

GoWell is a collaborative partnership between the Glasgow Centre for Population Health and the University of Glasgow's Department of Urban Studies and the MRC/CSO Social and Public Health Sciences Unit, sponsored by Glasgow Housing Association, the Scottish Government, NHS Health Scotland and NHS Greater Glasgow and Clyde.

A large teal speech bubble shape containing the title text.

**Health effects  
of housing  
improvements**

A grey silhouette of a person's head and shoulders, positioned to the right of the teal speech bubble.

November 2015

GoWell is a planned ten-year research and learning programme that aims to investigate the impact of investment in housing, regeneration and neighbourhood renewal on the health and wellbeing of individuals, families and communities. It commenced in February 2006 and has a number of different research components. This paper is part of a series of Briefing Papers which the GoWell team has developed in order to summarise key findings and policy and practice recommendations from the research. Further information on the GoWell Programme and the full series of Briefing Papers is available from the GoWell website at: [www.gowellonline.com](http://www.gowellonline.com)

## Key findings / recommendations

- The time taken for housing improvements to show health effects varies by type of housing improvement.
- External fabric works (including insulation) had positive effects on physical and mental health. New 'Secured by Design' front doors had immediate, positive effects on mental health.
- New kitchens and bathrooms had a positive effect upon mental health.
- Central heating had no effect on mental health and a negative effect on physical health, which is surprising but supports other studies which have reported contradictory evidence.
- For people living in deprived areas, gaining employment had a substantial impact on physical and mental health and therefore holistic approaches to regeneration are recommended which include social as well as physical regeneration.



## INTRODUCTION

Despite long-established associations between housing conditions and health, the evidence linking *housing improvements* to changes in *health outcomes* is still sparse and is often either of low quality or comes from cross-sectional data<sup>1,2</sup>. In this report we present results from a recently published paper<sup>3</sup> focusing on changes over time in self-reported physical and mental health using a measure called SF-12.

Glasgow City Council's housing stock was transferred to an independent housing association, Glasgow Housing Association (GHA) in 2003 at which point an investment programme began to bring the stock at least up to the Scottish Housing Quality Standard (SHQS), in line with commitments made at the time of transfer<sup>4,5</sup>. Our study looked at the impacts of these works on the occupants' health.



## RESEARCH OBJECTIVES

The objective of the research was to establish whether there were any differences in the change in physical and mental health outcomes over time between those who did or did not receive four different types of housing improvements.



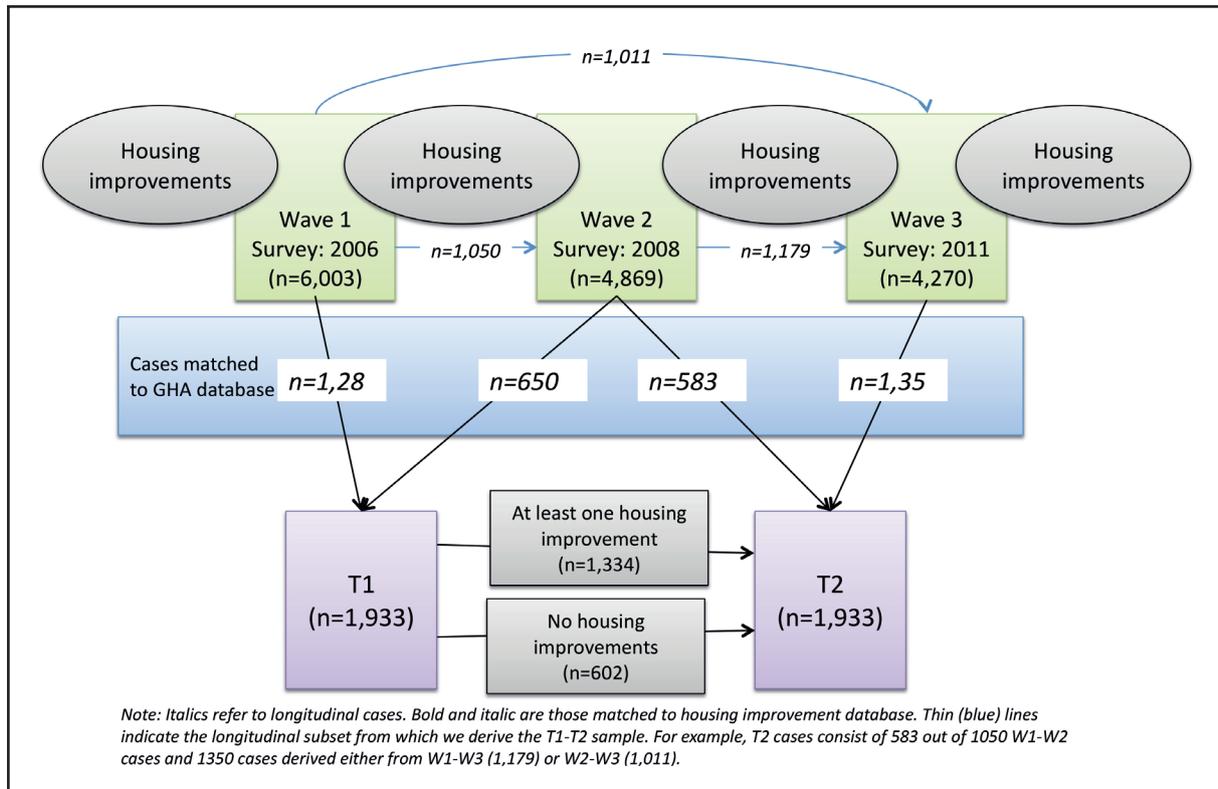
### ***Sample construction***

Our analysis draws upon three waves of survey data collected as part of GoWell, an ongoing study of the health and wellbeing impacts of regeneration across 15 of the most deprived communities in Glasgow. The surveys were conducted in 2006 (wave 1), 2008 (wave 2) and 2011 (wave 3) using a repeat cross-sectional design with a nested longitudinal cohort. Random samples of addresses were selected for interview across the study areas in waves 1 and 2. At wave 3 all previous addresses where an interview had been conducted were selected for the sample. In six areas where extensive demolition was taking place, all occupied dwellings were selected for interview at each wave. The surveys achieved response rates of 50.3%, 47.5% and 45.4%, respectively. Retrospective matching of names and addresses was used to identify the longitudinal cases embedded in the surveys, where we had interviewed the same householder in the same dwelling on more than one occasion.

We obtained GHA's records of all improvement works to properties since 2003, along with the dates of completion. The database covers predominantly GHA social rented housing, but also includes owner occupied dwellings within GHA buildings. Through this process, we derived a matched, longitudinal sample of 1,933 cases, comprising 9.5% of all GHA households in our study areas.

Figure 1 shows the embedded longitudinal cohort and demonstrates how we constructed the sub-sample for analysis.

**Figure 1: Construction of a matched longitudinal sub-sample.**



## Housing improvements

The types of works carried out to properties are shown in Table 1. GHA categorises works into nine types, split into external, internal and common works. We examined the effects of external and internal works; common works were extremely variable and rarely undertaken during our study period. We did not study the installation of new windows as too few had occurred in our sample. Therefore, we identified respondents who had received four types of works between the T1 and T2 interviews, across any of the survey interval pairings (W1-W2; W2-W3; W1-W3): *new kitchens and bathrooms plus rewiring (hereafter 'kitchens and bathrooms');* *central heating;* *front doors;* and *fabric works.*

From our sample, 1,334 households, (69%) received at least one of the four improvements between 2006-2011 compared with 55% of all GHA households in the study areas. This comprises 11.8% of all households (11,227) in the study areas who had at least one of these four improvements over the same period. Given the timings of our surveys, the survey interval ranges from two to five years, and the post-intervention follow-up period from less than one and up to five years.

**Table 1. Types of housing improvement works.**

Location	Category	Examples
External	High-rise fabric	Roof covering. Overcladding. Balcony repairs. Asbestos work.
	Low-rise fabric	Roof covering. Cavity-fill. Gutters and downpipes. Rendering. Repointing. Cladding or insulation.
	Doors Windows	'Secured By Design' doors. Double-glazed windows.
Common	Internal common works	Doors. Controlled-entry systems. Close painting. Lighting.
	Environmental Lifts	Various. Replacement.
Internal	Heating	Full central heating system. Boiler replacement. Hot-water tank.
	Kitchen, bathroom and rewiring	New kitchen and bathroom. Rewiring.

### ***Health outcome measures***

We used the SF-12v2 Physical and Mental Health Component summary scales (PCS-12 and MCS-12, respectively) as the outcome measures of interest, while controlling for the baseline (T1) score, effectively modelling the change in SF-12 over time, i.e. between the first (T1) and second (T2) interviews. The SF-12v2 is a validated questionnaire for measuring health-related quality of life; scores are computed from responses to 12 questions and range from 0-100, with higher scores indicating better health<sup>6</sup>. The physical and mental health scales are broad measures of self-rated health which are grounded in everyday language and experience and related to functional capabilities. Figure 2 summarises the 12 questions included in SF12.

**Figure 2: SF-12 Health questionnaire.**

- 1) In general would you say your health is Excellent, Very Good, Good, Fair or Poor?
- 2) Does your health limit you in these activities? If so, how much? (A lot; A little; Not at all)
  - a. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling or playing golf?
  - b. Climbing several flights of stairs?
- 3) During the past four weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (All of the time; Most of the time; Some of the time; A little of the time; None of the time)
  - a. Accomplished less than you would like
  - b. Were limited in the kind of work or other activities
- 4) During the past four weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling anxious or depressed) (All of the time; Most of the time; Some of the time; A little of the time; None of the time)
  - a. Accomplished less than you would like
  - b. Did work or other activities less carefully than usual
- 5) During the past four weeks did pain interfere with your normal work (including both work outside the home and housework). (Not at all; A little bit; Moderately; Quite a bit; Extremely)
- 6) These questions are about how you feel and how things have been with you during the past four weeks. How much of the time during the past four weeks:
  - a. have you felt calm and peaceful?
  - b. did you have a lot of energy?
  - c. have you felt downhearted and depressed?  
(All of the time; Most of the time; Some of the time; A little of the time; None of the time)
- 7) During the past four weeks how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives etc.) (All of the time; Most of the time; Some of the time; A little of the time; None of the time)

*Adapted from the SF-36 website<sup>7</sup>.*

We investigated whether there was any significant difference in the change in physical and mental health scores over time, dependent upon whether or not the survey respondents received housing improvement works in the interval.

 RESULTS

**Receipt of housing improvements**

Table 2 shows the number and proportion of our sample who had received housing improvements between two surveys. For example, overall, 25% of the sample had a new front door, including 8.3% who had *only* a front door while the remainder had doors in combination with other improvements as shown in Table 2. The most common housing improvement work in our sample was new kitchens, bathrooms and rewiring works with 36.5% of the sample receiving these.

**Table 2. Receipt of housing improvements.**

	Combined with:					
	On its own	Central heating	Doors	Fabric works	Kitchens and bathrooms	All variations
Central heating	70 (3.6%)	-	153 (7.9%)	169 (8.7%)	178 (9.2%)	374 (19.3%)
Doors	160 (8.3%)	153 (7.9)	-	185 (9.6%)	192 (9.9%)	483 (25.0%)
Fabric works	218 (11.3%)	169 (8.7%)	185 (9.6%)	-	220 (11.4%)	575 (29.7%)
Kitchens and bathrooms	331 (17.1%)	178 (9.2%)	192 (9.9%)	220 (11.4%)	-	706 (36.5%)

Number (% of total sample). n=1,933.

Table 3 shows the characteristics of the sample overall and separately for those who had no improvements and those who received each type of improvement.

**Table 3. Baseline characteristics of control and intervention groups.**

	Male (%)	Over 65 years (%)	Not working (%)	Educational qualifications (%)	Non-British (%)	PCS-12 $\bar{x}$ (SD)	MCS-12 $\bar{x}$ (SD)
Whole sample	39.5	28.3	82.3	19.5	13.7	46.57 (11.43)	47.91 (9.98)
<b>Control:</b> No improvements	37.2	27.8	76.9	21.8	11.4	46.70 (11.68)	47.35 (10.34)
<b>Intervention groups:</b>							
Kitchen and bathroom	39.2	29.5	84.9	16.9	7.1	45.69 (11.39)	48.05 (9.81)
Central heating	43.9	22.2	81.5	19.6	21.1	47.14 (10.82)	48.89 (9.86)
Doors	41.8	26.5	83.3	15.7	20.3	47.20 (11.06)	47.72 (9.73)
Fabric works	41.5	31.3	81.9	20.9	12.2	45.98 (11.12)	48.48 (9.41)

### **Housing improvements and health: results**

Figures 3 and 4 show the effect of each housing improvement on physical health (Figure 3) and mental health (Figure 4) after controlling for the respondent's baseline health status (SF12 at T1). The analysis also controls for the following: gender; age; education; nationality; change in employment status; wave pairing; whether the property is in a demolition area; and whether the property had any housing improvement prior to the first interview (T1).

The solid, blue bar shows the value of change in SF-12 score attributable to the housing improvement: above the horizontal line is a positive effect, below the line is negative. If the 'whisker' bar, which shows the confidence interval around the result, does not cross zero then the relationship is statistically significant. We can be reasonably confident that the true value of the change in SF-12 health score at T2 lies between the extremes on the 'whisker' bars. If this crosses zero then we cannot draw conclusions about the direction of the effect.

**Housing improvements and physical health**

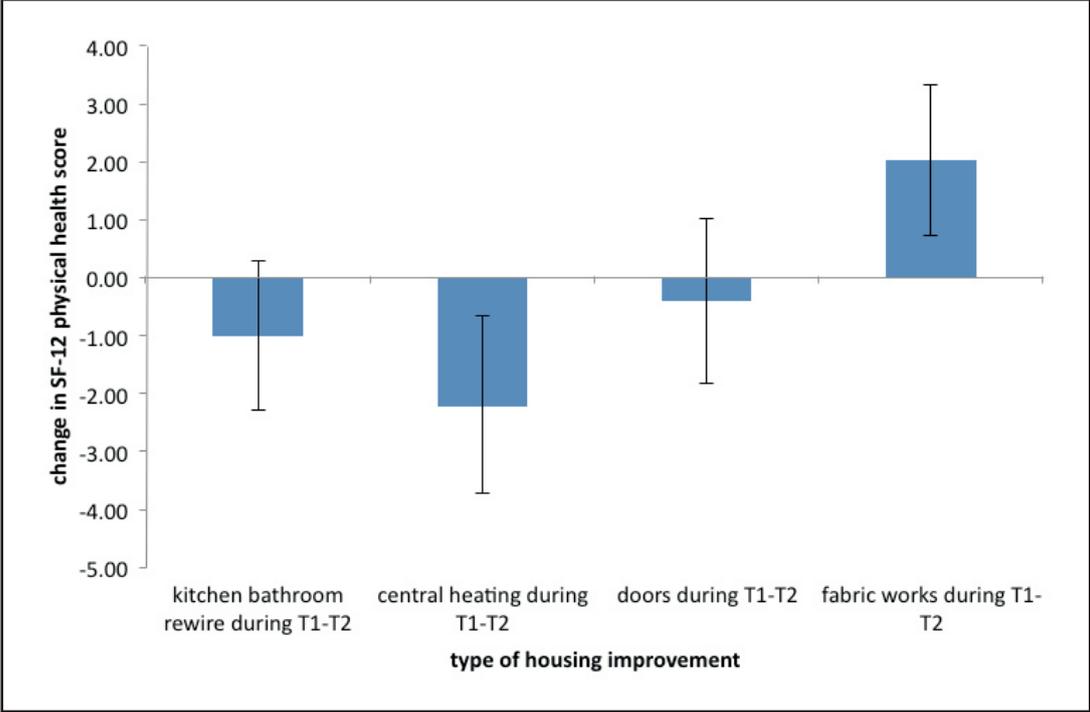
Figure 3 shows the relationship between each housing improvement and SF-12 physical health scores at T2.

There is no difference in physical health at T2 between those having doors or kitchens and bathrooms and those who did not have a housing improvement.

However, those who had central heating have a significantly *lower* physical health score at T2, meaning that central heating appears to have had a negative effect on physical health.

Conversely those who had fabric works have higher physical health scores at T2, so fabric works appear to have a positive effect on physical health.

**Figure 3: SF-12 physical health at T2 by housing improvement.**



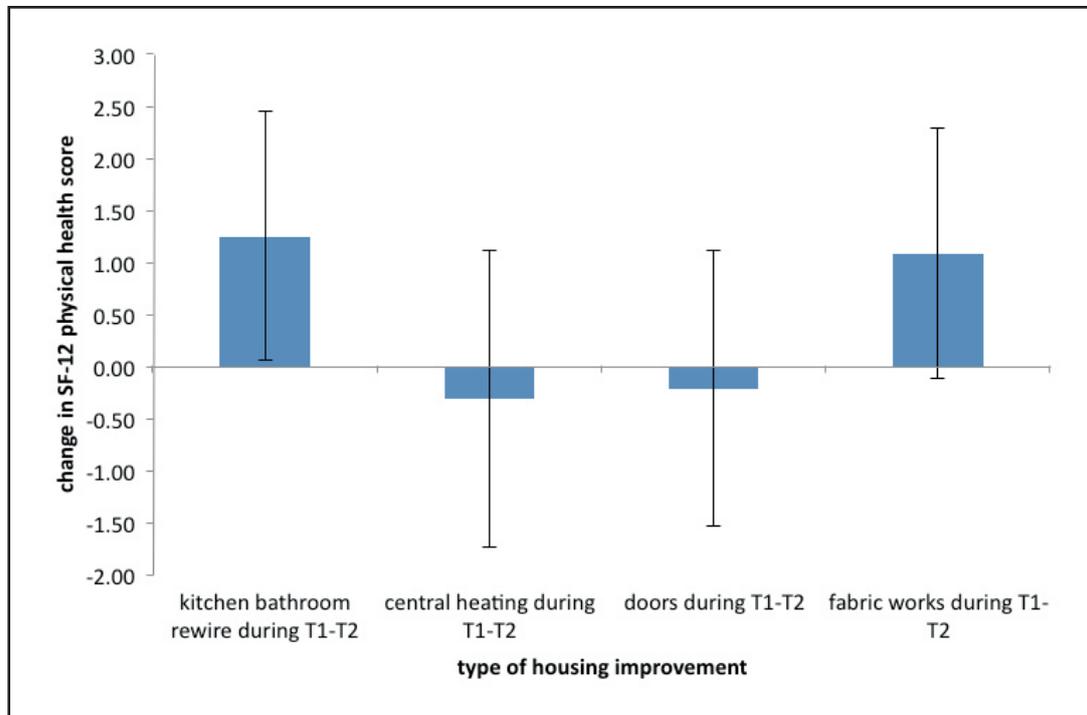
**Housing improvements and mental health**

Figure 4 shows the relationship between each of the housing improvements and mental health scores at T2. There is only one significant effect, those who had kitchens, bathrooms and rewiring have a higher SF12 mental health score at T2.

A similar positive effect of fabric works on mental health is very close to being statistically significant (the lower end of the whisker bar, or confidence interval, lies just below zero).

The overall effects of central heating and of new front doors upon mental health in this analysis are small and non-significant.

**Figure 4: SF-12 mental health at T2 by housing improvement.**



### ***Multiple housing improvements and health***

We also investigated the effects of multiple improvements using interaction terms in the statistical models. We found no significant effects of multiple improvements on physical health. For mental health there was a significant positive effect of having both a new front door as well as a new kitchen and bathroom.

### ***The timing of housing improvement impacts***

Finally we tried to establish whether there was any effect of the time between intervention and outcomes by creating dummy variables for time periods between the date of housing improvements and the T2 interview to establish whether there were differences in outcomes among those who have been living in improved homes for longer periods of time.

We found the positive effects of fabric works on physical health only occurred if we had interviewed the respondent within 1-2 years of having the housing improvement. We found a similar positive effect of fabric works within 1-2 years on mental health at T2.

Kitchens, bathrooms and rewiring had positive effects on mental health after 1-2 years and 3-5 years, relative to those who had the improvement for less than a year or not at all.

Central heating had a positive effect on mental health after 3-5 years, but not those who had it for less time.

Doors had a positive effect for those who had the improvement for less than a year, but not after longer periods of time.

### ***Other factors***

Other control variables in the models were also associated with health outcomes.

Those remaining in work or gaining employment over time had higher physical and mental health scores at T2, relative to those who remained in unemployment or became unemployed.

Female respondents had slightly lower mental health but higher physical health scores than men at T2.

Those aged over 65 had lower physical health but higher mental health scores at T2, compared with younger respondents.

Those who are non-British had higher T2 mental health scores than British respondents.

## **DISCUSSION**

Fabric works had a positive association with both physical and mental health. This appears to be a short-term effect, 1-2 years after the intervention. These findings may reflect two important aspects of fabric works. Firstly, fabric works include over-cladding and insulation, which makes homes warmer and more comfortable; this is important in the cold and wet climate of western Scotland. These improvements can potentially benefit both physical and mental health. The second important aspect of fabric works is the way that it brightens up the external appearance of run-down buildings, especially in locations where there are many improvements in the same neighbourhood. This may be an important aspect of the built environment for mental health in a climate with low levels of daylight<sup>8</sup>. Furthermore, previous research in Glasgow has shown a strong association between visual amenity of the built environment and mental wellbeing<sup>9</sup>.

New front doors had a substantial positive association with mental health within the first year after intervention, but not thereafter. This may reflect the immediate

perceived safety benefits provided by new doors in deprived areas where crime and antisocial behaviour, especially related to drug dealing and drunkenness, are significant concerns. All GHA doors and windows are installed to 'Secured by Design' (SBD) standards approved by the police to 'withstand reasonable levels of attack from housebreakers'. A recent study of GHA properties reported that housebreaking and attempted housebreaking fell in areas that had received SBD doors and windows<sup>10</sup>. A reduction in anxiety about crime and safety may be the source of immediate mental health gains from new doors, although this 'halo' effect appears not to last thereafter.

Our findings that central heating works had a negative association with physical health are curious, although other studies have found 'contradictory effects' of central heating on home satisfaction<sup>13</sup>. Installing heating systems is more disruptive to occupants than other works. Heating interventions are variable in nature so some heating interventions may be insufficient to counter the underlying trend of worsening physical health. GHA's investment programme aims to install new heating systems to all properties, but the level of need and 'potential to benefit' from this intervention may vary. Past studies which have found positive health effects from central heating have involved groups with an absence of heating beforehand, which was not generally the case in Glasgow. The positive association of central heating with mental health in the medium-term may reflect a period of getting over disruption, becoming used to the new equipment, and allaying concerns about costs, which practitioners thought were issues for occupants.

New kitchens and bathrooms had positive associations with mental health one year after the intervention and beyond, possibly indicating a cumulative effect after overcoming disruption and a period of adjustment to new facilities. This is the intervention where residents had an element of choice (in colour and layout) and therefore psychosocial benefits may be important. Our previous cross-sectional study showed that these internal works were associated with occupants' ratings of the internal quality of their dwelling, which in turn was positively associated with feelings of control and of status<sup>11</sup>.



## WHAT DOES THIS ADD?

Regeneration programmes are often 'property-led' as in Glasgow, and their insufficiency has been noted<sup>12</sup>. Housing improvements constitute the largest investment item within such programmes and we have shown that particular improvement works can affect the physical and mental health of occupants.

However, the gains are generally modest, particularly compared with the benefits upon health resulting from gaining employment; yet only a small group of our sample (5.4%) actually gained employment over time, while the vast majority (77.9%) remained out of work.



## RECOMMENDATIONS

Our findings relating the health improvements following housing improvements are modest. However, while housing improvements may not lead manifest improvements in individual health over the short term but improved and maintained housing stock should lead to longer term health improvements at the population level.

Although housing providers improve homes with the expectation of health gains they also aim to improve residential satisfaction and quality of life more generally. Our study highlights the central importance of employment to the health of residents in deprived areas, and supports a case for more attention to be paid to employment as part of regeneration, whether through economic, employability or health-improvement measures.



## REFERENCES

1. Howden-Chapman P, Isaacs N, Crane J, Chapman R. Housing and health: the relationship between research and policy. *International Journal of Environmental Health Research* 1996;6(3):173-185.
2. Thomson H, Thomas S, Sellstrom E, Petticrew M. Housing improvements for health and associated socio-economic outcomes. *The Cochrane Database of Systematic Reviews* 2013;2:CD008657.
3. Curl A, Kearns A, Mason P, Egan M, Tannahill C, Ellaway A. Physical and mental health outcomes following housing improvements: evidence from the GoWell study. *Journal of Epidemiology and Community Health* 2015;69(1):12-19.
4. Glasgow Housing Partnership Steering Group. *Better Homes, Stronger Communities: A Framework for Tenant-Led Change*, Glasgow: GHPSG; 2000.
5. Communities Scotland. *Scottish Housing Quality Standards Progress Report*. Edinburgh: Communities Scotland; 2007
6. Ware JE, Koninski M, Turner-Bowker DM, Gandek B. *How to Score Version 2 of the SF-12 Health Survey*. Lincoln, RI: Quality Metric Incorporated; 2005.
7. The SF-36 website. *Your Health and Well-being*. [http://www.sf-36.org/tools/pdf/SF-12v2\\_Standard\\_Sample.pdf](http://www.sf-36.org/tools/pdf/SF-12v2_Standard_Sample.pdf) (accessed September 2015)
8. Evans GW. The built environment and mental health, *Journal of Urban Health* 2003;80(4):536-555.
9. Bond L, Kearns A, Mason P, Tannahill C, Egan M, Whitely E. Exploring the relationships between housing, neighbourhoods and mental wellbeing for residents of deprived areas. *BMC Public Health* 2012;12:48.
10. Teedon P, Reid T, Griffiths P, et al. *Secured by Design Impact Evaluation: Key Findings*. Glasgow: Caledonian Environment Centre, Glasgow Caledonian University; 2009.
11. Clark J, Kearns A. Housing improvements, perceived housing quality and psychosocial benefits from the home. *Housing Studies* 2012;27(7):915-939.
12. Turok I. Property-led urban regeneration: panacea or placebo? *Environment and Planning A* 1992;24(3):361-379.



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This report has been produced on behalf of the GoWell team. The current GoWell team is as follows:

**Laura Baggley** (PA/Administrator)  
**Julie Clark** (Researcher)  
**Claire Cleland** (Researcher)  
**Joe Crossland** (Communications Manager)  
**Angela Curl** (Researcher)  
**Anne Ellaway** (Principal Investigator)  
**Ade Kearns** (Principal Investigator)  
**Louise Lawson** (Researcher)  
**Matt Lowther** (Ecological Monitoring Team)  
**Phil Mason** (Researcher)  
**Emma McIntosh** (Health Economist)  
**Jennifer McLean** (Ecological Monitoring Team)  
**Kelda McLean** (Programme Administrator)  
**Jill Muirie** (Ecological Monitoring Team)  
**Cat Tabbner** (Community Engagement Manager)  
**Carol Tannahill** (Principal Investigator)  
**David Walsh** (Ecological Monitoring Team)  
**Elise Whitley** (Researcher)

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## **CONTACT DETAILS**

For further information, please contact the report author:

*Dr Angela Curl  
Urban Studies  
University of Glasgow  
25 Bute Gardens  
Glasgow  
G12 8RS*

*Email: [angela.curl@glasgow.ac.uk](mailto:angela.curl@glasgow.ac.uk)  
Phone: +44 (0)141 330 2093*