RESEARCH REPORT

The health impacts of housing-led regeneration: a prospective controlled study

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J Epidemiol Community Health 2007;61:211–214. doi: 10.1136/jech.2006.049239

Study objective: To evaluate self-reported changes in housing quality and health associated with housing-led area regeneration.

Design: A prospective study over 1 year using structured interviews with 50 households who moved to new housing and with 50 matched controls who did not move.

Setting and participants: Residents of two social rented housing schemes in the West of Scotland.

Results: Small but not statistically significant increases in levels of "excellent" or "good" self-reported health status were found in both groups. Both intervention and control groups experienced reductions in problems related to warmth, but no significant change in how they felt about their house.

Conclusions: It is feasible to conduct prospective controlled studies to evaluate the health effects of housing improvement using matched control groups. The absence of marked improvement in health after moving to new housing might be due to the small sample size or to the limited potential to improve health through this intervention alone.

The potential for developing healthy public policy is seriously limited by the dearth of studies which have assessed the impact on health and health inequalities of social interventions, such as housing renewal.¹ Our systematic review of world literature identified only 18 studies (1936–2001) which had assessed the health effects of housing improvement, of which only six were prospective and controlled. Positive effects of housing improvement on mental health were consistently reported across the studies. However, methodological limitations and conflicting results prevented clear conclusions being drawn about the effects on physical and self-reported health.²

Calls to improve the quality and quantity of research evidence available to inform healthy public policy have recommended using the implementation of new investments or policies as opportunities to carry out outcome evaluations.^{1 3 4} This short paper reports the findings of a prospective controlled study of housing improvement.

METHODS AND RESULTS

We carried out a prospective controlled study in West Dunbartonshire, Scotland, where the local housing association was carrying out a major programme of housing-led neighbourhood renewal.⁵ The investment involved replacing ex-council owned housing stock that was reported to have problems of damp and mould, with newly built housing in the same locality. Control group participants were recruited from a nearby council estate (predominantly social rented housing) where the housing type, age and quality were reported by the council's housing department to be similar to the one under study. In both areas, contact details of residents (all social renters) willing to take part in the study were obtained after the relevant social housing provider had written to each tenant about the study. One adult (the principal householder or his/her nominee) from each household was recruited. Data were collected before the house

move (July 2000–May 2003) and one year after moving (November 2001–June 2004, mean (SD) time since house move = 12 (0.67) months) from the same person where possible; control group participants were interviewed at baseline (May 2001–October 2001) and 1 year afterwards (data collection May 2002–January 2003, mean (SD) time between interviews = 12.36 (1.139) months). At both time points, a 1-hour structured interview using a previously piloted questionnaire⁶ asking about health and housing was conducted by a nurse interviewer.

At baseline, 55% (intervention group 59/107: 15 refused, 33 failed to contact) and 45% (control group 84/188: 46 refused, 58 failed to contact) of households approached agreed to participate. At follow-up, 52 of 53 intervention households successfully followed up had moved house, and 53 of 64 control households had not moved house.

Table 1 presents an analysis comparing changes in the intervention and control groups after 1 year, in which the same person was interviewed at both time points (50/52 in the intervention group, 50/53 in the control group).

The intervention and control group participants were well matched at baseline with respect to age (intervention/control mean age 47.91/51.54 years, $p = 0.308$), sex (30%/26% men, $p = 0.656$), housing benefit dependency (57.8%/60.5%, $p = 0.798$), employment status, health status (self-reported and short form 36, version 2 (SF-36v2)), housing quality and occupancy (table 1). The groups were not successfully matched for house type or private garden, but none of these variables was associated with self-reported health at baseline (see supplementary table A available online at <http://jech.com/supplemental>). At baseline, the percentage of houses with dampness and/or condensation (24% householder reported) was greater than that reported in a national survey of social rented housing (up to 16% surveyor reported and 11% householder reported).⁸

At 1 year after moving to a new house, there was a small increase in the percentage of householders reporting "excellent" or "good" health (2.2%) and this percentage also increased among the control group (6%); neither increase was statistically significant. No significant changes were observed in the mean scores of the physical or mental component of the SF-36v2.

Residents in both groups reported fewer problems related to warmth (appendix A), but these improvements were significantly greater for intervention households. The proportion of residents reporting no other housing-related problems (appendix A) increased by similar amounts in both areas.

Some residents provided rent data ($n = 33$). Rent increased in both areas, with a larger increase in the intervention group (intervention/control mean change in rent +£6.65/+£1.31 per week, where mean rent at baseline was £32.24/£31.00 per week). Some residents reported increases in fuel bills (intervention/control 14/5 residents reporting increased fuel bill(s)).

At both time points, there was no significant difference between the intervention and the control group participants regarding how they felt about their house, or in the number of neighbourhood problems reported (appendix B). There was very little change in the intervention group at follow-up.

Table 1 Comparing intervention and control group percentage change in binary variables between time 1 and time 2 (and mean change in SF-36v2: calculated using UK norms[†])

	Intervention group (before) n = 50	Control group (before) n = 50	Statistics	Intervention group change at 1 year* n = 50	Control group change at 1 year* n = 50	Statistics*
Economically active						
Yes	11 (23.4%)	8 (16.0%)	$\chi^2=0.843$, $p=0.358$, missing = 3	-1.4%	-2%	$z=0.22$ (95% CI -4.56 to +5.76), missing = 3
Feel about house						
Happy	24 (48%)	25 (50%)	$\chi^2=0.939$, $p=0.626$, missing = 0	25 (50%)	21 (42%)	$\chi^2=0.659$, $p=0.719$, missing = 0
Neither happy nor unhappy	19 (38%)	21 (42%)		21 (42%)	24 (48%)	
Unhappy	7 (14%)	4 (8%)		4 (8%)	5 (10%)	
Type of house						
House	13 (26%)	31 (62%)	$\chi^2=13.149$, $p<0$, missing = 0	33 (66%)	-	$z=4.01$ (95% CI 20.46 to 59.54), missing = 0
Flat	37 (74%)	19 (38%)		17 (34%)		
Garden						
With private garden	13 (26%)	36 (72%)	$\chi^2=21.168$, $p<0$, missing = 0	+72%	-	$z=7.41$ (95% CI 52.97 to 91.03), missing = 0
House occupancy						
Persons per room	0.386	0.334	$t=1.393$ (95% CI -0.022 to 0.126), missing = 0	0.309	0.342	Intervention: paired t test = 4.409, (95% CI 0.418 to 0.112), missing = 0 Control: paired t test = -0.482, (95% CI -0.04 to 0.025), missing = 0
Self-rated health over the past year						
Excellent/Good	15 (32.6%)	20 (40%)	$\chi^2=0.368$, $p=0.544$, missing = 3	+2.2%	+6%	$z=0.92$ (95% CI -4.21 to 11.81), missing = 4
SF-36v2 (Physical Component Score)*	36.322	36.864	$t=-0.07$ (95% CI -7.082 to 6.598), missing = 10	+1.409	-0.317	Intervention: paired t test = 1.01, (95% CI -1.418 to 4.236), missing = 12 Control: paired t test = -0.238, (95% CI -3.01 to 2.372), missing = 6
SF-36v2 (Mental Component Score)*	46.052	46.547	$t=-0.201$ (95% CI -5.376 to 4.387), missing = 10	+2.083	-0.225	Intervention: paired t test = 1.094, (95% CI -1.756 to 5.922), missing = 6 Control: paired t test = -0.143, (95% CI -3.414 to 2.964), missing = 12
Dampness/condensation						
No problem	38 (76%)	43 (86%)	$\chi^2=1.624$, $p=0.202$, missing = 0	+24%	+2%	$z=3.27$, (95% CI 8.82 to 35.18), missing = 0
Draughts/leaky windows						
No problem	33 (66%)	37 (74%)	$\chi^2=0.762$, $p=0.383$, missing = 0	+28%	+10%	$z=2.29$, (95% CI 2.62 to 33.38), missing = 0
Keep home warm in winter						
No problem	36 (73.5%)	39 (78%)	$\chi^2=0.277$, $p=0.599$, missing = 1	+20%	+6%	$z=2.08$, (95% CI 0.82 to 27.18), missing = 0
Heating system						
No problem	36 (72%)	43 (86%)	$\chi^2=2.954$, $p=0.086$, missing = 0	+22%	+4%	$z=2.67$, (95% CI 4.82 to 31.18), missing = 0
Other housing problems						
No problems†	13 (26%)	7 (14%)	$\chi^2=2.250$, $p=0.134$, missing = 0	+10%	+12%	$z=0.32$ (95% CI -10.27 to 14.27), missing = 0
Neighbourhood problems						
Average number**	12.84	11.96	$t=-0.917$, (95% CI -2.785 to +1.025), missing = 0	-1.02	+0.14	Intervention: paired t test = 1.639, (95% CI -0.231 to 2.271), missing = 0 Control: paired t test = -0.279, (95% CI -1.148 to 0.868), missing = 0

SF-36v2, short form 36, version 2.*All reporting and testing differential change between intervention and control at 1 year, with the exception of "feel about house", which compares the two groups at both time points, and SF-36 and neighbourhood problem scores, which compare change between the two groups.

†See appendices.

What is already known on this topic

- Although it is often assumed that improved housing will lead to improved health, these assumptions are often based on studies with methodological limitations, and, in particular, on studies without control groups.

What this paper adds

- The health effects of housing improvement may be smaller than sometimes suggested.
- Prospective studies with matched control groups are a feasible means of assessing the health effect of housing improvement.

COMMENT

Despite significant improvements in reported housing quality, there was no significant change in the percentage of residents reporting “good” or “excellent” health 1 year after moving to improved housing. Similarly, among the matched control group, there was no significant change in “good” or “excellent” health.

The lack of any positive health effects after housing improvement is perhaps surprising, although the robustness and generalisability of the findings are limited by the study's low power to detect small effects. Nevertheless, this study shows the feasibility of a prospective controlled design, which is uncommon in housing research. The study also confirms the possibility of other important negative effects of housing improvement—namely, increases in rent.

Housing improvement is a complex intervention that may simultaneously have an effect on wider determinants of health. Such effects reported in previous research include increases in rent, relocation of tenants to a new area and wider neighbourhood changes.^{9–12} These secondary effects may counteract the potential for health improvement after housing improvement. However, residents in this study were not relocated to a new area, there was no significant change in the mean number of neighbourhood problems reported, and it is unlikely that the reported rent increases can explain the absence of a positive health impact, as over half of the participants (59.2%) were dependent on housing benefit.

Other possible explanations for the absence of health effects observed are the relatively short follow-up period (1 year), the possible insensitivity to change of the health measures used,¹³ and the possibility that the potential for health improvement in the intervention group was limited. Nearly half of the participants reported no problems with dampness, draughts, warmth or heating systems at baseline, and at baseline the association between housing conditions and health status was weak (see supplementary table A available online at <http://www.jech.com/supplemental>). National data from Scotland also suggest that the association between housing quality and health, although statistically significant, may be small.¹⁴ These data, and the data from the current study, question the likelihood of significant health improvements shortly after housing improvement, especially when the multiple deprivations commonly associated with poor housing are not similarly improved. This hypothesis remains to be tested in larger evaluative studies.

This study, albeit small, is one of only a few evaluations assessing the health impacts of major housing improvement,^{2 15 16} and larger prospective controlled studies are still needed. In addition, this study raises wider issues about the actual potential for health effects and the mechanisms for health effects after housing improvement. Future studies need to assess the wider context

within which housing improvement occurs and to investigate the processes through which health effects may, or may not, arise.

ACKNOWLEDGEMENTS

We thank Dr Donald Houston, Dr Anne Ellaway and Professor Ade Kearns for permission to adapt the questionnaire which they originally developed and piloted, and the Medical Outcomes Trust for permission to use the SF36v2. We also thank the local residents, West Dunbartonshire Council, and Cordale Housing Association, Renton, for supporting this research, and the MRC research nurses for data collection and commitment to tracing participants.

Supplementary tables are available at <http://www.jech.bmj.com/supplemental>

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Funding: HT and MP are funded by the Chief Scientist Office of the Health Department, Scottish Executive. MP receives funding as part of the DH-funded Public Health Research Consortium. DM is employed by NHS Greater Glasgow. The questionnaire used in the study was developed as part of a pilot project funded by Scottish Homes (now Communities Scotland), led by Dr Anne Ellaway, MRC SPHSU.

Competing interests: None.

Ethical approval: This study was approved by the University of Glasgow Ethics Committee.

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Accepted 30 June 2006

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APPENDIX

APPENDIX A: QUESTIONS ABOUT HOUSING PROBLEMS

Looking at the options on the card, to what extent, in your opinion, is each of the following a problem in your home? (options “no problem”, “minor problem”, “serious problem”, “don’t know”)

Housing problems related to warmth: Dampness or condensation; draughty/leaky windows, keeping your home warm in winter; the heating system.

Other housing-related problems: the level of security; too few rooms; too many rooms; rooms too small; rooms too large; not enough privacy; noise from neighbours; noise from other household members; poor state of repair; hazards inside the home; hazards outside the home

THE JECH GALLERY

Better homes, better neighbourhoods

Interventions to improve housing are often part of broader area-regeneration activities. A programme of housing-led regeneration in a post-industrial village in West Dunbartonshire, at the foot of Loch Lomond in Scotland, involved housing association tenants moving from ex-council flats reported to have damp problems (fig 1), to newly built houses with private gardens (fig 2). Not only was the fabric of the new houses better, but also the neighbourhood regeneration involved general environmental improvements. These included aesthetic improvements, provision of children’s play areas and better street design. Levels of housing density were reduced by housing people in houses rather than in flats, and although the flats were not overcrowded, there was a small but statistically significant reduction in house occupancy (persons per room) when residents moved to their new house. A paper in this issue of *JECH* reports the findings of a prospective controlled study that evaluated the effects on health 1 year after residents moved to a new house: no marked health effects were reported.¹

The potential for positive health effects is often used as a rationale for public investment in neighbourhood regeneration.^{2,3} However, positive health effects should not be assumed to be the inevitable result of housing improvement.⁴ The results from our study raise questions about the complexity of the intervention and about the diverse mechanisms through which housing improvement may affect health.¹

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APPENDIX B: NEIGHBOURHOOD SCORE—AGGREGATE OF 21 ITEM QUESTIONNAIRE

Looking at the options on the card, which best describes how much of a problem the following are around where you live? (options “not a problem”, “a minor problem”, “a serious problem”, “don’t know”)

Vandalism; litter and rubbish; smells and fumes; assaults and muggings; burglaries, levels of security of houses; closes and back courts or gardens; disturbance by children or youngsters; speeding traffic; people drinking alcohol in public places; uneven or dangerous pavements; lack of public transport; level of police presences and speed of police response; safe children’s play areas; facilities for teenagers/young people; adequate street lighting; nuisance from dogs; people hanging around; reputation of neighbourhood; drug dealing and drug taking; noise—for example, factories, traffic, shouting; the people around here.

Figure 1 Ex-council flats with reported damp problems.

Figure 2 Newly built houses with private gardens and wider environmental improvements.