

Web Table 1: Summary of housing improvement studies which reported cost data only and no economic evaluation (ordered by study quality, study design & date)

Author, date, location	Description of housing intervention	Study design *	Summary of effect directions on health outcomes by domain**				Summary of economic data and accompanying authors' interpretation reported
			General health	Respiratory	Mental	Illness/symptom	
Intervention: Warmth & energy efficiency improvements (post 1980)							
Heyman et al, 2011 UK [1] [2] [3]	Loft insulation (54%), cavity wall insulation (53%), draught exclusion (29%), heating controls (20%), central heating (13%), and other measures (not specified).	RCT	<>				Mean cost of intervention per house £727. Mean fuel expenditure (Int/Cont n=99/83) £596/£567, p=0.408. Change mean warmth satisfaction score (4 point scale) Int/Cont (n=96/82) +1.18/+0.64**.
Howden-Chapman et al, 2008 New Zealand [4]	Replacing 2kW electric heaters or portable unflued gas heaters with ≥4kW non-polluting alternative.	RCT	▲	▲		◄►	Mean cost of intervention per house \$NZ3000.
Platt et al, 2007 UK [5]	Installation/repair/upgrading of central heating plus insulation, safety alarms where appropriate, advice on energy use, and benefit entitlement check offered.	CBA	▲	◄►	◄►	◄►	Intervention group in receipt of improve heating were less likely to report difficulties to 'manage financially', than those who did not acquire heating (OR: 0.77, 95% CI: 0.60 to 0.99).
Lloyd et al 2008 UK [6]	Insulation (double skinning of walls) and draught proofing, gas central heating, double glazing, solar panels, dual-purpose heat recovery system, and front and back verandahs within internal living area of the flat.	CBA				▲	Heating costs per week Before v After (>4 years after intervention) (Int/Cont n=75/40) £35 v £7 per week, no change in rent. Control group do not report any changes in housing costs (unclear how data were obtained).
Shortt et al, 2007 N. Ireland [7] [8] [9]	Energy efficiency measures: included central heating, insulation and/or provision of new electrical appliances. Also promotion of benefit uptake for whole area (Int & Cont)	CBA		◄►	▲	▲	Fuel costs per annum Before v After (Int n=54) £1113 v £751.56. (Data refers to subgroup who received full intervention, no data for changes in control group).
Warm Front Study Group, 2006 UK [10] [11] [12] [13] [14] [15]	Grants for insulation (cavity wall and/or loft) draught proofing, hot water tank jacket, and/or central heating, and minor measures, heating repair, energy efficient light bulbs, security measures (up to total value of £2,700)	CBA	◄►	◄►	▲	◄►	Maximum value of grant per house £2500. Following introduction of cavity wall and loft insulation space heating fuel consumption reduced by 10% in centrally heated properties and 17% in non-centrally heated properties. Introduction of gas central heating system had no significant impact on reducing fuel consumption after adjustment for increased internal temperature.
Allen, 2005 UK [16] [17]	Central heating installation/repair, plus general repairs (including roofing/guttering), improved bath/shower access, plus health, housing and benefits advice.	UBA	▼		▲		Mean cost (GBP) of intervention per house £4,477 (range £799-£10,144), total cost of project £176,297. Unclear if intervention was supplemented by additional contributions. Funding from Disabled Facilities Grant £66,173 Mean funding per property £5,494 Funding from Occupational Therapy £1,691

							<p>Mean funding per property £85</p> <p>Additional funding from other sources</p> <p>Renovation grant £14,081</p> <p>Home repair grant £8,811</p> <p>Range of funding varied considerably between individuals who received grants from one or more of these sources.</p>																																													
Allen, 2005 UK [18]	Heating installation/repair (n=20), reproofing (n=2), replacement windows (n=31), ventilation for those with asthma (n=28), intruder alarm (n=3), general home repair plus health and benefits advice.	UBA			▲		<p>Mean cost (GBP) of intervention per house £5,800 (range £350 to £14,000).</p>																																													
Eick et al 2004 UK [19]	Participants received one of three different interventions: 1: Surfaces- laminated floors, occlusive anti-allergen covers, central vacuum cleaning systems (n=9). 2: Mechanical Ventilation Heat Recovery (MVHR) (n=32). 3: Water borne central heating (n=8).	RCT			▲		<p>Costs (GBP) of reduced medical events (costs for 3 months) n=16</p> <table border="1"> <thead> <tr> <th>Event</th> <th>Before</th> <th>After</th> <th>Change</th> </tr> </thead> <tbody> <tr> <td>Absence for sch. due to asthma</td> <td>528.78</td> <td>50.36</td> <td>↓478.42</td> </tr> <tr> <td>Absence from sch. due to Other reasons</td> <td>151.08</td> <td>214.03</td> <td>↑62.95</td> </tr> <tr> <td>Visits to GP</td> <td>144.50</td> <td>8.50</td> <td>↓136.00</td> </tr> <tr> <td>Home visits by GP</td> <td>22.58</td> <td>0</td> <td>↓22.58</td> </tr> <tr> <td>Visits to out patients (first attendance £110)</td> <td>220.00</td> <td>0</td> <td>↓220.00</td> </tr> <tr> <td>Steroid courses</td> <td>5.70</td> <td>0</td> <td>↓5.70</td> </tr> <tr> <td>Antibiotic courses</td> <td>16.80</td> <td>0</td> <td>↓16.80</td> </tr> <tr> <td>Nebulisations for an acute attack of asthma</td> <td>1.23</td> <td>0</td> <td>↓1.23</td> </tr> <tr> <td>Hospital admissions (inc. 1 days stay)</td> <td>5740.00</td> <td>0</td> <td>↓5740.00</td> </tr> </tbody> </table> <p>Expenditure associated with the installation of MVHR system</p> <p>Capital cost for a whole house MVHR unit and installation costs £2500</p> <p>Yearly maintenance costs to be shouldered by the property owner £150</p> <p>Yearly running costs for the air circulation fan to be shouldered by the occupant £35</p>	Event	Before	After	Change	Absence for sch. due to asthma	528.78	50.36	↓478.42	Absence from sch. due to Other reasons	151.08	214.03	↑62.95	Visits to GP	144.50	8.50	↓136.00	Home visits by GP	22.58	0	↓22.58	Visits to out patients (first attendance £110)	220.00	0	↓220.00	Steroid courses	5.70	0	↓5.70	Antibiotic courses	16.80	0	↓16.80	Nebulisations for an acute attack of asthma	1.23	0	↓1.23	Hospital admissions (inc. 1 days stay)	5740.00	0	↓5740.00					
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Caldwell et al 2001 UK [20]	Thermal improvements according to need, including heating, windows, cavity wall, insulation, fabric repair, re-roofing, loft insulation, external cladding, re-rendering, controlled entry, humidistat fans, close painting, new balcony rail, new doors, rewiring, new flooring, and backcourt lighting.	CBA			▲	◀▶	<p>Changes in annual energy costs (£GBP) by Intervention site (participant reported)</p> <table border="1"> <thead> <tr> <th></th> <th>Before</th> <th>After</th> <th>Mean change</th> <th>Wilcoxon t</th> </tr> </thead> <tbody> <tr> <td>Tollcross</td> <td>414.92</td> <td>179.46</td> <td>235.46</td> <td>p<0.01</td> </tr> <tr> <td>Ruchazie</td> <td>504.70</td> <td>47.00</td> <td>457.70</td> <td>p<0.01</td> </tr> <tr> <td>Drumchapel</td> <td>406.19</td> <td>199.72</td> <td>206.47</td> <td>p<0.01</td> </tr> <tr> <td>Lilybank</td> <td>419.70</td> <td>165.20</td> <td>254.60</td> <td>p<0.01</td> </tr> </tbody> </table> <p>Changes in annual energy costs (control) (participant reported)</p> <table border="1"> <thead> <tr> <th></th> <th>Before</th> <th>After</th> <th>Mean change</th> </tr> </thead> <tbody> <tr> <td>Tollcross</td> <td>482.62</td> <td>482.62</td> <td>0</td> </tr> <tr> <td>Ruchazie</td> <td>506.70</td> <td>506.70</td> <td>0</td> </tr> <tr> <td>Drumchapel</td> <td>414.85</td> <td>414.85</td> <td>0</td> </tr> <tr> <td>Haghill</td> <td>405.27</td> <td>405.27</td> <td>0</td> </tr> </tbody> </table>		Before	After	Mean change	Wilcoxon t	Tollcross	414.92	179.46	235.46	p<0.01	Ruchazie	504.70	47.00	457.70	p<0.01	Drumchapel	406.19	199.72	206.47	p<0.01	Lilybank	419.70	165.20	254.60	p<0.01		Before	After	Mean change	Tollcross	482.62	482.62	0	Ruchazie	506.70	506.70	0	Drumchapel	414.85	414.85	0	Haghill	405.27	405.27	0
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Green et al 1999 UK [21] [22]	Replacement of underfloor electric heating, improved insulation, each towerblock was encased in a mineral wool insulation material, with an outer skin of rainscreen cladding using an aluminium cassette-type system. Open balconies were enclosed, new ventilation system. Plus substantial improved security measures.	RC	◀▶			<p>Mean cost (£GBP) of intervention per house £28000. Estimated heating bills Int/Cont £4.46 v £9.04 (difference in fuel costs attributed largely to differences in fuel supplier tariffs rather than consumption); weekly rent Int/Cont £29.64/£19.63</p>																																																												
Intervention: Rehousing/retrofitting +/- neighbourhood renewal) post 1995)																																																																		
Thomson et al, 2007 UK [23]	Housing-led neighbourhood regeneration. Replacing ex-local authority social housing stock reported to have damp and mould with new build housing in same locality. Accompanied by physical and social neighbourhood improvements.	CBA	▲		◀▶	<p>Rent data (£GBP) presented for 33 participants (Int/Cont 18/15). Mean rent per week at baseline Int/Cont £32.24/£31.00. Mean change in rent per week Int/Cont +£6.65/+£1.31.</p> <p>Some residents reported increased fuel cost (int/cont 14/5) actual cost data not presented.</p>																																																												
Critchley et al 2004 UK [24]	Low-income tenants moved from poor-quality (hard to heat with damp, mould & condensation problems reported to be highly prevalent) tower blocks to high-quality low-rise new build accommodation.	CBA	<>		<>	<p>Over 12 year period Liverpool Housing Action Trust invested £260m in housing renewal (this appears to be the total housing budget and does not refer specifically to this intervention). Estimated annual running costs Before v After rehousing for- two person household £662 v £347; single person's costs £610 v £319. Percentage living in fuel poverty (excluding housing benefit), Before v After intervention for: 1 person households 86% v 14%; 2 person households 48% v 8%.</p>																																																												
Thomas et al,	Housing-led neighbourhood regeneration	CBA			◀▶	Total cost (£GBP) of renewal project (Single Regeneration Budget) £2million over study																																																												

2005 UK [25] [26]	(Single Regeneration Budget) plus other employment and education initiatives related to SRB. Housing improvement mostly improvements to heating, bathrooms, kitchens and windows.						period. Costs do not relate necessarily to study sample and not specifically to housing, project included range of non-housing investment improvements.
Blackman et al, 2001 UK [27] [28]	Refurbishment or demolition of void dwellings, discretionary renovation grants for individual dwellings, heating and security improvements. Landscaping, environmental improvements.	UBA	▼	▼	▲		Mean cost (£GBP) of renewal project per house £8000. Total cost of housing renewal programme £5.5million. Costs do not relate necessarily to study sample and not specifically to housing, project included some environmental improvements and road safety improvements.
Ambrose 2000 UK [17] [29] [30]	Rehoused to better accommodation, or had existing accommodation improved plus neighbourhood improvements (Single Regeneration Budget) plus other employment and education initiatives related to regeneration programme.	UBA		◄►	▲	◄►	<p>Stage 1 survey 131 households (467 people) interviewed. Stage 2 survey 18 of these households were interviewed plus an extra two added to make sample more ethnically representative (92 people). Retrospective study, sample asked to recall and present bill evidence of household costs before intervention.</p> <p>Before v After (Two years after intervention) : Mean weekly housing costs (£GBP)- rent (n=105 households) £52 v £72; water (n=60) £0.92 v £4.38; gas (n=92) £5.54 v £6.46; electricity (n=98) £4.62 v £5.77.</p> <p>Stage 2 (Before v After- 3 years after intervention) (n=19 households): Mean weekly housing costs- rent £60.33 v £79.30; water £3.50 v £5.06; gas (n=9) £8.28 v £6.15; electricity (n=6) £4.76 v £3.33.</p> <p>NB: Not all participants reporting cost data also reported health data so unclear how two datasets relate to each other.</p>
Walker & Bradshaw, 1999 UK [31]	Housing led neighbourhood regeneration. Homes renovated with additional improvement to physical and social neighbourhood environment.	XCBA	No health impacts only health service use				<p>Investment of £8.6million by local authority in repair of homes and renovation of property.</p> <p>Percentage change in general practice prescribing costs per 1000 patients after intervention (1994-1998).</p> <p>Intervention practice A/Intervention practice B/ Control practices:</p> <p>Gastrointestinal +12.33%/+25.8%/+12.92% ;</p> <p>Cardiovascular +31.27%/+37.56%/+27.01% ;</p> <p>Respiratory +46.92%/+82.87%/+43.57+;</p> <p>Central nervous system +79.22%/+73.7%/+79.7% ;</p> <p>Hypnotic +67.58%/+15.99%/+93.33% ;</p> <p>Anxiolytic -74.12%/-12.29%/-6.51% ;</p> <p>Antidepressant +109.51%/+86.27%/+120.77% ;</p> <p>Analgesic +26.92%/+26.59%/+42.66% ;</p> <p>Anti-infective +12.96%/-22.19%/-26.26% .</p> <p>(Int A and Int B. are GP practices within intervention area. Control data taken from 7 GP practices in surrounding area)</p>
Halpern, 1995 UK [32]	Housing refurbishment and neighbourhood regeneration. Some housing improvement and with major re-design of estate- to reduce traffic speed, improve visibility of parked cars.	UBA			▲		Mean cost (£GBP) of intervention per house (full refurbishment) £10,000-£15,000.

Woodin et al, 1996 UK [33]	Mix of neighbourhood and housing renewal. Original housing demolished and replaced with new stock	R	No health impacts only health service use	Total cost of renewal project £97million, figure includes more than study sample.																														
Intervention: Provision of basic housing needs/ low or middle income country																																		
Cattaneo et al, 2006 Mexico [34]	Replacing mud floors (up to 50sqm) with cement floors.	RC		▲ ▲ Mean cost of intervention per house = \$(US)150.																														
Aga Khan Health Service, 2001 Pakistan [35]	Installation of roof hatch windows, wall and roof insulation, double glass windows, stove with water warming facility	RC		▲ Annual spending on health care for intervention and control groups after intervention. <table border="1"> <thead> <tr> <th>Rupees Spent</th> <th>Intervention n (%)</th> <th>Control n (%)</th> </tr> </thead> <tbody> <tr> <td>No spending</td> <td>7 (14)</td> <td>16 (16)</td> </tr> <tr> <td>1-499</td> <td>8 (16)</td> <td>13 (13)</td> </tr> <tr> <td>500-999</td> <td>1 (2)</td> <td>5 (5)</td> </tr> <tr> <td>1000-2,999</td> <td>10 (20)</td> <td>24 (24)</td> </tr> <tr> <td>3,000-5,999</td> <td>3 (6)</td> <td>15 (15)</td> </tr> <tr> <td>6,000-9,999</td> <td>3 (6)</td> <td>3 (3)</td> </tr> <tr> <td>>10,000</td> <td>10 (20)</td> <td>13 (13)</td> </tr> <tr> <td>Don't know</td> <td>8 (16)</td> <td>10 (10)</td> </tr> <tr> <td>Total</td> <td>50 (100)</td> <td>99 (100)</td> </tr> </tbody> </table> <p>Estimated that insulation has resulted in up to 50% reduction in wood consumption by a typical family, reducing cost and time spent collecting and buying firewood.</p>	Rupees Spent	Intervention n (%)	Control n (%)	No spending	7 (14)	16 (16)	1-499	8 (16)	13 (13)	500-999	1 (2)	5 (5)	1000-2,999	10 (20)	24 (24)	3,000-5,999	3 (6)	15 (15)	6,000-9,999	3 (6)	3 (3)	>10,000	10 (20)	13 (13)	Don't know	8 (16)	10 (10)	Total	50 (100)	99 (100)
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Aiga et al, 2002 Phillipines [36] [37]	Provision of private water faucet (with meter) and private toilet, electricity, paved roadways to every household.	R		▲ Mean monthly household expenditure on water (Pesos) Int/Cont 109/234 Intervention cost not available. Mean household income (Pesos) after intervention Int/Cont 8032/4530. Increased household income attributed to increase in time available to earn income (as a result of improved water supply). Estimated that increase in income in the control group would be if they received an improvement in water supply 5740 Pesos.																														
Wolff et al 2001 Malawi [38]	Rehousing from 2 room traditional mud house with thatched roof and hard packed mud floors to 3 room house with fired mud bricks, tiled roof, concrete foundation.	UBA	▲	▲ Mean cost of building a new 'habitat' house, \$ (US) 550.																														
Intervention: Rehousing from slums (pre-1965)																																		
Chapin, 1938 USA [39]	Rehousing and relocation from slum housing/neighbourhood to housing/neighbourhoods with slightly better living conditions	UBA		^ Mean cost of intervention per house \$(US)7,791 total cost of project \$(US)3,623,000 for 465 houses. Before v After intervention, mean unit rental \$(US)15.68 v 17.98, mean room rental \$(US)3.21 versus 3.79.																														
McGonigle et al, 1936 UK [40]	Moved from slum housing estate (demolished) to new build houses on self-contained municipal housing estate.	CBA		v Mean weekly rent Before v After Int 4s.8d/9s.0d. Cont 4s.7½d/4s.10½d (s=shilling, d=pence, 1 shilling=5 pence). Rent as a % of income subdivided by employed or unemployed status (Int/Cont n=28/27 families). Int: Employed/unemployed 20.5%/31.3% Cont: Employed/unemployed 14.7%/20.8% (Int/Cont n=35/30 families) Before v After Int/Cont rent as % of income 20.5%/14.7% v 31.3%/20.8%.																														

*Study design: RCT: Randomised Controlled Trial; CBA: Controlled Before & After; UBA: Uncontrolled Before & After; XCBA: Controlled Before & After using area level cross sectional data at both time points; XUBA: Uncontrolled Before & After using area level cross sectional data at both time points; RC: Retrospective controlled study; R: Retrospective uncontrolled.

** Effect direction: upward arrow= positive health impact, downward arrow= negative health impact, sideways arrow= no change/mixed effects/conflicting findings

Sample size: Final sample size (individuals) in intervention group Large arrow >300; medium arrow 50-300; small arrow <50

Statistical significance: Black arrow $p < 0.05$; grey arrow $p > 0.05$; empty arrow = no statistics/data reported
£ = British pound sterling; \$(US) = United States of America dollar; \$NZ = New Zealand dollar

References

- 1 Heyman B, Harrington BE, Heyman A, *et al.* A randomised controlled trial of an energy efficiency intervention for families living in fuel poverty. *Housing Studies* in press 2010.
- 2 Heyman B, Harrington BE, Merleau-Ponty N, *et al.* Keeping warm and staying well. Does home energy efficiency mediate the relationship between socio-economic status and the risk of poorer health? *Housing Studies* 2005;**20**:649-64.
- 3 Harrington BE, Heyman B, Heyman A, *et al.* Keeping warm and staying well: findings from the qualitative arm of the Warm Homes Project. *Health & Social Care in the Community* 2005:259-67.
- 4 Howden-Chapman P, Pierse N, Nicholls S, *et al.* Effects of improved home heating on asthma in community dwelling children: randomised controlled trial. *British Medical Journal* 2008;**337**:1411a-.
- 5 Platt S, Mitchell R, Petticrew M, *et al.* The Scottish Executive Central Heating Programme: assessing impacts on health. *Research Findings 239/2007*. Edinburgh: Scottish Executive: Social Research Development Department 2007.
- 6 Lloyd EL, McCormack C, McKeever M, *et al.* The effect of improving the thermal quality of cold housing on blood pressure and general health: a research note. *J Epidemiol Community Health* 2008;**62**:793-7.
- 7 Shortt N, Rugkasa J. "The walls were so damp and cold" fuel poverty and ill health in Northern Ireland: Results from a housing intervention. *Health & Place Part Special Issue: Environmental Justice, Population Health, Critical Theory and GIS* 2007;**13**:99-110.
- 8 Rugkasa J, Shortt N, Boydell L. Engaging communities: an evaluation of a community development model for tackling rural fuel poverty (<http://www.inispho.org/phis/catalogue/resdetails.php?resID=245>, accessed 2/08/07). Institute of Public Health in Ireland 2004.
- 9 Rugkasa J, Shortt N, K. , Boydell L. The right tool for the task: "boundary spanners" in a partnership approach to tackle fuel poverty in rural Northern Ireland. *Health and Social Care in the Community* 2007;**15**:221-30.
- 10 The Warm Front Study Group. Health impact evaluation of England's home energy efficiency scheme (Warm Front). Headline results. Report to Energy Saving Trust/Defra. March 2006. 2006.
- 11 Oreszczyn T, Hong SH, Ridley I, *et al.* Determinants of winter indoor temperatures in low income households in England. *Energy and Buildings* 2006;**38**:245-52.
- 12 Hong SH, Oreszczyn T, Ridley I, *et al.* The impact of energy efficient refurbishment on the space heating fuel consumption in English dwellings. *Energy and Buildings* 2006;**38**:1171-81.
- 13 Critchley R, Gilbertson J, Grimsley M, *et al.* Living in cold homes after heating improvements: Evidence from Warm-Front, England's home energy efficiency scheme. *Applied Energy* 2006;**84**:147-58.
- 14 Gilbertson J, Stevens M, Stiell B, *et al.* Home is where the hearth is: Grant recipients' views of England's home energy efficiency scheme (Warm Front). *Social Science & Medicine* 2006;**63**:946-56.
- 15 Hutchinson EJ, Wilkinson P, Hong SH, *et al.* Can we improve the identification of cold homes for targeted home energy-efficiency improvements? *Applied Energy* 2006;**83**:1198-209.
- 16 Allen T. Private sector housing improvement in the UK and the chronically ill: implications for collaborative working. *Housing Studies* 2005;**20**:63-80.

- 17 Ambrose P. A drop in the ocean; the health gain from the Central Stepney SRB in the context of national health inequalities. London: The Health and Social Policy Research Centre, University of Brighton 2000.
- 18 Allen T. Evaluation of the housing for healthier hearts project April 2003-March 2005. Bradford: University of Bradford 2005.
- 19 Eick SA, Houghton N, Richardson G. The breath of fresh air project: Draft report for comments September 2004. Plymouth: AC & T England Ltd. 2004.
- 20 Caldwell J, McGowan S, McPhail J, *et al.* Glasgow Warm Homes Study: Final Report (http://www.glasgow.gov.uk/NR/rdonlyres/BDA67F07-0A84-4F2A-924E-FB6BA8EFB4D9/0/final_report.pdf, accessed 1/8/07). Glasgow: Glasgow City Council Housing Services 2001.
- 21 Green G, Gilbertson J. Housing, poverty and health: the impact of housing investment on the health and quality of life of low income residents. *Open House International* 1999;**24**:41-53.
- 22 Green G, Ormandy D, Brazier J, *et al.* Tolerant building: the impact of energy efficiency measures on living conditions and health status. In: Nicol F, Rudge J, eds. *Cutting the cost of cold*. London: E & FN Spon 2000:87-103.
- 23 Thomson H, Morrison D, Petticrew M. The health impacts of housing-led regeneration: a prospective controlled study. *J Epidemiol Community Health* 2007;**61**:211-4.
- 24 Critchley R, Gilbertson J, Green G, *et al.* Housing investment and health in Liverpool. Sheffield: CRESR, Sheffield-Hallam University 2004.
- 25 Thomas R, Evans S, Huxley P, *et al.* Housing improvement and self-reported mental distress among council estate residents. *Social Science & Medicine* 2005;**60**:2773-83.
- 26 Huxley P, Evans S, Leese M, *et al.* Urban regeneration and mental health. *Social Psychiatry & Psychiatric Epidemiology* 2004;**39**:280-5.
- 27 Blackman T, Harvey J. Housing renewal and mental health: a case study. *Journal of Mental Health* 2001;**10**:571-83.
- 28 Blackman T, Harvey J, Lawrence M, *et al.* Neighbourhood renewal and health: Evidence from a local case study. *Health & Place* 2001;**7**:93-103.
- 29 Ambrose P, MacDonald D. For richer, for poorer? Counting the costs of regeneration in Stepney. Brighton: University of Brighton 2001.
- 30 Ambrose P. 'I mustn't laugh too much': housing and health on the Limehouse Fields and Ocean estates in Stepney. Centre for Urban and Regional Research, University of Sussex 1996.
- 31 Walker R, Bradshaw N. The Oakdale renewal scheme: use of prescribing data to assess the impact on the health of residents. Gwent Health Authority & Welsh School of Pharmacy 1999.
- 32 Halpern D. Mental health and the built environment: More than bricks and mortar? *Philadelphia, PA, US: Taylor & Francis* 1995;**240**.
- 33 Woodin S, Delves C, Wadhams C. 'Just what the doctor ordered': a study of housing, health and community safety in Holly Street, Hackney. Hackney, London: Comprehensive Estates Initiative, Hackney Housing Department 1996.
- 34 Cattaneo MD, Galiani S, Gertler PJ, *et al.* Housing, health and happiness (*final report to the Mexican Government*). Haas School of Business and School of Public Health, University of California, Berkeley 2007.
- 35 The impact of BACIP interventions on health and housing in the northern areas, Pakistan. Gilgit, Pakistan: Aga Khan Health Service, Pakistan 2001.
- 36 Aiga H, Arai Y, Marui E, *et al.* Impact of improvement of water supply on reduction of diarrheal incidence in a squatter area of Manila. *Environmental Health & Preventive Medicine* 1999;**4**:111-6.

- 37 Aiga H, Umenai T. Impact of improvement of water supply on household economy in a squatter area of Manila. *Social Science & Medicine* 2002;**55**:627-41.
- 38 Wolff CG, Schroeder DG, Young MW. Effect of improved housing on illness in children under 5 years old in northern Malawi: cross sectional study. *British Medical Journal* 2001;**322**:1209-12.
- 39 Chapin FS. The effects of slum clearance and rehousing on family and community relationships in Minneapolis. *American Journal of Sociology* 1938;**43**:744-63.
- 40 McGonigle G, Kirby J. Poverty, nutrition and the public health. *Poverty & Public Health*: Gillencz 1936.