cooperation between stakeholders. However the intervention was less effective at reaching immigrants from non-English speaking countries, people educated below year 10 and the unemployed. These shortcomings may be particularly relevant to the Villawood context where there are a high proportion of residents from non-English speaking backgrounds.

Thomson et al. [2003,2+] find ‘low’ strength evidence for the following health impacts associated with social cohesion during programmes of housing improvement:
- Moving house can be a stressful, health damaging life event, particularly in the field of social housing where there are limited opportunities to negotiate with the housing authority. The review notes that housing relocation can also be associated with loss of community, uprooting of social networks and unsatisfied social aspiration that may counteract satisfaction with improved housing.
- Housing regeneration projects can lead to displacement of original residents, which may result in misleading shifts in routine social and health statistics.
- Socioeconomic characteristics of a neighbourhood may have an effect on a person’s health status. The review notes that health improvements are likely where employment, education and social integration opportunities increase alongside housing.

In guidance on HIAs for housing improvements Douglas et al. [4] suggest that there is ‘moderate’ strength evidence that although health effects are unknown, there are associations between housing improvements and:
- increased community involvement;
- social support; sense of belonging and feeling of safety;
- reduced fear of crime; and
- sense of isolation.

Thomson et al. [2003,2+] find ‘moderate’ strength evidence that good access to waste storage is an important requirement to reduce domestic infestation that pose potential health hazards e.g. cockroaches, rats and mice. Design considerations should therefore ensure that adequate provision is made for waste management, particularly in high density housing.

Access to social support, sense of belonging and feeling of safety;
- reduced fear of crime; and
- sense of isolation.

The guidance also notes that moving and relocation can lead to loss of social networks, stress and uncertainty and lack of control over changes and living circumstances. Furthermore, original residents may be displaced and not benefit from the housing improvement; or residents in neighbouring areas not part of a regeneration program may feel excluded resulting in community divisions between improved and non-improved areas.

In an article in the Lancet Rao et al. identify ‘low’ strength evidence that creating streets, green spaces, and neighbourhoods that encourage more walking or cycling and opportunities for informal social interaction, are associated with improved physical activity and mental health. Furthermore, incorporate clear signposting, good acoustics and natural lighting into building design may reduce stress.

Douglas et al. [4] suggest in their review supporting HIA guidance that interventions targeting house dust mite and allergens exposure do not improve health or reduce asthma symptoms.

What is the evidence for effects on vulnerable groups?

General

There is ‘moderate’ evidence from Braubach et al. [1+] in their systematic review that those people living in poor housing are most likely to be socioeconomically deprived and have long-standing illness. Vulnerable groups such as the sick, the elderly, and the unemployed, are among those most likely to live in poor housing and also tend to spend large amounts of time in their homes exposed to potentially hazardous environments. The review found ‘high’ strength evidence that improvements in provision of affordable warmth can lead to respiratory health improvement in the short term. The greatest potential for health improvements is for those with existing respiratory illness who are living in houses that are difficult and costly to heat. Douglas et al. [4] report ‘moderate’ strength evidence that the elderly are at particular risk of indoor air quality and extremes of temperature. Furthermore Braubach et al. found ‘moderate’ strength evidence that housing adaptations to promote
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provides individuals with their own rooms.

has low numbers of residents;

is of good quality; and

asthma triggers (such as mould, moisture, dust mites, and rodents); and

should be offered housing that is:

in housing rather than type of housing. For individuals with SPMI not identified as being homeless, the review

services. For previously homeless people with SPMI, the key issue for improving health outcomes is length of time

providing housing to formerly homeless persons with SPMI reduces hospital admissions and reduces days

mental health conditions and their carers within the community.

consideration should be given during the planning of residential developments to providing appropriate

Mental health

Mansell et al[26] found 'moderate' strength evidence that dispersed community-based housing is superior to

clustered housing on the majority of quality of life indicators for adults with intellectual disabilities. The only

being that there are some benefits to village communities for people with less severe disabilities.

Consideration should be given during the planning of residential developments to providing appropriate

community based accommodation opportunities for adults with intellectual disabilities. Kozma et al[27] noted

that the presence of people with intellectual disabilities in the community, their participation in community-based activities,

and use of community facilities are often seen as one of the core indicators of their social integration. The review found 'moderate' strength evidence that people with mental health conditions in small scale community-based residences or in semi-independent or supported living arrangements have a better objective quality of life than do people in large, congregate settings. The review suggests that residential developments should consult with local mental health services on how aspects of housing provision and urban design can support people with mental health conditions and their carers within the community.

Kyle et al[28] noted that individuals with severe and persistent mental illness (SPMI) identify housing as an

important factor in achieving and maintaining their health. The review found 'high' strength evidence that providing housing to formerly homeless persons with SPMI reduces hospital admissions and reduces days hospitalised. The evidence suggests that 95% of housing costs can be offset by the reduced use of hospital services. For previously homeless people with SPMI, the key issue for improving health outcomes is length of time in housing rather than type of housing. For individuals with SPMI not identified as being homeless, the review found 'low' strength evidence that housing interventions that improve the housing circumstances of individuals with SPMI, may reduce psychiatric symptoms and increase wellbeing. Kyle et al conclude that people with SPMI should be offered housing that is:

- not contingent on psychiatric treatment compliance or sobriety;
- offers an unlimited length of stay;
- has low numbers of residents;
- is of good quality; and
- provides individuals with their own rooms.

Sellström et al[29] found 'moderate' strength evidence of a 10% increased risk of having a low birth-weight

infant (a significant determinant of child health) if the mother lived in a disadvantaged neighbourhood. The review notes that low-income mothers with limited education tend to have lower birth-weight infants. Sellström et al also found 'moderate' strength evidence that behavioural problems among children were more common in poor neighbourhoods, and within these communities more prevalent amongst families of low socioeconomic status.

Sellström et al conclude that neighbourhood socioeconomic status and social climate have small to moderate
effects on child health outcomes, i.e. birth weight, injuries, behavioural problems, and child maltreatment. The evidence suggests that health risks to children can be reduced by targeting underprivileged and physical neighbourhoods, particularly families with few resources. Jelleyman et al[30] found 'moderate' strength evidence that children who experienced high levels of relocation (repeated changes in housing) were associated with increased indirect aggression, property offences and behavioural problems requiring psychological help. For adolescence outcomes shifted to earlier initiation of drug use, earlier onset of depression and, among adolescent girls, an increased risk of both premarital sexual behaviour and teenage pregnancy. The review's findings suggest that consideration should be given to creating stable residential environments for children and adolescents. This may include appropriate access to parental employment opportunities as well as an affordable family housing.

Social cohesion

In examining how psychosocial environments affect health, Egan et al[31] found 'moderate' strength evidence that social support (from spouses at home and from social networks in the wider community) or participation in local activities are associated with better health amongst elderly populations. The review also found that fewer social resources at a community level can be associated with increased likelihood of child maltreatment at home, which may increase risks of bio-polar disorder in later life. The review suggests that in planning housing developments consideration should be given to optimising opportunities for social support and social networks, e.g. through appropriate housing mix, layout and integration of services and amenities.

Access to services

Rosso et al[32] found 'low' strength evidence that transportation systems, land use patterns, and urban design can impact mobility in older adults. The review concludes that to promote physical activity (walking) in older adults, developments should give consideration to reducing car commuters; increasing paths and trails; proving retail and employment opportunities close to residential areas; and include traffic safety measures for pedestrians.

Lovasi et al[33] found that disadvantaged groups in the US tend to live in worse environments with respect to food stores, places to exercise, aesthetic problems, and traffic or crime-related safety. The review found 'moderate' strength evidence that proximity to convenience stores is associated with higher body mass index in adolescents as well as fewer health food choices and poorer quality produce. Low income areas tend to have more convenience stores and fewer supermarkets. Supermarkets are generally associated with greater fruit and vegetable consumption. Papas et al[34] also found 'moderate' strength evidence (primarily from US studies) that access to affordable, healthy foods, is constrained within low-income communities, thus partially explaining the higher rates of obesity seen in low-income communities. However the review notes that studies (not systematic reviews) from Australia[35-37] have found weak or no association between neighbourhood-level socioeconomic factors and food availability. The review also found 'low' strength evidence that for older people perceived 'availability of services for seniors' and 'neighbourliness' increased physical activity in home-dwelling persons aged 65 years or older. The review suggests that to promote physical activity, residential developments should: have access to affordable, healthy food; facilitate access to services for older people; and adopt development layouts that encourage positive interactions with neighbours.

Jelleyman et al[30] found 'low' strength evidence that children and adolescents exposed to high levels of relocation experienced reduced continuity of healthcare provision. The evidence suggests that local health
services should be alerted to the potential need for increased service promotion for new residents and increase care planning for those who may be displaced.

Access to good quality space/urban design

Ding et al\(^2\) summarise findings from peer reviewed papers on the associations between neighbourhood environment and physical activity among young people. The review found ‘moderate’ strength evidence that for children the environmental attributes that were consistently associated with physical activity were walkability, traffic speed/volume, access/proximity to recreation facilities, land-use mix, and residential density. ‘Moderate’ strength evidence was also found for adolescents that the most supported correlates were land-use mix and residential density. These findings suggest that planning policies should: enhance access to parks during neighbourhood regeneration; encourage schools to open facilities to the community; provide incentives for private recreation facilities to locate in underserved neighbourhoods; require mixed-use development; and create roadways that are pedestrian friendly and promote safe traffic patterns. These findings are consistent with Carter et al\(^2\) who found ‘high’ strength evidence that socioeconomic disadvantage increases child adiposity (obesity). The findings suggest that reducing socioeconomic disadvantage has an important role to play in reducing levels of childhood obesity. Another opportunity for reducing childhood obesity that may arise in the planning of residential developments is improving opportunities for physical activity. McCormack\(^2\) et al\(^{2,3}\) find ‘moderate’ strength evidence that access to nearby parks and natural settings is associated with improved healthy weight among children. The review notes that actual and perceived attributes including safety, aesthetics, amenities, maintenance, and proximity are important for encouraging park use. The review reinforces the suggestion that during residential developments opportunities should be taken to create more high quality neighbourhood parks within walking distance.

Yen et al\(^2\) identify ‘moderate’ strength evidence that neighbourhood environment is important for older adults’ health and functioning, as a majority of older adults are inactive and physical inactivity is linked to quality of life, morbidity, and mortality. The review found that more accessible neighbourhood design (including well laid out green spaces, well-maintained sidewalks, and adequate levels of ward and street lighting) was associated with better health outcomes. Yen et al\(^2\) also found ‘moderate’ strength evidence that quality of sidewalks, parks and exercise facilities affect levels of physical activity. The review notes that as use is also highly dependent on cost, opening hours and maintenance, low income groups usually have less access to indoor and outdoor places to exercise. Lovasi et al also identified that low income and minority populations tend to live in neighbourhoods that are perceived as less attractive and less safe. Their review finds ‘low’ strength evidence that pleasant aesthetics or green spaces are linked to reduced health disparities and to lower obesity risk. Lovasi et al conclude that advantaged subgroups benefit the most from new residential developments and that minority populations tend to live in neighbourhoods that are perceived as less attractive and less safe.

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What is the experience from previous Health Impact Assessments?

HIA summaries (additional detail is provided in appendices)

The March Farm Central Area Regeneration Masterplanning HIA\(^4\) noted that although there were likely to be long-term health and wellbeing benefits from the development, during construction and decanting there would be considerable disruption of daily routines with adverse impacts on mental health, social networks and access to services. The HIA noted that children were particularly vulnerable to disruption of school and extra-curricular activities, with adverse impacts on health and wellbeing. The loss of shops and amenities that particularly targeted younger age groups, or which had strong meanings for existing local children was also noted as important. Other disadvantaged groups included, women with childcare responsibilities, older people, people with disabilities or people from black or ethnic minorities. For these groups disruption to local services was more pronounced, as was the loss of local shops that provided culturally important specialist produce. Key mitigation recommendations included: provision of financial assistance to longstanding residents to support their move; provide community spaces and a range of facilities, (e.g. health centre, business space and community facilities); homes should meet high quality standards; shopping area should be family friendly and prioritise use by families; older people and those with disabilities; shopping area should include an ATM cash machine; provision of biodiverse green-space with play areas and covered seating; include a ‘cop shop’ to reduce perceptions of crime; any pub should be away from residential areas; routes should be safe, accessible and well lit; adopt a ‘walkable community and development’ principle; ensure adequate provision for maintenance is built into the proposals; and make provision for sustainable waste management.

The San Francisco Public Housing Redevelopment HIA\(^5\) noted the importance of using safe building materials, e.g. lead free paint and low VOC materials. The HIA also stressed the importance of high quality design and maintenance to avoid structural defects which could have adverse health impacts (e.g. build-up of pollutants/allergens, infestation and mould). Recommendations for this issue included: quality plumbing; good noise insulation; avoid carpeting; good ventilation and drainage to avoid mould; and food and garbage management to avoid pests. The HIA also examined neighbourhood context, noting the importance of environmental hazards such traffic calming measures to reduce traffic-related pollution and community noise. Housing affordability was also highlighted in preventing homelessness, overcrowding and displacement as a result of the development. Crime and fear of crime were important design considerations. Being prospective the HIA was able to note residents’ views that the open nature of the residential site created a sense of vulnerability and the important role that the community centre played in keeping young people out of trouble. The HIA recommended that future developments ensure that commitments are made to provide ongoing security for the areas of the development, as a onetime investment is insufficient to keep levels of violence low. A major concern raised during the HIA concerned involuntary residential displacement and the importance of providing additional support to any residents temporarily displaced by the redevelopment, particularly the elderly, families or vulnerable individuals.

To reduce the likelihood of displacement, the HIA recommended opportunities to expand rather than redevelop public housing. The HIA noted that children are a key, and often vulnerable, population during public housing redevelopments. The HIA recommended developments include on-site community centres with extended hours (e.g. computer labs, job training, sports and fitness, after-school education and college planning). Health eating was also raised with the recommendation that there be fewer fast food and more supermarket grocery stores onsite in new neighbourhoods. The HIA includes a useful diagrammatic summary of the pathways between health and housing, which has been reproduced in Appendix B (see Figure 3). The HIA argues that the strongest evidence for housing-health relationships exists at the ‘microenvironmental’ level.

The regeneration of Kipling & Blackmore on the South Acton Estate Mental Well-being Impact Assessment (MWIA)\(^6\) focused on the adverse mental health impacts associated with decanting populations during large scale residential redevelopment projects. The impact assessment noted that such disruption is stressful and can break up social networks particularly for vulnerable immobile elderly people. The report found that families need additional support owing to stress associated with changes in schools. Adolescents also had particular difficulties owing to limited success in re-establishing themselves in a new community, with consequent loss of social networks and friendships. A further vulnerable group during decanting were refugees and migrants who face barriers to accessing services (particularly language). This group may have less understanding of what is happening; may have less opportunity to participate; and may not have secure tenure. It was noted that those most affected by the regeneration were those least likely to come to the regeneration office to participate or receive information. A suggestion was that targeted outreach could be undertaken to ensure those who are most at risk had a better understanding of what was happening. Other recommendations of the HIA were to include residents in the design process, as they would be able to quickly identify improvements simply by looking at the design of gardens and open spaces; provide better access to services through new housing developments; the recommendations included: providing additional temporary lighting to areas under redevelopment to improve safety; providing a means for residents to identify their home as it is being built to create a sense of identity and attachment in the early phases; providing practical support for residents e.g. créche facilities available when people are moving out; and establishing a ‘buddy’ scheme whereby existing tenants can volunteer to mentor new tenants.

The HIA of social housing redevelopment in Devonport\(^7\) found that there would be improved health in the long run from better housing. However the HIA also identified potential health risks, particularly from construction phase activities. Key issues included; stress, disruption and pollutants affecting residents; economic stress on local businesses; serious stress and reduced access to health moderating services from inefficient or poorly communicated decant plans. The HIA recommended involvement of experts and residents in considering ways to improve the efficiency of the decanting process and in planning provision for disabled people. With regard to operational housing provision the HIA found there was: inadequate housing provision for people with disabilities,
A sustainable new community at Sherford HIA categorised potential housing development health opportunities and risks into five areas, namely: service provision; transport and connectivity; social and cultural governance; housing and the built environment; and the economy and employment. For service provision the key opportunities were: provision for small retailers, which were described as the linchpin of a sustainable business base; increased availability of services and amenities; and more facilities offering a variety of foods, such as fresh vegetables, obtaining medicines, or getting regular exercise. The HIA recommended partnership working with local producers and retailers. Health risks associated with service provision highlighted a current lack of both formal and informal youth orientated services and facilities, catering for both older as well as younger children. In the transport and connectivity category, the HIA noted: the opportunity for car park and green travel plans that included elements of physical activity; the potential social, as well as exercise, benefits of ‘safe routes to school’ initiatives; and the advantages of developing access plans for those with disability that provided a complete solution from within the home, to shops/work and back to home. Health risks associated with transport and connectivity were also described, including: the disproportionate effect of poor public transport access on women, children and disabled people, people from minority ethnic groups, older people and people with low socio-economic status; and the trade-off between the benefits of improved transport and the potential for severance of community networks at the local level due to large traffic volumes. The HIA recommended regular surveys and inclusion of residents in the detailed design of each leg of public/private travel planning. Within social and cultural governance the HIA identified opportunities for building empowerment and social capital from community participation. Public art was cited as a potential focus for community activity. In contrast potentially adverse health effects were social isolation; fearfulness; and vandalism. The HIA recommended support for local representatives/councillors during the community transition; and crime/fear of crime in reducing social cohesion and causing stress, particularly for the elderly. The HIA recommended the provision of: flexible social infrastructure, which can be easily adapted to a changing population; affordable sports facilities; and services and facilities that cater not only for young people, especially teenagers, but also for the needs of different faith groups. Within the category of housing and the built environment the HIA found opportunities to improve health by: using high design standards (e.g. BREEAM); make provision within the scheme for opportunities to safely exercise (parks, green space and sports facilities); specifically catering to issues of setting that facilitate social interactions within older people (e.g. access to transport, safe public spaces and trees near older peoples’ homes); include and maintain a high percentage of affordable housing within the scheme; make neighbourhoods walkable (e.g. mixed land use, high density, high street connectivity, and safety features such as lighting and CCTV). The HIA made a number of recommendations to address potential health effects associated with employment schemes; and finally develop a communication strategy to publish the results of the HIA. The project should actively link to providing training and engaging socially excluded groups, e.g. the long-term unemployed and those with low educational achievement). The potential for further benefits to the local and regional economy are also noted, with the effect of health on labour supply as a major contributor to economic growth. However the HIA warns that traditionally regeneration initiatives are often filled by workers from other areas, which whilst having beneficial regional or sub-regional effects may have adverse local effects. Finally the HIA notes the importance of job quality. Jobs that offer only low pay, insecurity and limited job satisfaction will not promote the social inclusion of the worst off. The HIA recommends that the developer work with skills trainers to bring trained employees forward in line with demand (e.g. construction and operation of new facilities). The Dove Gardens HIA, Derby40 made a number of recommendations to address potential health effects associated with the demolition and redevelopment of a housing estate, of 79 dwellings, these included: the need for traffic calming measures; local consultation on the demolition contract; involvement of residents in environmental work (e.g. tree planting); ensure homes are energy efficient to reduce fuel poverty; include planting with food plants that retain clear responsibility for the plants, e.g. within gardens; incorporate recycling systems into the design of kitchens and gardens; design homes that can be adapted to the changing needs of families as children grow up, e.g. provision for the study needs of children and students; minimise use of flats; ensure new developments complement the layout of retained areas; provide safe play areas and make street safe places from children; build contracts for ongoing maintenance into the scheme; regularly update residents on the development’s progress, e.g. meetings and newsletters; form a residents association early on in the process as a forum for formal consultation; include outreach work and comprehensive information packs in any decant process; identify how individual health needs can be catered for within dwellings; encourage contractors to link with local training and employment schemes; and finally develop a communication strategy to publish the results of the HIA. The HIA recommends a ‘locally sensitive lettings policy’ was developed which recognised in particular the needs of minority groups, young people and disabled people.

With the result that this group suffered reduced health outcomes from not being integrated within communities; insufficient access to green space; and inadequate provision for the housing needs of young people (the HIA noted that community cohesion is harmed if youth needs are unmet). The HIA also noted stakeholder concerns that the development was not addressing: stress arising from ‘problem’ neighbours; resentment at perceived ‘priority’ treatment for others at the expense of need for housing for people facing homelessness. To address these concerns the HIA recommended a ‘locally sensitive lettings policy’ was developed which recognised in particular the needs of minority groups, young people and disabled people.

The Dove Gardens HIA, Derby40 made a number of recommendations to address potential health effects associated with the demolition and redevelopment of a housing estate, of 79 dwellings, these included: the need for traffic calming measures; local consultation on the demolition contract; involvement of residents in environmental work (e.g. tree planting); ensure homes are energy efficient to reduce fuel poverty; include planting with food plants that retain clear responsibility for the plants, e.g. within gardens; incorporate recycling systems into the design of kitchens and gardens; design homes that can be adapted to the changing needs of families as children grow up, e.g. provision for the study needs of children and students; minimise use of flats; ensure new developments complement the layout of retained areas; provide safe play areas and make street safe places from children; build contracts for ongoing maintenance into the scheme; regularly update residents on the development’s progress, e.g. meetings and newsletters; form a residents association early on in the process as a forum for formal consultation; include outreach work and comprehensive information packs in any decant process; identify how individual health needs can be catered for within dwellings; encourage contractors to link with local training and employment schemes; and finally develop a communication strategy to publish the results of the HIA.
The Better Homes Better Health, HIA of Sheffield’s Housing Strategy\(^2\) acknowledges that for the majority of residents the housing market provides a secure home, conferring the psychosocial benefits of mental health and well-being. However for a majority of residents, stress arising from the financial insecurity of their home leads to depression and anxiety. The HIA therefore recommends that a strong social housing sector is maintained and short-term measures that alleviate financial distress that contribute to health and wellbeing include: warmth, safety, security, cohesive communities and good quality housing. The HIA recommends focusing on improvements to warmth and security, particularly for single pensioner households.

At the neighbourhood level the HIA notes the need for a balance between environmental objectives with those for health, social cohesion and community safety. Strategic planning and investment in housing services should therefore promote the independence of vulnerable residents and alleviate physical dependency caused by ill health. To this end the HIA recommends expansion of the Joint Strategic Needs Assessment (JSNA) which covers the area of the development to include a cost-benefit analysis of housing’s contribution to adding quality of life to years lived.

The 29th St./San Pedro St. Area Health Impact Assessment\(^6\) notes the benefits of high density residential housing in improving: access to goods and services; the success of neighbourhood retail; walkability; the success of public transit; and the amount and access to parks and open space. This is primarily due to the ability to offer services more efficiently with less supporting infrastructure per capita. However the HIA warns against ‘urban sprawl’ as people living in areas of sprawling development are less likely to walk, and more likely to weigh more and to suffer from high blood pressure. In designing new communities, the HIA advocates reducing income-related residential segregation, as this improves household safety, reduced exposure to crime, and decreased neighbourhood social disorder. However consideration should be given to balancing housing costs as high rents or mortgage costs can precipitate eviction and displacement, conditions that can lead to overcrowding, segregation and even homelessness. The HIA therefore recommends prioritising developing housing units that can be offered at an affordable rate for local community residents most in need. The range of affordable housing costs should be recalculated to reflect rates that allow local residents to be paying no more than 30% of their income on rent or mortgages. The HIA also recommends that the size and number of bedrooms in housing units should reflect the range of family size in the local population and that specific housing opportunities should be made for teachers and/or local school employees in order to focus on the link between the project site and neighbourhood schools.

A further point on housing design is the suggestion that buildings facing park and recreation spaces should have windows that open onto these areas in order to increase community surveillance. Finally the HIA notes the importance on ongoing maintenance to prevent deterioration of housing. Substandard and deteriorating housing contributes to a variety of ailments, from respiratory disease and neurological disorders to psychological and behavioural dysfunction. At the community level, deterioration of housing stock results in “housing filtering”, or the trend of those with lower levels of income to move into a neighbourhood over time, which results in progressively poorer housing maintenance and quality.

The San Francisco Housing Authority Flooring Policy HIA\(^7\) addresses the single issue of alleviating allergens that exacerbate respiratory symptoms though selection of flooring surface. The HIA notes that carpeting serves as a nesting environment for dust mites in the home and that people who rent their accommodation have limited control over the flooring. The HIA therefore recommends that a reasonable proportion of the new units are built without carpeting. This review notes that whilst this is a pragmatic suggestion, the evidence is not conclusive regarding the results of such interventions (see Douglas et al\(^4\) [4], which suggests that interventions targeting house dust mite and allergens exposure do not improve health or reduce asthma symptoms.)

### 4 Appendix A: Literature Summaries

#### Interpretation

Results are presented in three groups:

- **Section A** presents evidence from systematic reviews (this is the strongest evidence)
- **Section B** presents evidence from other published literature
- **Section C** presents a review of previous HIAs of housing developments (internationally)

The results are presented chronologically by date of publication, with each section starting with the most recent publications.

#### Section A: Evidence from systematic reviews

<table>
<thead>
<tr>
<th>ID</th>
<th>Type of evidence</th>
<th>Publication Date</th>
<th>Quality of study</th>
<th>Region</th>
<th>Evidence statements (note, population, intervention and outcomes)</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Systematic review</td>
<td>September 2011</td>
<td>1+ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
<td>International - all</td>
<td>Saunin R, Uitteen, M, Koepsk, K, Sigsgaard T, Verbeek, JH. Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma. Cochrane Database Syst Rev. 2011 Sep 7;(9):CD007897.</td>
<td>Planning policies should enhance access to parks during neighbourhood regeneration; encourage schools to open facilities to the community; provide incentives for private recreational facilities to locate in underserved neighbourhoods; require mixed-use development; and create roadways that are pedestrian friendly and promote safe traffic patterns.</td>
</tr>
</tbody>
</table>
- Identify population size and density of population.  
- Identify the association between environmental physical activity attributes that were consistently associated with physical activity: walkability, traffic speed/volume, access/proximity to recreation facilities, land-use mix, and residential density.  
- Develop a strategy to improve access to parks during neighbourhood regeneration; encourage schools to open facilities to the community; provide incentives for private recreational facilities to locate in underserved neighbourhoods; require mixed-use development; and create roadways that are pedestrian friendly and promote safe traffic patterns. |
Mental health should be included as a separate outcome in assessing the health impacts of housing. Consequently

May 2011

Further research to determine the mechanisms by which neighbourhoods influence birth outcomes.


International - all

Investment in affordable warmth measures that are targeted at those in poor housing, and with pre-existing illness

June 2011

Proximity to retail and employment destinations increases walking. However proximity to other destinations has produced

Systematic review

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3134204/

51

58

Systematic review

Proximity to walking paths and trails is associated with amount of daily walking but not with frequency of neighbourhood

Literature Review

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3134204/

23

Villawood East HIA

51

Litterature Review

ID 23

Citation Braubach M, Jacobs DE, and Ormandy D (2011) ‘Environmental Burden of Disease associated with inadequate housing’.

Copenhagen, Denmark: WHO Europe.


Type of evidence Systematic review

Publication Date June 2011

Quality of study 1+ (well-conducted MA, SR, or RCTs with a low risk of bias)

Region International - all

Evidence statements (note population, intervention and outcomes)

A review of the effect of housing quality on mental health noted that people living in multiple family housing or on the upper floors of high rise buildings have greater mental health problems. These effects are probably larger for young women and young children. The review notes that there are methodological problems with quantification of mental health impacts at population level.

(Strength of evidence = Moderate; Topic = Mental health)

The review concludes that it is unlikely that housing itself will precipitate serious mental disorder. However, there are two likely ways in which housing can contribute to mental health.

1. It can directly affect chronic stress which is known to affect nonclinical symptoms of anxiety, depression, and hostility and frustration.

2. Poor quality housing may be an additional risk factor that often co-varies with poverty and thus is associated with other physical (e.g., pollution, toxins) and social (e.g. family instability, violence) risk factors.

The review notes that exposure to multiple risk factors dramatically escalates the probability of psychological distress.

(Strength of evidence = Moderate; Topic = Mental health)

The link between poor housing and poor health is well established. Many cross-sectional studies have reported consistent and statistically significant associations between poor housing conditions and poor health. Those living in poor housing are most likely to be socioeconomically deprived and have long-standing illness. In addition, vulnerable groups such as the sick, the elderly, and the unemployed, are among those most likely to live in poor housing and also tend to spend large amounts of time in their homes exposed to potentially hazardous environments.

(Strength of evidence = Moderate)

Improvements in provision of affordable warmth can lead to health improvement in the short term, in particular respiratory and mental health. The greatest potential for health improvements is for those with existing respiratory illness who are living in houses that are difficult and costly to heat. Improved warmth in the home may also impact positively on socioeconomic health determinants. Following these types of improvements, residents reported less time off work/school, and increased social and educational opportunities; these impacts may be health promoting in the long term.

(Strength of evidence = High; Topic = Urban design)

Despite programmes of housing led renewal delivering major improvements to housing and the outdoor housing environment, it would appear that there is little evidence of associated improvements in health. There is some suggestion from poorer quality studies that mental health may improve. Very little is known about possible impacts on respiratory health or other specific symptoms. It is important to note that there is little evidence that rehousing leads to deterioration in physical or mental health.

(Strength of evidence = Low; Topic = Urban design)

Although effective measures to reduce noise may reduce disturbance and annoyance caused by noise, little is known about the health impacts of measures to reduce occupants’ exposure to noise.

(Strength of evidence = Very Low; Topic = Urban design)

Housing adaptations to promote independent living and rehousing to meet medical or mobility needs can have health benefits for residents.

(Strength of evidence = Moderate; Topic = Social cohesion; Service access)

- Mental health should be included as a separate outcome in assessing the health impacts of housing. Consequently measures of housing quality need to consider factors that might be relevant to mental health.

- Investment in affordable warmth measures that are targeted at those in poor housing, and with pre-existing illness can lead to health improvements, in particular respiratory improvements. Health improvements following area-based programmes of housing led neighbourhood renewal are less clear. There is little suggestion that housing improvement leads to negative health impacts.

- Interventions most likely to lead to measurable health improvements are those that target groups in most need where the potential to benefit is greatest, i.e. residents in the poorest housing who are also most vulnerable to the detrimental health effects of poor housing.

- Poor housing, poverty, and poor health are inextricably linked to each other and it may be that improvements to housing conditions alone are insufficient to lead to measurable health improvements, especially in the short term. The possibility of long-term health impacts and prevention of poor health among future generations remains largely unknown.

Implications

Further research to determine the mechanisms by which neighbourhoods influence birth outcomes.

ID 58


Web link http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3134204/

Type of evidence Systematic review

Publication Date June 2011

Quality of study 1+ (well-conducted MA, SR, or RCTs with a low risk of bias)

Region International - all

Evidence statements (note population, intervention and outcomes)

Rosso et al found ‘low’ strength evidence that transportation systems, land use patterns, and urban design can impact mobility in older adults.

- A high percentage of car commuters is positively associated with increased walking difficulty among those aged 75 and older, but not among younger age groups.

- Proximity to walking paths and trails is associated with amount of daily walking but not with frequency of neighbourhood walking.

- Proximity to retail and employment destinations increases walking. However proximity to other destinations has produced varied results.

The presence of safety measures for pedestrians against traffic increases walking.

(Strength of evidence = Low; Topic = Service access; Urban design)

Implications

To promote physical activity (walking) in older adults, developments should give consideration to reducing car commuters; increasing paths and trails; proving retail and employment opportunities close to residential areas; and include traffic safety measures for pedestrians.
Communities with large concentrations of low-income and minority residents are especially likely to be exposed to high
quality MA; or SR of RCTs; or RCT with very low bias risk).

Gibson M, Petticrew M, Bambra C, Sowden AJ, Wright KE, Whitehead M. Housing and health inequalities: A synthesis of
systematic reviews of interventions aimed at different pathways linking housing and health. Health Place. 2010 Sep 29.

Neighbourhoods with better access to supermarkets and other retail outlets with minimally processed foods tend to eat a
healthier diet than their counterparts in neighbourhoods with less access to these goods.

The density of fast food outlets and preponderance of energy-dense foods in convenience stores and other small markets
has been linked with higher prevalence of obesity and higher BMI. Similarly, liquor stores are more likely to be located in
low-income and more minority communities and their greater density is associated with adverse community-level
consequences.

Communities with large concentrations of low-income and minority residents are especially likely to be exposed to high
concentrations of pollutants and are less protected by zoning from the siting of dumps and bus depots and proximity to
highways. Children are particularly sensitive to unhealthy conditions in neighbourhoods; even low levels of pollution can
increase morbidity and mortality.

Hazards in the home may include lead, indoor allergens (e.g., dust mites, mold), and radon, each of which has been shown to
cause harm. Exposures in the home have been implicated in approximately 40% of children diagnosed with asthma. Among
with the physical dangers within the home, lack of housing affordability has been linked to health. The financial strain of
unaffordable housing has been associated with decreased spending on health care and care, including delays in seeking
preventive and routine medical care, medication non-adherence, and increased emergency department utilization. High
utility bills place an additional burden on lower-income families, forcing tradeoffs among housing, heating, food, medical
care, and other basic needs, which can undermine children’s growth and healthy development. Lack of affordable housing is
associated with increased prevalence of residential relocation and mobility, causing a disruption in schooling, health care, and
social networks.

Miller et al conclude that parks, green spaces and recreational facilities, high-quality schools, competively priced
supermarkets and other commercial services, and zoning that keeps industrial sites and pollutants at a distance from
residential areas contribute to an environment that is conducive to the achievement and maintenance of good health. These
local assets reduce adverse environmental exposures, promote opportunities for self-development, and allow individuals and
families to engage in health-promoting activities.

Implications: An effective population health improvement strategy requires enlisting new partners among public agencies including
housing, transportation, recreation, community development, and planning, and joint efforts between private sector business
and voluntary organizations. Further research on community-based interventions to guide policy makers.

There is evidence to suggest that interventions aimed at altering disadvantaged participants’ neighbourhood conditions by
moving them to areas of lower poverty can lead to reductions in the percentage of participants reporting depression and
increases in the proportion reporting good or excellent health. Moving people from high to low poverty neighbourhoods can
improve mental health, reduce obesity and improve diet in some studies, but not in others. mover outcomes.

There is some evidence of positive impact for area effects interventions designed to improve high poverty areas, although
adverse impacts can also result from these. Focusing investment on deprived areas may assist all of the residents and thus be
more cost-effective. However, it is difficult to gather robust evidence of impact for area level interventions aimed at improving
either area characteristics or internal housing conditions in part because impacts may be diluted by benefiting many who are
not personally disadvantaged.

The lack of systematic reviews of the health impact of housing interventions aimed at altering housing tenure represents a
major knowledge gap. There is evidence to support specific interventions.

Interventions carefully targeted at those in greatest need may hold the most promise for improving health.
Citation: McCormack GR, Rock M, Tohey AM, Hignell D. Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. Health Place. 2010 Jan;16(1):31-41. Epub 2009 Dec 16.

Evidence statements (note population, intervention and outcomes)

McCormack et al.** noted that physical activity participation provides mental and physical health benefits and can also reduce the risk of many chronic diseases. The review notes that the built environment can both enable and limit physical activity participation. Specifically, neighbourhood characteristics such as the proximity and mix of land uses, pedestrian connectivity, aesthetics and interesting scenery, and traffic and personal safety are important correlates of physical activity. The review notes that access to nearby parks and natural settings is associated with improved mental health, reduced anxiety, physical health, and healthy weight among children. The review provides moderate strength evidence for features and attributes of parks that are associated with improved park use and hence physical activity.

- **Park feature:**
  - For children and adolescents access to facilities that support sports and play (playgrounds and trees) increase park use. Facilities which are age-inappropriate, poorly equipped, out-dated, or mentally or physically unstimulating should be avoided.
  - For adults and adolescent girls constructed and natural trails were important for park use.
  - Barbeques, seating, water fountains, picnic tables and bathrooms were important in promoting park use for all ages.
  - Other facilities that promote park use include dog litter bins and appropriate placement of shade-providing devices for children and caregivers.

- **Park condition:**
  - For both adults and children the cleanliness of parks and the maintenance of facilities and playing surfaces are important in park use.

- **Park accessibility:**
  - Generally, having more local parks within walking distance was positively associated with park use, while the necessity of driving to reach a park often deterred use. However, concerns over safety at local parks and the presence of high quality facilities in more distant parks affect this pattern.

- **Aesthetics:**
  - For adults, adolescents and children. The presence of graffiti or vandalism discourages park use.

- **Park safety:**
  - Actual and perceived park safety is often dependent on the presence of undesirable users (e.g. drug users, homeless people and lotters). The presence of older children and teenagers in parks can be a concern for younger children and caregivers.
  - Specific park attributes that influence safety from crime include: lighting, law-enforcement patrols, surveillance features, secluded paths or areas.
  - Specific park attributes that influence safety from injury include: grass, stones, rocks, debris, heavy traffic, cyclists and other fast moving park users.

- **Park social environment:**
  - A park environment that facilitates social meetings is associated with increased park use. Opportunities to socialize in safe and supportive social environments appears to be important, notably for women and girls. For girls, meeting friends at local parks facilitated both active and passive leisure pursuits. For adolescents the opportunity to socialise independently from adults was an important determinant of park use. Social clubs and neighbourhood associations are positively linked to park use and physical activity.

McCormack et al conclude that actual and perceived attributes including safety, aesthetics, amenities, maintenance, and proximity are important for encouraging park use; which is an important facilitator of physical health, mental health and social networking.

Implications: Create more high quality neighbourhood parks within walking distance of most residents to encourage physical activity participation in the population.


Evidence statements (note population, intervention and outcomes)

Renalds et al.** found moderate strength evidence that neighbourhoods that are characterized as more walkable, either urban, leisure-oriented or destination-driven, are associated with increased physical activity, increased social capital, lower overweight, lower reports of depression, and less reported alcohol abuse.

- **Strength of evidence:** Moderate
- **Topic:** Mental health; Social cohesion

Implications: Residential areas should be designed to increase walkability and incorporate desirable mixed use destinations (e.g. leisure, retail or employment).
<table>
<thead>
<tr>
<th>ID</th>
<th>Citation</th>
<th>Year</th>
<th>Web link</th>
<th>Type of evidence</th>
<th>Publication Date</th>
<th>Quality of study</th>
<th>Region</th>
<th>Evidence statements (note population, intervention and outcomes)</th>
<th>Implications</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Yen H, Michael YL, Perdue L. Neighborhood environment in studies of health of older adults: a systematic review. Am J Prev Med. 2009 Nov;37(5):455-63.</td>
<td>2009</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/19840702">http://www.ncbi.nlm.nih.gov/pubmed/19840702</a></td>
<td>Systematic review</td>
<td>November 2009</td>
<td>2++ (High quality SR of non RCT studies; or high quality non-RCT studies with a very low bias risk and high probability of a causal relationship)</td>
<td>International - all</td>
<td>Yen et al identified that neighborhood environment is important for older adults’ health and functioning. A majority of elder adults are inactive and physical inactivity is linked to quality of life, morbidity, and mortality. The review found ‘moderate’ strength evidence that more accessible neighborhood design supported greater levels of walking. <em>(Strength of evidence = Moderate; Topic = Urban design)</em></td>
<td>To increase physical activity in older adults, neighborhoods should be designed to have well laid out good quality walking surfaces.</td>
</tr>
<tr>
<td>2</td>
<td>Thomson H, Thomas S, Sellstrom E, Petticrew M. The health impacts of housing improvement: a systematic review of intervention studies from 1887 to 2007. Am J Public Health. 2009 Nov;99 Suppl 3:S681-92.</td>
<td>2009</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/19890174">http://www.ncbi.nlm.nih.gov/pubmed/19890174</a></td>
<td>Systematic review</td>
<td>November 2009</td>
<td>1++ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
<td>International - all</td>
<td>Thomson et al describe the health impacts of housing improvements. The review notes ‘moderate’ strength evidence for improvements in air quality, respiratory, and mental health following warmth and energy efficiency improvements to housing. The review notes that there is ‘very low’ strength evidence with respect to other aspects of housing led neighborhood renewal programs. This is due to conflicting and unclear impacts and generally low quality scientific studies. Thomson et al conclude that other than the benefits from improved warmth, the size and type of health impacts following programs of housing-led neighborhood renewal is currently unknown. <em>(Strength of evidence = Moderate; Topic = Mental health; Urban design)</em></td>
<td>Provide improvements in housing warmth for vulnerable individuals who have poor health and live in poor housing. Further research into the socioeconomic impacts associated with housing improvement is needed to investigate the potential for longer-term health impacts.</td>
</tr>
</tbody>
</table>
• There is ‘moderate’ strength evidence that proximity to convenience stores is associated with higher body mass index in adolescents as well as younger health food choices and poorer quality produce. Low income areas tend to have more convenience stores and fewer supermarkets. Supermarkets are generally associated with greater fruit and vegetable consumption.  
• There is ‘moderate’ strength evidence that quality of sidewalks, parks and exercise facilities affect levels of physical activity. Though use is also highly dependent on cost, opening hours and maintenance. Low income groups usually have less access to indoor and outdoor places to exercise. *(Strength of evidence = Moderate; Topic = Service access)*  
• Low income and minority populations tend to live in neighborhoods that are perceived as less attractive and less safe. There is ‘low’ strength evidence that pleasant aesthetics or green spaces have been linked to reduced health disparities and to lower obesity risk, with enjoyable scenery being a particularly important determinant of physical activity among lower-income minority participants. Lovasi et al conclude that advantaged subgroups benefit the most from new resources when they are provided at the same level to all. Thus, a built environment improvement may increase health disparities unless disadvantaged groups are specifically targeted. *(Strength of evidence = Low; Topic = Urban design)* | To improve low level mental health outcomes (depression) consideration should be given to urban designs and local policies that minimise social disorder and promote neighborhood socioeconomic status. Further research into the mediating pathways and effect-modifying factors will help to identify what specific neighborhood features matter for depression. |
Evidence statements (note population, intervention and outcomes)

Egan et al. found 'moderate' strength evidence that favourable psychosocial environments that promote factors such as social support and networks, social capital, social cohesion, collective efficacy and participation in local organisations tend to be associated with better health outcomes. Poor psychosocial environments (including exposure to community violence, anti-social behaviour, or discrimination) may reduce health outcomes and contribute to health inequalities.

In terms of more specific results, the review found:
- Social support and size of social networks may be associated with lower risk of coronary heart disease and cancer (particularly breast cancer).
- Social support (from spouses at home and from social networks in the wider community) and participation in local activities may be associated with better health amongst elderly populations.
- Fewer social resources at a community level may be related to an increased likelihood of child maltreatment at home, and that unsupportive or maladaptive family relationships at home may be associated with a higher risk of offspring developing bi-polar disorder in later life.
- Egan et al. conclude that there is some evidence that supports the view that favourable psychosocial environments are linked to better health, but there is also a significant body of scientific evidence that finds little or no association. Local factors and circumstances are therefore likely to be important.

(Strength of evidence = Moderate; Topic = Social cohesion)

Implications

Housing developments should promote favourable psychosocial environments by considering how the housing mix, layout and integration with transport and amenities can optimise opportunities for social support and social networks. Further research into community participation using better quality studies is needed.

Evidence statements (note population, intervention and outcomes)

Jelleyman et al. examined health outcomes in children and adolescents exposed to high levels of relocation. Although there was limited support for causal relationships, the review found 'moderate' strength evidence that during childhood outcomes included increased indirect aggression, property offences and behavioural problems requiring psychological help. During adolescence outcomes included earlier initiation of drug use and related problems, earlier onset of depression and, among adolescent girls, an increased risk of both premarital sexual behaviour and teenage pregnancy.

There was also 'low' strength evidence for an association between children and adolescents exposed to high levels of relocation and reduced continuity of healthcare provision. (Strength of evidence = Low; Topic = Service access)

Implications

Consideration should be given to creating stable residential environments for children and adolescents. This may include appropriate access to parental employment opportunities as well as an affordable family housing. The impact of housing and economic policies on childhood residential mobility should be evaluated considering this evidence.

Evidence statements (note population, intervention and outcomes)

Papas et al. found 'moderate' strength evidence that individuals with severe and persistent mental illness (SPMI) identify housing as an important factor in achieving and maintaining their health. However, many live in substandard accommodations that are physically inadequate, crowded, noisy and located in undesirable neighbourhoods. The review found 'high' strength evidence that providing housing to formerly homeless persons with SPMI reduces hospital admissions and reduces days hospitalised. The review also found that length of time in housing rather than type of housing appears to be the key factor and that 95% of housing costs were offset by hospital service reductions. Similarly 'high' strength evidence suggests that life satisfaction is unrelated to housing type for previously homeless people with SPMI.

(Strength of evidence = High; Topic = Mental health; Service access)

Implications

People with severe and persistent mental illness (SPMI) should be offered housing that offers an unlimited length of stay because SPMI is a chronic and fluctuating condition that requires stable surroundings to maintain health. Housing should ideally have low numbers of residents, be of good quality (though type of housing does not appear to change outcomes) and provide individuals with their own rooms. More research is needed about housing solutions for individuals with SPMI who are housed, but in precarious or inappropriate housing situations.

Evidence statements (note population, intervention and outcomes)

Papas et al. looked mainly at US studies and found 'moderate' strength evidence that access to affordable, healthy foods, is constrained within low-income communities, thus partially explaining the higher rates of obesity seen in low-income communities. However the review notes that studies (not systematic reviews) from Australia have found weak or no association between neighbourhood-level socioeconomic factors and food availability.

(Strength of evidence = Moderate; Topic = Social cohesion)

Implications

To promote healthy eating and physical activity, residential developments should have access to affordable, healthy food; facilitate access to services for older people; and adopt development layouts that encourage positive interactions with neighbours. Further research on the impact of the built environment on obesity is needed.
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>56</td>
<td>Sellström E, Bremberg S. The significance of neighbourhood context to child and adolescent health and well-being: a systematic review of multilevel studies. Scand J Public Health. 2006;34(3):544-54.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/16990166">http://www.ncbi.nlm.nih.gov/pubmed/16990166</a></td>
<td>Systematic review</td>
<td>July 2006</td>
<td>1+ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
<td>International - all</td>
<td>Selström et al found moderate strength evidence that the risk of giving birth to a low-birth-weight infant is a significant determinant of child health increased by over 10% if the mother lived in a disadvantaged neighbourhood. The review notes the review adds to existing evidence that low-income mothers with limited education give birth to low-birth-weight infants more often than do more advantaged mothers. The review also found moderate strength evidence that behavioural problems among children were more common in poor neighbourhoods, and within these communities more prevalent amongst families of low socioeconomic status. Sellström et al conclude that neighbourhood socioeconomic status and social climate have small to moderate effects on child health outcomes, i.e. birth weight, injuries, behavioural problems, and child maltreatment. (Strength of evidence = Moderate; Topic = Mental health; Service access)</td>
<td>Health risks to children, especially in families that lack resources, can be reduced by targeting regeneration (and other interventions) in underprivileged neighbourhoods.</td>
</tr>
<tr>
<td>30</td>
<td>Sellström E, Bremberg S. The significance of neighbourhood context to child and adolescent health and well-being: a systematic review of multilevel studies. Scand J Public Health. 2006;34(3):544-54.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/16990166">http://www.ncbi.nlm.nih.gov/pubmed/16990166</a></td>
<td>Systematic review</td>
<td>July 2006</td>
<td>1+ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
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<td>Selström et al found moderate strength evidence that the risk of giving birth to a low-birth-weight infant is a significant determinant of child health increased by over 10% if the mother lived in a disadvantaged neighbourhood. The review notes the review adds to existing evidence that low-income mothers with limited education give birth to low-birth-weight infants more often than do more advantaged mothers. The review also found moderate strength evidence that behavioural problems among children were more common in poor neighbourhoods, and within these communities more prevalent amongst families of low socioeconomic status. Sellström et al conclude that neighbourhood socioeconomic status and social climate have small to moderate effects on child health outcomes, i.e. birth weight, injuries, behavioural problems, and child maltreatment. (Strength of evidence = Moderate; Topic = Mental health; Service access)</td>
<td>Health risks to children, especially in families that lack resources, can be reduced by targeting regeneration (and other interventions) in underprivileged neighbourhoods.</td>
</tr>
<tr>
<td>33</td>
<td>Rehkopf DH, Buka SL. The association between suicide and the socio-economic characteristics of geographical areas: a systematic review. Psychol Med. 2006 Feb;36(2):145-57.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/16420711">http://www.ncbi.nlm.nih.gov/pubmed/16420711</a></td>
<td>Systematic review</td>
<td>February 2006</td>
<td>1+ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
<td>International - all</td>
<td>Rehkopf et al found moderate strength evidence that suicide rates are associated with neighbourhood level socioeconomic level, with suicide rates increasing as socioeconomic levels decrease. Furthermore the review found that area suicide rates are most strongly associated with the proportion of residents that are living below the poverty level (or similar measures of economic deprivation). Results did not vary significantly by gender. Rehkopf et al conclude that these findings are consistent with a contextual explanation where area suicide rates are driven by social and economic isolation of neighbourhoods with higher levels of deprivation. (Strength of evidence = Moderate; Topic = Mental health)</td>
<td>To reduce rates of suicide, regeneration should target areas of high deprivation, poverty and unemployment. Suicide prevention resources should focus more on communities of a relatively lower socioeconomic level, in particular, those at high levels of concentrated disadvantage.</td>
</tr>
<tr>
<td>29</td>
<td>Anderson LM, Charles JS, Fullilove MT, Scrimshaw SC, Fielding JE, Normand J; Task Force on Community Preventive Services. Providing affordable family housing and reducing residential segregation by income. A systematic review. Am J Prev Med. 2003 Apr;24(3 Suppl):47-67.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/12668198">http://www.ncbi.nlm.nih.gov/pubmed/12668198</a></td>
<td>Systematic review</td>
<td>April 2003</td>
<td>1+ (well-conducted MA, SR, or RCTs with a low risk of bias)</td>
<td>International - all</td>
<td>Anderson et al note that the social, physical and economic characteristics of neighbourhoods are increasingly recognized as having both short- and long-term consequences for residents' physical and psychological well-being. The review notes that affordability of housing is linked to the health and well-being of individuals and families. When a market lacks a sufficient supply of affordable housing, lower income families are often forced to limit expenditures for food, medical care, and other necessities in order to pay rent. The lack of affordable housing within a community can contribute to family residential instability, as families are forced to move frequently, live with other families in overcrowded conditions, or experience periods of homelessness. The review found moderate strength evidence that the use of tenant-based rental assistance programs (which subsidize the cost of housing secured by low-income households within the private rental market through the use of vouchers or direct cash subsidies) are effective in improving household safety, on the basis of reductions in exposure to crimes against person and property and decreases in neighbourhood social disorder. The review was unable to draw conclusions with respect to effects on reducing housing hazards, youth risk behaviours, or psychological and physical morbidity. (Strength of evidence = Moderate; Topic = Social cohesion)</td>
<td>The review identified that due to a lack of relevant studies there was only very low strength evidence available on the effectiveness of mixed-income housing (publicly subsidized multifamily rental housing developments) in improving family health and safety while providing affordable housing. (Strength of evidence = Very low; Topic = Social cohesion)</td>
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## Section B: Evidence from other published literature

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<th>ID</th>
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<th>Web link</th>
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<th>Region</th>
<th>Evidence statements (note population, intervention and outcomes)</th>
<th>Implications</th>
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</thead>
<tbody>
<tr>
<td>38</td>
<td>Bond et al. Exploring the relationships between housing, neighbourhoods and mental wellbeing for residents of deprived areas. BMC Public Health 2012, 12:48</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3293078">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3293078</a></td>
<td>Controlled observational study (controlled but not randomised)</td>
<td>January 2012</td>
<td>2+ (well conducted non-RCT studies with a low bias risk and moderate probability of a causal relationship)</td>
<td>Australia</td>
<td>This study examined the associations between housing, neighbourhood and mental wellbeing after controlling for personal characteristics (age, gender, household type and economic factors) and found that the residential and environmental aspects of people’s houses and neighbourhoods were significantly associated with positive mental wellbeing. In particular, for residential aspects, perceiving the area as having a good internal reputation, being satisfied with house and landlord and feeling that both the home and neighbourhood contribute to a sense of doing well were all associated with average or higher than average levels of mental wellbeing. <strong>(Strength of evidence = Low; Topic = Mental health)</strong></td>
<td>The implication for regeneration activities undertaken to improve housing and neighbourhoods is that it is not just the delivery of improved housing that is important for mental wellbeing, but also the quality and manner of delivery.</td>
</tr>
<tr>
<td>49</td>
<td>Kalaher M, War D, Tactico T. Evaluating health impacts: Results from the neighbourhood renewal strategy in Victoria, Australia. Health Place. 2010 Sep;16(5):861-7. Epub 2010 Apr 28.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pubmed/20472489">http://www.ncbi.nlm.nih.gov/pubmed/20472489</a></td>
<td>Controlled observational study (controlled but not randomised)</td>
<td>January 2012</td>
<td>2+ (well conducted non-RCT studies with a low bias risk and moderate probability of a causal relationship)</td>
<td>Australia</td>
<td>The analysis demonstrates a Neighbourhood Renewal (NR) intervention was effective in improving health and life satisfaction among people living in NR areas, who were disadvantaged in terms of socioeconomic position, health status and life satisfaction. The study noted that a NR intervention was not effective at a wider area level because it has no health benefit for people living in NR areas which were not reached by the intervention. The intervention was less effective at reaching immigrants from non-English speaking countries, people educated below year 10 and the unemployed. <strong>(Strength of evidence = Moderate; Topic = Mental health; Social cohesion; Service access; Urban design)</strong></td>
<td>The intervention was an interagency cooperation program between local and government with 50% resident membership, whose objectives were increased community pride and participation; enhanced housing and environment; improved employment, learning and local economic activity; decreased levels of crime and improved personal safety; better health and wellbeing; and increased access to services and improved government responsiveness. Results suggest that enhanced housing delivered as part of an area-based health intervention, that includes residential involvement alongside local and government agencies, can be an effective way of reducing health inequalities.</td>
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**Evidence statements (note population, intervention and outcomes)**

- Buildings are becoming increasingly airtight in developed countries under moves designed to provide thermal comfort and to reduce energy consumption. Coupled with this are changes in the lifestyles of an aging population in the developed world, where people are spending ever greater proportions of their time indoors. There is a need to strike a balance between improving building energy efficiency and maintaining adequate ventilation for reducing concentrations of harmful air pollutants. Indoor air pollutants may relate to combustion processes, primarily particulate matter (e.g. PM10 and PM2.5), carbon monoxide (CO), oxides of nitrogen (NOx) and volatile organic compounds (VOC). Exposures may also include other indoor pollutants (such as mould, radon and chemicals from household products). **(Topic = Urban design)**

- In designing new homes, consideration should be given to balancing building thermal efficiency and the need for adequate ventilation. **(Strength of evidence = Moderate; Topic = Mental health; Social cohesion; Urban design)**

- Social housing renewal may bring positive psychosocial benefits to tenants; however such benefits may not be accompanied by significant changes in health, at least in the short term. Consequently although there are well-documented associations between poor housing and poor health, housing investment may not be a major tool for improving health and reducing health inequalities. **(Strength of evidence = Moderate; Topic = Mental health; Social cohesion; Urban design)**
### Literature Review

**Evidence statements (note population, intervention and outcomes)**

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<tr>
<td>20</td>
<td>Thomson H, Atkinson R, Petticrew M, Kearnes A. Do urban regeneration programmes improve public health and reduce health inequalities? A synthesis of the evidence from UK policy and practice (1980–2004). J Epidemiol Community Health. 2006 February; 60(2): 108–115.</td>
<td><a href="http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2357736/pdf/1018.pdf">http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2357736/pdf/1018.pdf</a></td>
<td>Grey literature</td>
<td>February 2006</td>
<td>2+ (well conducted non-RCT studies with a low bias risk and moderate probability of a causal relationship)</td>
<td>United Kingdom</td>
<td>Despite significant public investment in national urban regeneration programmes there is still little evidence to demonstrate the impacts on socioeconomic or health outcomes. The dearth of data validating links between regeneration or housing improvement within regeneration programmes and subsequent health improvement has been established in both systematic and non-systematic reviews. This report used a systematic review approach to consider data and lessons from previous policy interventions within government reports of policy evaluations. The review concluded that evaluations of national regeneration investment have rarely assessed impacts on health or impacts on the socioeconomic determinants of health, far less is reported on the social distribution of these impacts. The report notes that the lack of data on both health impacts and socioeconomic impacts may undermine the rhetoric that links such investment to health gains and reductions in health inequalities. However, the absence of impact data does not provide grounds for inaction, and it would be wrong to conclude that there is no research evidence to support hypothetic links between urban regeneration investment and health impact. For example, in the UK both the Black Report and the Acheson Report presented data from a wealth of cross sectional and longitudinal studies to establish clear links between socioeconomic circumstances and poor health. The available evidence suggests that regeneration programmes may lead to some small positive impacts on health and socioeconomic circumstances, however due to the incompleteness of research adverse impacts are also a possibility.</td>
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<td>37</td>
<td>Acheson Report presented data from a wealth of cross sectional and longitudinal studies to establish clear links between socioeconomic circumstances and poor health. The available evidence suggests that regeneration programmes may lead to some small positive impacts on health and socioeconomic circumstances, however due to the incompleteness of research adverse impacts are also a possibility.</td>
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<td>76</td>
<td>Despite significant public investment in national urban regeneration programmes there is still little evidence to demonstrate the impacts on socioeconomic or health outcomes. The dearth of data validating links between regeneration or housing improvement within regeneration programmes and subsequent health improvement has been established in both systematic and non-systematic reviews. This report used a systematic review approach to consider data and lessons from previous policy interventions within government reports of policy evaluations. The review concluded that evaluations of national regeneration investment have rarely assessed impacts on health or impacts on the socioeconomic determinants of health, far less is reported on the social distribution of these impacts. The report notes that the lack of data on both health impacts and socioeconomic impacts may undermine the rhetoric that links such investment to health gains and reductions in health inequalities. However, the absence of impact data does not provide grounds for inaction, and it would be wrong to conclude that there is no research evidence to support hypothetic links between urban regeneration investment and health impact. For example, in the UK both the Black Report and the Acheson Report presented data from a wealth of cross sectional and longitudinal studies to establish clear links between socioeconomic circumstances and poor health. The available evidence suggests that regeneration programmes may lead to some small positive impacts on health and socioeconomic circumstances, however due to the incompleteness of research adverse impacts are also a possibility.</td>
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Indoor air quality, including: house dust mite and allergens; and dampness and hygrothermal conditions. See more recent
This guide may be a useful companion in undertaking the Villawood HIA.
There is moderate evidence that increased rents lead to reduced income, which may result in an inability to buy an
Relocation to a new area may provide a different social environment, as well as educational and employment
This 2009 article appears to have been written as a chapter (68) in Braubach et al.
What explanations might there be for displacement?
Was there sufficient consultation about the housing improvements?
What are the specific housing changes/improvements that are proposed?
Is there any other change that may affect living costs— transport, food, access to amenities?
Area effects. Socioeconomic characteristics of a neighbourhood may have an effect on a person's health status. The review
Thomson H, Petticrew M, Douglass M. Health impact assessment of housing improvements: incorporating research evidence. J
Grey literature
There is conflicting evidence regarding the effect of housing improvement on respiratory symptoms, however improved
What levels of displacement can be predicted over the period of improvement?
What implications might there be for displacement?
Thomson et al. recommended that housing HIA's include the following questions:
• What are the specific housing changes/improvements that are proposed?
• Are there other housing changes not detailed in the proposals that may occur?
• What is the evidence that these changes will affect health and any specific symptoms?
• Are there vulnerable groups (for example, elderly, asthmatic people) who may benefit particularly from the proposed changes?
• When can health gains be realistically expected?
• Will the improvement be too marginal to detect?
• Are there going to be any changes in housing costs?
• Is there any other change that may affect living costs— transport, food, access to amenities?
• Was there sufficient consultation about the housing improvements?
Further research into the health impacts of housing interventions.

| Citation | Thomson H, Petticrew M, Douglass M. Health impact assessment of housing improvements: incorporating research evidence. J Epidemiological Community Health. 2003 Jan;57(1):11-6 |
| Web link | http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1732281/pdf/v057p00011.pdf |
| Type of evidence | Grey literature |
| Publication Date | January 2003 |
| Quality of study | 2+ (well conducted non RCT studies with a low bias risk and moderate probability of a causal relationship) |

**Evidence statements (note population, intervention and outcomes)**

In an evidence summary28 based on an earlier review27 Thomson et al synthesised findings indicating the expected health effects of specific housing improvements. The authors also reviewed observational data of housing associated health risks to highlight the key impacts to consider when doing a housing HIA. The evidence summary notes that although the systematic review on which it is based found some health gains associated with housing interventions, the evidence was generally weak. The authors explain that the evidence summary was produced in response to consultation with policymakers and HIA practitioners to find a way in which the available research could be used to inform HIA. Note:
- The 2009 review by Thomson27 updates information provided in the 2001 review (hence the 2001 review is not included separately).
- This 2009 article appears to have been written as a chapter (68) in Braubach et al.28

The findings of this evidence summary are collectively considered 'low' strength evidence, consistent with the 2001 systematic review that underpins them. However several of the topics have since been covered in more recent systematic reviews (e.g. warmth and mould) where stronger evidence is presented. The review identifies that the main housing factors that have been associated with health variation and targeted as part of common housing improvements are:

- Indoor air quality, including: house dust mite and allergens; and dampness and hygrothermal conditions. See more recent reviews.1123
- Temperature and warmth. See more recent reviews.12
- Home ownership. Generally home ownership is associated with improved health. However the trend does not hold for those people who are living on the margins of home ownership where mortgage arrears increase insecurity and are detrimental to mental health.
- House type and design, for example, flat or house. Causal relationships are not possible to rule out due to limited evidence. However there are associations between flat dwelling and stressful living conditions such as increased social isolation, crime, reduced privacy and reduced opportunities for safe play for children.

**Implications**

- Thomson et al. recommended that housing HIA's include the following questions:
- What are the specific housing changes/improvements that are proposed?
- Are there other housing changes not detailed in the proposals that may occur?
- What is the evidence that these changes will affect health and any specific symptoms?
- Are there vulnerable groups (for example, elderly, asthmatic people) who may benefit particularly from the proposed changes?
- When can health gains be realistically expected?
- Will the improvement be too marginal to detect?
- Are there going to be any changes in housing costs?
- Is there any other change that may affect living costs— transport, food, access to amenities?
- Was there sufficient consultation about the housing improvements?

Further research into the health impacts of housing interventions.

Literature Review

**Evidence statements (note population, intervention and outcomes)**

The guide includes a literature review of all studies which have monitored health change following housing improvement between 1930 and 2000. The review notes the following potential health effects associated with housing:

- Indoor air quality is influenced by many factors and can impact on health. Elderly and people with asthma especially at risk.
- Dampness & hygrothermal growth can result in small increased risk of respiratory symptoms.
- Interventions targeting house dust mite & allergies exposure do not improve health or reduce asthma symptoms.
- The elderly are at increased risk from cold weather. Measures to improve protection from the cold in this group may have positive health impact in this group.
- Home ownership is associated with improved health; however, negative health impacts are associated with mortgage arrears and insecure home ownership.
- Living in a flat (as opposed to a house) is associated with poor mental health and other adverse conditions which may impact on health.

- Relocation to a new area may provide a different social environment, as well as educational and employment opportunities. There may also be positive changes to the economic and social environment as a result of influx which may have health benefits.
- Housing costs such as increased rents may affect people's ability to buy an adequate diet, and may create a benefit trap limiting employment opportunities.
- Moving & relocation can lead to: loss of social networks; stress; and uncertainty and lack of control over changes and living circumstances.

Original residents may be displaced and not benefit from the housing improvement.

- Residents in neighbouring areas not part of a regeneration program may feel excluded. This may result in community divisions between improved and non-improved areas.

This guide may be a useful companion in undertaking the Villawood HIA.

**Implications**

This guide may be a useful companion in undertaking the Villawood HIA.
### Evidence statements (note population, intervention and outcomes)

<table>
<thead>
<tr>
<th>Citation</th>
<th>Giles-Corti B, Ryan K, Foster S, 2012, Increasing density in Australia: maximising the health benefits and minimising the harm, report to the National Heart Foundation of Australia, Melbourne.</th>
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<tr>
<td>Web link</td>
<td><a href="http://www.heartfoundation.org.au/density">www.heartfoundation.org.au/density</a></td>
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<tr>
<td>Type of evidence</td>
<td>Grey literature</td>
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<tr>
<td>Publication Date</td>
<td>March 2012</td>
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<tr>
<td>Quality of study</td>
<td>2+ (High quality SR of non RCT studies; or high quality non RCT studies with a very low bias risk and high probability of a causal relationship)</td>
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Building and environmental factors can be manipulated to mitigate the effects of exposure to environmental stressors:
- number of rooms and household density;
- maintenance, upkeep and pest control, location (including presence of trees);
- design (balconies, cross ventilation); and
- proximity to high traffic roads and location in relation to prevailing winds.

It is the location, design, construction and quality of housing which influence mental health rather than housing density in and of itself.

Housing density may have direct effects on mental health: eg environmental stressors such as crowding, noise, indoor air quality and light. Housing density may have indirect effects: eg other factors that affect daily living and social interactions between residents.

The impact of higher density housing on mental health may relate to:
- the social environment (who else lives in the housing and their SES);
- the floor on which residents live (indicative evidence that higher floors lead to adverse effects especially for stay-at-home women with children); and
- levels of interaction and social support.

Crime and fear of crime: higher density housing with higher population levels can increase the incidence of crime and disorder simply because there are more people in the area. Internal and external environments can be designed to help reduce crime and fear of crime.

Giles-Corti et al report some overlapping findings for children and young people and housing density including:
- behavioural problems – British and Austrian studies showing higher rates of behavioural problems for children in centrally located high-rise in multiple dwelling units;
- overweight and obesity - few studies have examined this issue. The authors cite a Cyprus study of children aged 9-13 which found that girls in highly urbanised areas were 4 times as likely to be overweight as girls in less urbanised areas. The authors note the complexity of the issue and relate findings to parenting styles and opportunities for independent mobility;
- independent mobility – mixed use and dense environments may work well for adults but they can restrict opportunities for active play and independent mobility;
- risk of pedestrian injury – a major influencing limiting factor for children’s mobility;
- physical activity – improve walkability of neighbourhoods;
- active play – ensure that public open space is accessible and that it is considered safe by parents;
- child density – co-locate families to provide opportunities for interaction; and
- involving young people in decision making.

### Implications

(Strength of evidence = N/A; Topic = Mental health; Urban design)
Six dimensions of exclusion:
- neighbourhood;
- social and civic engagement;
- access;
- crime and security;
- community identity; and
- economic characteristics

The division of social exclusion based on tenure characteristics alone is questioned. Rather, it is the experience of public housing residents of multiple dimensions of exclusion which is the most significant tenure based difference.

It is in relation to the incidence of exclusion through access to services (locational disadvantage) and economic capacity (poverty) that the divergences between locations of public housing and private housing neighbourhoods emerge most strongly.

Social exclusion is not the product of agency characteristics of local residents. The authors argue that exclusion through access and economic capacity for public housing tenants represents the structural outcomes of Australian public housing and planning policy. The accessibility of public housing estates in the western Sydney context is driven largely through historical land purchase and the development policies of social housing providers in the 1960s and 1970s. While fringe residential development was rapid, the majority of these locations were developed in the absence of coherent and funded infrastructure provision plans or local economic opportunities. It is these historical factors which play a significant role in present day exclusion of public housing residents in areas such as Shalvey and Villawood.

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<td>- neighbourhood;</td>
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The incidence of multiple social exclusion differentiates the experience of social exclusion in areas of public housing. Policy prescriptions to address exclusion (in these areas in western Sydney) need to address the compounding difficulties that poor accessibility and high levels of income poverty generate for these communities.

The concept of social cohesion is a difficult concept to grasp with, not least because of its numerous dimensions and utilisation by policy makers in a variety of ways that are often ill defined (70, p458). Social cohesion is not a new concept but it emerges at different times in response to widespread societal upheaval and change.

There seems little evidence to support the expectations of policy makers that balanced social mix builds social cohesion. This contention appears refutable on the basis of reviews of both quantitative and qualitative research findings, at least from Australian, English and Dutch studies.

Length of residence in the neighbourhood is an important factor as time is needed for building trust and relationships. Social capital tends to develop over time in response to stability of residency and opportunities for social interaction, which in turn helps to establish the bonding and bridging networks that build trust and participation within neighbourhoods.12

Spatial scale is also an important factor in facilitating cross-tenure social interaction as it enlarges or decreases opportunities for contacts to occur. However, scale increases the risk of negative interactions as socially engineering too fine-grained social mix may enhance opportunities for conflict to occur rather than leading to the envisaged social cohesion, especially where differences in socioeconomic characteristics between residents are considerable. In some mixed-tenure neighbourhoods, owners and renters expressed the view that they did not mind living near each other but resistance increased exponentially as spatial proximity between residents of different housing tenures increased.

Some studies have found that school aid with social cohesion as children develop friendships with other local children. Other studies have not found this effect so Arthurson suggests that the quality of the school is important: good quality schools with a socioeconomic mix of students may have an important role to play in the development of neighbourhood social cohesion. NB: residents often talked about social mix in terms of the age of neighbourhood residents. Specifically they expressed the view that the presence of children was conducive to enhancing social cohesion particularly through interactions at local schools. The elderly and longer term residents as well were identified as more stable groups of residents that generated a sense of community and neighbourliness. These aspects of social mix have received only limited attention in the wider debates about social mix.

A number of studies conclude that attempts to facilitate social mix through building socially diverse housing often have to deal with owner-occupier perceptions that poorer households are inherently bad neighbours. Owners are associated with an enhanced area reputation but in turn they are more likely to identify problems, such as inappropriate social behaviour, as due to public housing tenants. This is not surprising given that individuals entering public housing are increasingly high need and complex tenants that without proper support and service provision can provide challenges for their neighbours.

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The incidence of multiple social exclusion differentiates the experience of social exclusion in areas of public housing. Policy prescriptions to address exclusion (in these areas in western Sydney) need to address the compounding difficulties that poor accessibility and high levels of income poverty generate for these communities.

The concept of social cohesion is a difficult concept to grasp with, not least because of its numerous dimensions and utilisation by policy makers in a variety of ways that are often ill defined (70, p458). Social cohesion is not a new concept but it emerges at different times in response to widespread societal upheaval and change.

There seems little evidence to support the expectations of policy makers that balanced social mix builds social cohesion. This contention appears refutable on the basis of reviews of both quantitative and qualitative research findings, at least from Australian, English and Dutch studies.

Length of residence in the neighbourhood is an important factor as time is needed for building trust and relationships. Social capital tends to develop over time in response to stability of residency and opportunities for social interaction, which in turn helps to establish the bonding and bridging networks that build trust and participation within neighbourhoods.12

Spatial scale is also an important factor in facilitating cross-tenure social interaction as it enlarges or decreases opportunities for contacts to occur. However, scale increases the risk of negative interactions as socially engineering too fine-grained social mix may enhance opportunities for conflict to occur rather than leading to the envisaged social cohesion, especially where differences in socioeconomic characteristics between residents are considerable. In some mixed-tenure neighbourhoods, owners and renters expressed the view that they did not mind living near each other but resistance increased exponentially as spatial proximity between residents of different housing tenures increased.

Some studies have found that school aid with social cohesion as children develop friendships with other local children. Other studies have not found this effect so Arthurson suggests that the quality of the school is important: good quality schools with a socioeconomic mix of students may have an important role to play in the development of neighbourhood social cohesion. NB: residents often talked about social mix in terms of the age of neighbourhood residents. Specifically they expressed the view that the presence of children was conducive to enhancing social cohesion particularly through interactions at local schools. The elderly and longer term residents as well were identified as more stable groups of residents that generated a sense of community and neighbourliness. These aspects of social mix have received only limited attention in the wider debates about social mix.

A number of studies conclude that attempts to facilitate social mix through building socially diverse housing often have to deal with owner-occupier perceptions that poorer households are inherently bad neighbours. Owners are associated with an enhanced area reputation but in turn they are more likely to identify problems, such as inappropriate social behaviour, as due to public housing tenants. This is not surprising given that individuals entering public housing are increasingly high need and complex tenants that without proper support and service provision can provide challenges for their neighbours.

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The division of social exclusion based on tenure characteristics alone is questioned. Rather, it is the experience of public housing residents of multiple dimensions of exclusion which is the most significant tenure based difference.

It is in relation to the incidence of exclusion through access to services (locational disadvantage) and economic capacity (poverty) that the divergences between locations of public housing and private housing neighbourhoods emerge most strongly.

Social exclusion is not the product of agency characteristics of local residents. The authors argue that exclusion through access and economic capacity for public housing tenants represents the structural outcomes of Australian public housing and planning policy. The accessibility of public housing estates in the western Sydney context is driven largely through historical land purchase and the development policies of social housing providers in the 1960s and 1970s. While fringe residential development was rapid, the majority of these locations were developed in the absence of coherent and funded infrastructure provision plans or local economic opportunities. It is these historical factors which play a significant role in present day exclusion of public housing residents in areas such as Shalvey and Villawood.

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The incidence of multiple social exclusion differentiates the experience of social exclusion in areas of public housing. Policy prescriptions to address exclusion (in these areas in western Sydney) need to address the compounding difficulties that poor accessibility and high levels of income poverty generate for these communities.
Social capital must be understood as the combination of both cognitive and structural elements which reinforce each other to generate the stream of outcomes that has been associated with the concept. This means that the structures of social capital (social networks) must not be dissociated from the cognitive elements (trust, attitudes, etc) which are more commonly measured by surveys.

A multi-level approach to social capital measurement enables the distinction between the effects of context and those of social capital itself. The growing literature on this topic suggests an important distinction between two types of social capital: bonding and bridging. Bonding social capital refers to the relations within homogeneous groups. These are the strong ties that connect family members, neighbours, and close friends and colleagues. Bonding relationships act as the primary means for the transfer of social norms to family members and friends. Bonding social capital is important for establishing and maintaining norms that define appropriate social behaviour, generating mutual aid, and protecting the vulnerable.

By contrast, bridging social capital looks at heterogeneous relations, ones that exist between groups; these are the weak ties, including formal or informal social interactions that link people and communities of different ethnic, occupational and socio-economic backgrounds. On a macro level, bridging social capital is important for civil society. It is also recognised as an important source of benefits for individuals and communities. It provides opportunities to integrate with wider society through participation in heterogeneous groups of people from diverse social classes, and it opens channels to voice concern in favour of those who may have very little opportunity to reach more formal avenues in order to affect changes in society, for example, to instigate changes in public welfare-oriented policies.

Implications

A multi-level approach to social capital measurement enables the distinction between the effects of context and those of social capital.

Evidence statements (note population, intervention and outcomes)

- Social exclusion suggests a boundary, and focuses attention on those outside it rather than on the features of society which systematically generate widespread poverty and disadvantage. Three discourses within which social exclusion is framed: 1. a redistributionist discourse (RED) developed in British Critical social policy, whose prime concern is poverty; 2. a moral underclass discourse (MUD) which centres on the moral and behavioural delineity of the excluded themselves; and 3. a social integrationist discourse (SID) whose central focus is on paid work. MUD is the most closely associated with neoliberal ideology in that it locates the source and the remedy for exclusion primarily in the behaviour and choices of the “excluded” themselves, and de-emphasizes the role and responsibility of state agencies. MUD is also the discourse of exclusion which most easily integrates with and suggests a policy focus on place insofar as it suggests that a significant contributor to exclusion and to poverty is a set of learned and shared values and related behaviours which stand in contrast to the values of mainstream (working and home-owning) society.

- Public housing redevelopment projects which claim to use mixed income as a means of addressing poverty are explicitly associated with a focus on geographic concentration and tenure.

- Social cohesion is an important source of benefits for individuals and communities. It provides opportunities to integrate with wider society through participation in heterogeneous groups of people from diverse social classes, and it opens channels to voice concern in favour of those who may have very little opportunity to reach more formal avenues in order to affect changes in society, for example, to instigate changes in public welfare-oriented policies.

Implications

Research on housing estates should employ smaller geographic areas than whole estates as their units of analysis.
Large scale community redevelopment including master planning

Development description

Redevelopment of Marsh Farm Estate, Luton, UK, a deprived area with a mixture of private and public sector housing,iming to create a planned, environmentally sustainable social capital and community cohesion, by implementing the Community and Supportive Services (CSS) beyond the life of the redevelopment project.

For new residents: Over the medium term (demolition/construction and early operation phase): provision of new homes; the ability to have children and young people or have strong meanings for existing local children as focal points; change in play areas and green-space; and new amenities/facilities.

For older/lower income families: Over the long term (operation phase): health and wellbeing impacts were viewed as likely to continue to be positive: (Actions or mitigations taken: Improved: green space and play areas; and new amenities/facilities.)

For displaced residents who must relocate outside of their neighbourhoods may lose valuable supportive family and community relationships. Strong social networks and relationships have been found to be protective health factors. Research has shown that public housing residents, particularly those that have lived longest in public housing, have strong bonds with people and places, and that their social capital is spatially specific. (Actions or mitigations taken: Although implementation is unknown, the HIA recommended: neighbourhoods to develop new initiatives that encourage social networks, such as community centres or programmes aimed at specific groups; or other vulnerable groups, those who experienced disruptions; those from equalities/vulnerable groups; and other estate residents. Equalities/vulnerable group categories included: gender [men, women, trans-gender]; children and young people; disability [physical, sensory, learning; mental health]; faith [and are not Muslim, Jewish or Sikh]; and unemployment [and are not unemployed due to caring for children].

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Health effects that directly link to housing (non-populations)

The retrospective HIA considered how redevelopment of public and affordable housing had either positively or negatively impacted the health of the population. The HIA examined housing opportunities and challenges for Environmental and Urban Development Initiative. HOPE VI aimed to fundamentally transform public housing by both physically revitalizing properties and also changing the character of low-income housing communities. The HIA analysis consisted of a review of the literature on variables that influence health and a review of an example HOPE VI project in Orlando with key individuals in the redevelopment process, and mapping neighbourhood-level data for the two housing sites.

Materials and methods: Use of lead based paints homes has been associated with lead exposures, which affects neurodevelopment in children. Lead exposure can result in muscular weakness, mental retardation, and increased incidence for cancerogenesis. Xenobiotic vicinal diolylyisocyanates (VDICs) are chemicals that are released as gases from many household items, including paints, varnishes, particle board and adhesive.

Outcomes or mitigations taken: Although implementation is unknown, the HIA recommended: building materials that are low-VOC materials.

Planning and design tools: The planning and design tools can help improve health outcomes for residents in public housing developments. The HIA noted with respect to mitigation to reduce fear of crime that public housing redevelopment has the ability to mitigate some of the risk factors associated with violence; however it is clear that a one-time investment in redevelopment is not sufficient to keep levels of violence down. The HIA also recommended that housing authorities consider taking step to provide low income areas to keep low risk areas. In addition, risk factors should be kept to a minimum in order to enhance the safety and security. The HIA noted that the success of a facility depends on the community that is looking to expand opportunities for public housing projects. The HIA also noted that housing authorities should consider releasing their HIA report to the public, and that the report would be helpful in the decision making process for future housing projects.

Children living in distressed public housing are vulnerable populations. Health status later in life can be predicted by trajectories that are initiated in early life. Such trajectories can either enhance health or increase vulnerability and are influenced by social contexts. Public housing redevelopment has the potential to create physical spaces and new social spaces in which youth can develop social and emotional skills. Youth development is influenced by consideration of play areas, mixed land use, and environmental conditions that promote active modes of transportation. The promotion of play areas may also occur with fewer fast food and more supermarket groceries stores onsite in the neighbourhood. On the other hand, the HIA noted that public housing restructuring efforts may serve as a physical focal point for youth’s skills and education (e.g., leadership training, library, access to Internet, and music, dance, and computer classes, etc.). Having dedicated space and access to safe and supportive community centres and adults can help students develop confidence and increased academic development, which has lasting health impacts, such as economic status in adulthood. (Actions or mitigations taken: Although implementation is unknown, the HIA recommended: neighbourhoods to develop new initiatives that encourage social networks, such as community centres or programmes aimed at specific groups; or other vulnerable groups, those who experienced disruptions; those from equalities/vulnerable groups; and other estate residents. Equalities/vulnerable group categories included: gender [men, women, trans-gender]; children and young people; disability [physical, sensory, learning; mental health]; faith [and are not Muslim, Jewish or Sikh]; and unemployment [and are not unemployed due to caring for children].)

Some groups (e.g. the disabled, elderly, BME) can be particularly vulnerable to negative impacts. Potential extra household costs arising from relocation or improved housing can have negative health impacts.

Regeneration of an estate in the London Borough of Ealing, built 1949 – 1970, covering 25 hectares of land, providing 1,800 dwellings and home to a population of approximately 5,000 people. The Regeneration Project aims to transform the estate into a thriving mixed tenure sustainable neighbourhood. The current phase of regeneration focuses on the decantment of residents from 127 homes and the allocation of new homes to those which are secure tenants. The impact assessment focuses on mental health outcomes and uses a workshop approach.

Decanting may be a disruptive and stressful process that breaks up social networks particularly for vulnerable inmorable elderly people.

Families need additional support owing to stress of decantment process, which may affect a change in schools.

May be difficult for adolescents to re-establish themselves in a new community resulting in a break up of social networks and friendships.

Refugees and migrants may face barriers to accessing services (language), may have less understanding of what is happening, may have less opportunity to participate; and may not have secure tenure.

As the regeneration moves forward, some areas will deteriorate before they are improved. This report suggests making arrangements to temporarily light those areas so people feel safe walking through them.

It was noted that those most affected by the regeneration were those least likely to come to the regeneration office. A suggestion that targeted outreach could be undertaken to ensure those who are most at risk had a better understanding of what was happening.

It was seen as important to highlight the support networks available to those moving away as well as those who would remain. The regeneration team should make use of existing communications mechanisms (e.g. notice boards both in existing and new builds, local groups).

Provide a means for residents to identify their home as it is being built will assist with creating a sense of identity and attachment in the early phases. Provide practical support for residents e.g. crèche facilities available when people are moving out.

The regeneration team may consider establishing a ‘buddy’ scheme whereby existing tenants can volunteer to mentor new tenants and support them through the process of moving into a new home/community.

The HIA identified concern that the development had inadequate provision of green space & play opportunities. Play develops children’s wellbeing and accessible green space benefits health for all.

The HIA identifed that there had previously been difficulties when the 'development team' liaised with 'community services' regarding the decanting of some residents. This can cause reduce wellbeing and reduced access to services that improve health outcomes.

The HIA recommended to increase the provision of green space, especially public green space and play-friendly space.

The HIA identified that the new development would have inadequate housing provision for disabled people. Such lack of provision was linked to reduced wellbeing outcomes for people with disabilities who are unable to be housed within the community.

The HIA recommended that the relevant 'experts' including residents reassess the current and future needs for housing available for disabled people and that the regeneration team attend a workshop aimed at identifying various stages of support required.

The HIA recommended that the development should make use of existing communications mechanisms (e.g. notice boards both in existing and new builds, local groups). The HIA raised concerns that there was insufficient emphasis being placed on the housing needs of young people, who may benefit from higher levels of support. The HIA noted that community cohesion is harmed if youth needs are not met.

The HIA recommended that new development should be as quick & efficient as possible. Experts and residents should consider ways to improve the efficiency of the decanting process.

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Affordable housing can decrease the value of adjacent properties. Pepper-potting tenancies can make marketing the homes more complicated. If high levels of affordable housing, which are not available for ownership, generate higher levels of turnover, then the development may not be financially viable. This commitment that affordable housing would be subject to the same design and environmental standards as private housing is beneficial to psychological and physical health. Viewing green space including sports facilities and formal and informal public areas can help reduce anxiety and promote a culture of health.

The lack of social cohesion in high-rise living conditions can decrease social cohesion and lead to lower levels of community oversight and investment by public housing residents. In particular, fear of crime leaves elderly people isolated and vulnerable. Strategies that are designed to mitigate crime, such as the use of physical barriers and imposition of negative freedoms, can also negatively impact by reducing access, visibility and promulgating a culture of fear.

Housing and the built environment

The HIA identifies the following potential health risks linked to the housing and the built environment:

1. Affordability: Having access to good-quality and affordable housing is a basic human right. Affordable housing can reduce stress and improve health outcomes. In particular, this commitment that affordable housing would be subject to the same design and environmental standards as private housing is beneficial to psychological and physical health.

2. The need for mixed communities: Mixed communities are classed as those possessing mixed land use, high density, street connectivity, and safety. This is important for children and disabled people, people from minority ethnic groups, older people and people with low socio-economic status.

3. Environmental factors such as the distance between houses, access to facilities such as parks, the density of the child population, accessibility of facilities, opportunities for activity, and aesthetic qualities of the area.

4. Health effects that directly link to housing (not populations)

The HIA identifies the following potential health risks linked to housing and the built environment:

1. Housing can decrease social cohesion and lead to lower levels of community oversight and investment by public housing residents. In particular, fear of crime leaves elderly people isolated and vulnerable. Strategies that are designed to mitigate crime, such as the use of physical barriers and imposition of negative freedoms, can also negatively impact by reducing access, visibility and promulgating a culture of fear.

2. Pollution can affect health by reducing access, visibility and promulgating a culture of fear. In particular, fear of crime leaves elderly people isolated and vulnerable. Strategies that are designed to mitigate crime, such as the use of physical barriers and imposition of negative freedoms, can also negatively impact by reducing access, visibility and promulgating a culture of fear.

3. Characteristics of walkable neighbourhoods were classed as those possessing mixed land use, high density, street connectivity, and safety. This is important for children and disabled people, people from minority ethnic groups, older people and people with low socio-economic status.

4. Social cohesion is a key factor in a successful public art strategy- enhancing the sense of ownership of the public realm.

5. Public transport can have a positive impact on health by improving access to services, reducing stress and improving physical activity.

6. The need for mixed communities is particularly important for older people who may otherwise become socially isolated.

The HIA identifies the following potential health risks linked to the construction works and traffic:

1. Air pollution; noise; dust; injury as a result of road traffic accidents involving construction vehicles; and hazards from contaminated land.

2. Access to facilities such as parks, the density of the child population, accessibility of facilities, opportunities for activity, and aesthetic qualities of the area.

3. Environmental factors such as the distance between houses, access to facilities such as parks, the density of the child population, accessibility of facilities, opportunities for activity, and aesthetic qualities of the area.

4. Health effects that directly link to traffic (not populations)

The HIA identifies the following potential health risks linked to traffic and the built environment:

1. Health effects that directly link to traffic (not populations)

Public transport can have a positive impact on health by improving access to services, reducing stress and improving physical activity.

The need for mixed communities is particularly important for older people who may otherwise become socially isolated.

The HIA identifies the following potential health risks linked to the development:

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2. Social cohesion is a key factor in a successful public art strategy- enhancing the sense of ownership of the public realm.

3. The need for mixed communities is particularly important for older people who may otherwise become socially isolated.
Outreach workers should be involved in any decant. Any decant should include a comprehensive information pack that includes assistance and advice on change of address.

A communications strategy should be developed to publish the results of the HIA. Demolition and redevelopment of a housing estate, of 79 dwellings, in the Brandywell ward in Derry, Northern Ireland. December 2008

Asbestos surveys and removal should take place under health and safety regulation.

Traffic calming, signage and pedestrian areas should be designed into the new scheme (including a ‘welcome’ sign); consider traffic stops.) or mitigations taken: Expand transit stops into more areas where low income residents are concentrated. Locate elderly housing is in close proximity to bus stops. Motor vehicles are the leading cause of accidental death, and the number and severity of injuries increase as speed increases.

Although a ‘destination’ based community is desirable, there are inherent conflicts between the anticipated amount of traffic and the plan for a mixed use walkable / bikeable community. Residents, pedestrians or bicyclists may experience an increased risk of automobile related injury and adverse health outcomes related to air and noise pollution. (Actions or mitigations taken: Develop a complete street network that accommodate multiple modes of transportation and simulates a grid pattern. [Block sizes in the range of 200-800 feet and maximum distances to the disparate health outcomes between upper and lower income groups. Neighbourhoods that are dominated by fast food chains, gas stations, or convenience stores, or that lack good public transportation and mixed use nodes away from major roads. Consider ways to reduce traffic volume and speed including use of traffic calming measures.)

The health benefits of increased physical activity through walking are well established in the literature, and are extremely important to the disparate health outcomes between upper and lower income groups. Neighbourhoods that are dominated by fast food chains, gas stations, or convenience stores, or that lack good public transportation and mixed use nodes away from major roads. Consider ways to reduce traffic volume and speed including use of traffic calming measures.)

Vehicle traffic is the major source of air pollution in urban environments. (Actions or mitigations taken: Create pedestrian, bicyclist and children’s safety corridors that accommodate the changing needs of families including children. This should be reflected in bedroom sizes which accommodate the study needs of school children and students. Determine the number of flats.

The new layout of dwellings should complement the layout of any retained areas or dwellings.

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<td>Date</td>
<td>October 2008</td>
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<td>Scale of development</td>
<td>Strategic level policy HIA (Sheffield's Housing Strategy)</td>
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<td>Region</td>
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<tr>
<td>Development description</td>
<td>Review of potential health impacts and strategic interventions for housing policy.</td>
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<tr>
<td>Health effects that directly link to housing (note: populations)</td>
<td>For the majority of residents the housing market provides a secure home, conferring the psychosocial benefits of mental health and well-being. For a minority of residents, stress arising from the financial insecurity of their home leads to depression and anxiety. (Actions or mitigations taken: Access: Maintain and replenish a strong social housing sector to enhance the financial security and mental health of lower income residents. Affordability: Short-term focus on measures to alleviate financial stress in the private housing market and maximize gains in mental health.)</td>
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<td>Date</td>
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<td>Scale of development</td>
<td>Large scale community development on previously industrial land.</td>
</tr>
<tr>
<td>Region</td>
<td>North America</td>
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<tr>
<td>Development description</td>
<td>A proposed 11.6 acre development providing more than 450 units of affordable housing along with retail and multipurpose space for community activities. The four-block area, located in South Los Angeles, is currently being rezoned from industrial to residential.</td>
</tr>
<tr>
<td>Health effects that directly link to housing (note: populations)</td>
<td>A warm, safe and secure home contributes to residents’ health and well-being. Cohesive communities and good quality housing environments contribute to successful neighbourhood health and wellbeing. (Actions or mitigations taken: Independence: Expand the Joint Strategic Needs Assessment to include a cost-benefit analysis of housing’s contribution to adding quality of life to years lived. Inclusion: Provide evidence of health gain from securing a home for vulnerable and excluded people.)</td>
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<tr>
<td>Citation</td>
<td>San Francisco Housing Authority Flooring Policy. San Francisco Department of Public Health. 2009.</td>
</tr>
<tr>
<td>Type of HIA</td>
<td>Health Impact Assessment - other</td>
</tr>
<tr>
<td>Date</td>
<td>October 2009</td>
</tr>
<tr>
<td>Scale of development</td>
<td>Health Impact Assessment case study illustrating the use of impact assessment in a community setting.</td>
</tr>
<tr>
<td>Region</td>
<td>North America</td>
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<tr>
<td>Development description</td>
<td>HA of housing flooring policy for new developments in San Francisco, USA.</td>
</tr>
<tr>
<td>Health effects that directly link to housing (note: populations)</td>
<td>The dust mite is a common allergen and an asthma trigger. Carpeting and other fabric-covered furniture serve as nesting environments for dust mites in the home. This research has indicated the removal of carpeting along with other physical remediation efforts have an effect on the dust mite allergen levels. Although rigorous daily vacuuming can reduce the level of dust mite allergens, most health experts recommend smooth flooring as a substitute for carpeting. For many families in San Francisco, obtaining smooth flooring can be a challenge because most of them are renters, who have minimal control over the flooring in their units. Families with asthma who live in public housing have limited financial resources and often become victims of a shortage of affordable housing. Furthermore, these families often are not given sufficient information and resources to create healthier environments. (Actions or mitigations taken: A reasonable proportion of the new units in each complex of the development will be built without carpeting. Increase awareness of the option for removing carpeting in existing units.)</td>
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<td>Date</td>
<td>August 2009</td>
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<tr>
<td>Scale of development</td>
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</tr>
<tr>
<td>Development description</td>
<td>Residential density impacts access to goods and services, success of neighbourhood retail, walkability, success of public transit, amount and access to parks and open space and other factors that impact health. High density housing serves these health-related needs best. The compact nature of higher-density development requires less extensive infrastructure to support it, making delivery of basic services like mail, trash collection, and police and fire protection more efficient. With more people and activity within the same amount of space, communities with higher-density development have also been found to have greater safety. (Actions or mitigations taken: Although actions taken are not reported, the HIA makes the following recommendations: Prioritize developing housing units that can be offered at an affordable rate for local community residents most in need of housing. The range of affordable housing costs should be rearticulated to reflect rates that allow local residents to pay no more than 30% of their income on rent or mortgages. The size and number of bedrooms in housing units being built should reflect the range of family size in the local population. Specifically target housing opportunities at teachers and/or local school employees in order to focus on the link between the project site and neighbourhood schools. Ensure that buildings facing the park and recreation space have windows open to these areas in order to increase community surveillance.)</td>
</tr>
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<td>Health effects that directly link to housing (note: populations)</td>
<td>Negative health implications have also been associated with urban sprawl. Research has found that people living in countries with sprawling development are less likely to walk, and more likely to weigh more and to suffer from high blood pressure than those living in less sprawling counties. Increased rents or mortgage costs can also precipitate eviction and displacement, conditions that can lead to overcrowding, segregation and even homelessness. Displacement is a stressful life event and relocation can have significant impacts on health and childhood development. Segregated neighbourhoods have fewer institutional assets such as schools, libraries, and public transportation, and are often the site for the location of environmentally burdensome infrastructure such as highways, power plants, factories and waste sites, which compromise air, noise, water, and soil quality. Residually segregated neighbourhoods have been found to experience more violent crime, and more infectious and chronic diseases. Research has shown that reducing income-related residential segregation improves household safety, reduced exposure to crime, and decreased neighbourhood social disorder. Unstandard and deteriorating housing contributes to a variety of ailments, from respiratory disease and neurological disorders to psychological and behavioural dysfunction. At the community level, deterioration of housing stock results in ‘housing fanning’, or the trend of those with lower levels of income to move into a neighbourhood over time, which results in progressively poorer housing maintenance and quality. In addition to housing, the HIA also addresses issues of: pedestrian safety, neighbourhood walkability and public transit; health services and food retail; education; and parks and recreational facilities.</td>
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<td>Health effects that directly link to housing (note: populations)</td>
<td>For the majority of residents the housing market provides a secure home, conferring the psychosocial benefits of mental health and well-being. For a minority of residents, stress arising from the financial insecurity of their home leads to depression and anxiety. (Actions or mitigations taken: Access: Maintain and replenish a strong social housing sector to enhance the financial security and mental health of lower income residents. Affordability: Short-term focus on measures to alleviate financial stress in the private housing market and maximize gains in mental health.)</td>
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Appendix B: Conceptual models

Figure 1 Model of housing, housing change and health

Source: Curtis S et al\(^{29,33}\), which was adapted from Dunn and Hayes\(^{27,565}\).

Figure 2 Model of higher density housing and health

Source: Giles-Corti et al\(^{9}\).
There is limited causal evidence that particular types of housing give rise to mental health problems, however living in multiple family housing or on the upper floors of high-rise buildings is associated with greater mental health problems.\(^{24,25}\)

There are associations between flat dwelling and stressful living conditions such as increased social isolation, crime, reduced privacy and reduced opportunities for safe play for children.\(^{14,28}\)

Access to nearby parks and natural settings is associated with improved mental health and reduced anxiety.\(^{31,42}\)

Women who live in low income neighbourhoods are significantly more likely to have a low birth weight infant.\(^{6,24}\)

Women with young children

Despite rates increase as socioeconomic levels in an area decrease.\(^{33}\)

Residents living below the poverty level

Although effective measures to reduce neighborhood noise levels (excludes construction noise) may reduce disturbance and annoyance, there is little evidence of health impacts associated with such changes in exposure in a housing context.\(^{14,32}\)

Elderly, children and young people

Effective social support or large social networks are associated with reduced risk of coronary heart disease and cancer (particularly breast cancer). However poor psychosocial environments (including exposure to community violence, anti-social behaviour, or discrimination) may reduce health outcomes and contribute to health inequalities.\(^{24,25}\)

The presence of sidewalks and crosswalks, bike paths, playing fields, parks, shopping accessible on foot, and public transportation, along with the perception that it is safe to be outside, contribute substantially to the average amount of regular physical activity that residents of a neighborhood achieve.\(^{28,38}\)

Elderly and children

Health inequalities.

Positive mental wellbeing is associated with having a home in good repair, living in an area perceived as having attractive buildings, and living in an attractive, quiet and peaceful environment.\(^{24,36}\)

Low income and minority populations

Although effective measures to reduce neighborhood noise levels (excludes construction noise) may reduce disturbance and annoyance, there is little evidence of health impacts associated with such changes in exposure in a housing context.\(^{14,32}\)

Elderly

Neighbourhood characteristics such as the proximity and mix of land uses, pedestrian connectivity, aesthetics and interesting scenery, and traffic and personal safety are important correlates of physical activity.\(^{14,28}\)

Elderly

Neighbourhoods that are characterised as more walkable and either leisure-oriented or destination-driven, are associated with increased physical activity, increased social capital, fewer overweight people, lower reports of depression, and less reported alcohol abuse.\(^{14,28}\)

The elderly and children are at particular risk of indoor air quality

To reduce concentrations of harmful indoor air pollutants, there is a need to strike a balance between improving building energy efficiency and maintaining adequate ventilation.\(^{36}\)

The elderly and children are at particular risk of indoor air quality

Home ownership is generally associated with improved health. However the trend does not hold for those people who are living on the margins of home ownership where mortgage arrears increase insecurity and are detrimental to mental health.\(^{37,72}\)

People with insufficient income to meet mortgage repayments

Improvement in the home may produce long term positive socioeconomic health benefits, such as less time off work/school, and increased social and educational opportunities.\(^{4,53}\)

Immigrants from non-English speaking countries, people with low educational achievement and the unemployed

The lack of affordable housing has been linked to decreased spending on health and health care (including delays in seeking preventative medical care, medication non-adherence and increased emergency department utilisation), trade-offs among housing, heating, food, medical care, and other basic needs, and moving frequently, living with other families in overcrowded conditions, or experiencing periods of homelessness.\(^{10,11}\)

Children and people with existing respiratory illness.

Affordable housing costs should be calculated to reflect rates that allow local residents to be paying no more than 30% of their income on rent or mortgages.\(^{29}\)

Children and women

Women who live in low income neighbourhoods are significantly more likely to have a low birth weight infant.

Behavoural problems among children are more common in poor neighbourhoods, and within these communities more prevalent amongst families of low socioeconomic status.

Negative mental wellbeing is associated with having a home in poor repair, living in an area perceived as having unattractive buildings, and living in an unattractive, noisy and unpleasant environment.\(^{24,36}\)

Children and adolescents

Incorporating clear signposting, good acoustics and natural lighting into building design may reduce stress.\(^{38}\)

Residents displaced from the area of development

People with existing respiratory illness.

Elderly

Figure 3 Pathways between housing and health

Table 6 Summary of key findings and vulnerable populations

<table>
<thead>
<tr>
<th>Health outcomes and behaviours (long term)</th>
<th>Vulnerable populations</th>
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<tr>
<td>Improved warmth in the home may produce long term positive socioeconomic health benefits, such as less time off work/school, and increased social and educational opportunities.(^{4,53})</td>
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</tr>
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<td>The presence of sidewalks and crosswalks, bike paths, playing fields, parks, shopping accessible on foot, and public transportation, along with the perception that it is safe to be outside, contribute substantially to the average amount of regular physical activity that residents of a neighborhood achieve.(^{28,38})</td>
<td>Children and the unemployed</td>
</tr>
<tr>
<td>Education and employment opportunities influence health by providing the means to achieve an adequate standard of living now and in the future.(^{4})</td>
<td>Low-income communities and the elderly</td>
</tr>
<tr>
<td>Neighbourhoods with better access to supermarkets and other retail outlets with minimally processed foods tend to eat a healthier diet (and have lower prevalence of obesity) than their counterparts in neighbourhoods with less access to these goods.(^{14,32})</td>
<td>Low-income and minority residents, particularly children</td>
</tr>
<tr>
<td>Zoning that keeps industrial sites and pollutants a distance from residential areas contribute to an environment that is conducive to the achievement and maintenance of good health.(^{14,28})</td>
<td>General population</td>
</tr>
<tr>
<td>Although effective measures to reduce neighborhood noise levels (excludes construction noise) may reduce disturbance and annoyance, there is little evidence of health impacts associated with such changes in exposure in a housing context.(^{14,32})</td>
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<td>Low income and minority populations</td>
</tr>
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<td>A neighborhood renewal intervention can be particularly effective in improving health and life satisfaction among disadvantaged people living in the target areas if there is effective cooperation between stakeholders.(^{29})</td>
<td>Immigrants from non-English speaking countries, people with low educational achievement and the unemployed</td>
</tr>
<tr>
<td>Moving house can be a stressful, health damaging life event, particularly in the field of social housing where there are limited opportunities to negotiate with the housing authority.(^{24,36})</td>
<td>Children and adolescents</td>
</tr>
<tr>
<td>Housing regeneration projects can lead to displacement of original residents, which may result in misleading shifts in routine social and health statistics.(^{29})</td>
<td>Residents displaced from the area of development</td>
</tr>
<tr>
<td>Health improvements are likely where employment, education and social integration opportunities increase alongside housing.(^{27})</td>
<td>General population</td>
</tr>
<tr>
<td>Residents in neighbouring areas not part of a regeneration program may feel excluded resulting in community divisions between improved and non-improved areas.(^{27})</td>
<td>Residents in areas adjoining area of development</td>
</tr>
<tr>
<td>Good access to waste storage is an important requirement to reduce domestic infestation that pose potential health hazards e.g. cockroaches, rats and mice.(^{29})</td>
<td>General population</td>
</tr>
</tbody>
</table>

Source: University of California Berkeley Health Impact Project (UCBHIPP)\(^{14,18}\)
Potential health effects associated with housing developments

- Housing the poor in disorderly areas of a city with few amenities is linked to obesity and adverse mental health outcomes.
- Housing in such areas is typically disparaged, with increased exposures to lead, asthma triggers (such as mold, moisture, dust, and rodents), and mental health stressors such as violence and social isolation.

Potential differential effects within the population

- Ethnic minority populations and low-income communities
- Adult's with intellectual disabilities
- Homeless people

- Dispersed community-based housing is superior to clustered housing on the majority of quality of life indicators for adults with intellectual disabilities. The only exception being that there are some benefits to village communities for people with less severe disabilities.
- Providing to formerly homeless persons with severe and persistent mental illness reduces hospital admissions and decreases hospital days. The evidence suggests that 95% of housing costs can be offset by reduced use of hospital services.

Construction can cause considerable disruption of daily routines with adverse impacts on mental health, social networks and access to services. Disruption an affect access to local shops and services.

Children are particularly vulnerable to disruption of school and extra-curricular activities.

Other disadvantaged groups included women, with childcare responsibilities, older people and people with disabilities.

- Provision for maintenance should be built into the proposals to avoid structural defects which could have adverse health impacts (e.g. build-up of pollutants/allergens, infestation and mould).
- Housing development offers the opportunity to include on-site community centres with extended hours (e.g. computer labs, job training, sports and fitness, after school education and college planning).
- Housing development offers the opportunity to include residents in the design process, as they would be able to quickly identify improvements simply by looking at the design with a view to living in it.
- Access plans for those with disability should provide a complete solution from within the home, to shops/work and back to home.
- There is also an opportunity to identify how individual health needs can be catered for within dwellings.
- Public art can be a potential focus for community activity, with benefits for community involvement and social cohesion.

General population

- It is important that appropriate social infrastructure is established in advance of, or in tandem with, the population moving in.

Children and young people

- Residential development should include income opportunities though the inclusion of businesses that provide living wage jobs in the area.
- Traditionally regeneration initiatives are often filled by workers from other areas, which whilst having beneficial regional or sub-regional effects may miss opportunities for beneficial health impacts from local employment.
- Although there are health benefits from employment, jobs that offer only low pay, insecurity and limited job sustainability will not promote the social inclusion of the worst off.
- To reduce stress and uncertainty about the development local residents should be regularly updated on the development's progress, e.g. meetings and newsletters. Forming a residents association early on in the process can be an effective facilitator of consultation.
- Residential developments should ensure retail, grocery, and other amenities essential to daily life are within easy walking distance (ideally 400 metres) of housing.
- It is important to maintain accessibility for the elderly and those with disabilities, e.g. frequently stopping to home.

Other disadvantaged groups

- High density residential housing can improve access to goods and services; the success of neighbourhood walkability; the success of public transit; and the amount and access to parks and open space. This is primarily due to the ability to offer services more efficiently with less supporting infrastructure per capita.
- Although evidence is not conclusive, it is thought that providing enough proportion of the new units without car parking; as car parking serves as a resting environment for dust mitles and people who rent their accommodation have limited control over the fencing.

- It is important to maintain accessibility for the elderly and those with disabilities, e.g. frequently stopping to home.
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7 List of references


10. Hulse, K. et al. At home and in place? The role of neighbourhood in promoting mental wellbeing in elderly people with intellectual disabilities. The only exception being that there are some benefits to village communities for people with less severe disabilities.

11. Child and people with existing respiratory conditions.

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