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## Conference Paper

# Health begins at home? An RCT study to test the effects of a housing provider's health interventions

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# **Health begins at Home?**

## **An RCT Study to Test the Effects of a Housing Provider's Health Interventions\***

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# Health begins at Home?

## An RCT Study to Test the Effects of a Housing Provider's Health Interventions\*

Jemma Mouland (Family Mosaic), Paul Cheshire and Stephen Gibbons SERC & LSE

### Abstract

*Recent research has been increasingly showing that it is not the houses or the neighbourhoods in which people live that make them sick or poor: rather it is their personal characteristics (Cheshire et al, 2014). Still this does not mean that interventions aimed at occupants of social housing may not be effective in improving health. The structure of social housing provision in Britain means that there are many large social landlords. Landlords have particular access to their tenants and this paper presents the results of a Randomised Control Trial designed to evaluate the impacts of simple health interventions on the health of poorer residents over 50 living in 5 inner London boroughs. The study was carried out between February 2013 and May 2015. Participants were randomly divided into three groups: a control group (n= 186), a group receiving additional signposting to health services (n= 172); and a group receiving intensive support from a dedicated health and wellbeing support worker (n= 174). The intervention period was 18 months. The main outcomes measured were self-reported health and wellbeing ratings and NHS usage. Randomisation was computer-generated and participants and assessors were blinded to the allocation.*

*Perhaps the single most important finding was that the initial base line health evaluation revealed 25 (4.5%) of the total sample as having such severe health problems that significant and immediate intervention was required. This set of people was taken out of the trial and directed to treatment. In purely scientific terms this is unfortunate since it means that all intervention effects are likely underestimated since these were people whose health was critical. On the other hand it shows that the simplest possible intervention to a targeted group (older and poorer people), just an individual health status assessment, can produce significant health improvements. For the 95% staying in the trial significant effects were found for planned hospital usage, with the intensive intervention group's usage reducing by 39% in comparison to control group's increase of 11% ( $p= 0.004$ ). Significant effects were also found for nights in hospital where the signposting intervention's usage decreased (35%) significantly in comparison to the control group's increased usage (13%) ( $p= 0.022$ ). The intensive intervention group's usage in fact reduced more (62%) but variance was high (20.198), affecting significance. Substantive effects were identified for emergency GP usage, where group 3 reduced their usage by 15%, a substantive difference ( $p= 0.055$ ) to group 2's 181% increase.*

Key Words: Randomised Control Trial; Neighbourhood Effects; Health interventions

JEL Codes: I18:C93:R29

## 1. Introduction

There is overwhelming evidence for the prevalence of severe health inequalities between socio-economic groups. The Marmot Review (Marmot, 2010) brought much attention to such inequalities highlighting, for example, that people living in the poorest neighbourhoods in England will on average die seven years earlier than people living in the richest, and will on average spend 17 more years disabled. As has been extensively discussed elsewhere, however, the very powerful correlation between poor disadvantaged neighbourhoods and the incidence of ill-health does not demonstrate causation: or not causation in the sense that it is the fact of living in a disadvantaged neighbourhood that causes someone to have a higher probability of ill-health. A far more plausible causal link – and one for which there is substantial evidence – is that those with poor health or at greater risk of poor health have other characteristics, including in many cases the fact of poor health, that cause them to have low incomes. The result is that they are concentrated in cheaper housing and cheaper housing is geographically concentrated in ‘poor’ neighbourhoods. The end result is that such disadvantaged neighbourhoods have concentrations of people with a syndrome of associated characteristics including poorer health, disabilities, lower educational attainment etc. Together these characteristics of people lead them to have a higher incidence of unemployment and a higher risk of ill-health. For an extensive review of this evidence see Cheshire et al 2014 especially Chapter 4.

Registered Social Landlords house some of the most vulnerable citizens, and have a unique level of access to such people who are also typically excluded, or who may not be engaged with other public services. Whilst better quality housing may promote better health<sup>1</sup>, there is to date no evidence of which we are aware that landlords may be able to play a part in interventions effectively to promote improved health and wellbeing for their tenants. This study therefore aimed to fill this gap and explore the hypothesis that through their utilisation of their landlord status to gain access to tenants, higher rates of engagement could be obtained with vulnerable people to improve their health and well-being.

The study focused on providing interventions for a group of people aged over-50 who lived in socially provided ‘general needs accommodation’ in London. An older demographic was selected as the basis for this pilot project since this demographic group has the highest usage of NHS services and greatest health needs.

The key objective of this study was therefore:

- To test whether Family Mosaic, as a social landlord, could improve the health and wellbeing of their over 50s general needs tenant population.

The two services that were tested were:

- A signposting service from the Neighbourhood Manager (a frontline staff member responsible for managing a patch of properties).

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<sup>1</sup> ‘The cost of poor housing to the NHS’, BRE (2015) estimates costs of £1.4 billion to the NHS in first year treatments alone.

- An intensive handholding service from a specialised team of health and wellbeing support workers.

In the rest of this paper we first discuss the trial design and the interventions for each of the two treated groups. We then discuss the health outcomes measured, the sample and the process of randomisation. The process and set up of the study is presented in Section 3 and in Section 4 we describe the outcomes for the three groups: the control group and two treated groups. In the final section we discuss the implications of the study.

## **2. Methods**

### **2.1 Trial Design**

A parallel three-arm randomised control trial was used, with an even-split random allocation across three groups: a control group (Group 1), a lightly-treated, ‘signposted’ group (Group 2) and an intensively treated group (Group 3). Details of the interventions are described below. During the process of carrying out the first assessments, the allocation protocol was modified as a result of the unanticipated level of vulnerability amongst some participants.

The first stage for all participants was a base-line health check. At this initial stage some participants were identified as having conditions which posed an immediate threat to their health and wellbeing, even their life. This meant they could not risk being placed in either the control or signposted groups so they were removed from the study and placed in a sub-group 3b. This group were directed to their GP or hospital for treatment where necessary, but otherwise received the same services as those in group 3. People placed in this group do not form part of the main analysis since they were non-randomly drawn from the treatment and control groups based on their severe health needs. 15 individuals were identified at the point of first assessment, and a further 10 were identified either at, or before the 9 month assessment point. So in total 25 people – or some 4.5 percent of the population – were immediately identified on the basis of a simple health assessment as suffering serious, often life threatening conditions for which they were receiving no treatment.

### **2.2 Participants**

The eligibility criteria for participants were set as:

- Over 50s
- Living in a General Needs Family Mosaic property that is ordinary social housing – not housing aimed at the elderly or physically disabled. They did not have to be the main tenant.
- Living in the borough of Hackney, Islington, Hammersmith and Fulham, Kensington and Chelsea or Haringey

This data was gathered from Family Mosaic’s central database of all household data. Data on secondary household members is less comprehensive and so on occasions other eligible household members would be referred to us via lead tenants that we approached. There was no restriction on multiple household members taking part in the study, although there was in fact no example of multiple participants from the same household.

**Tables 1a: Health Status: Participants Compared to Borough and London Means**

Borough	Health Status		
	Good/Very Good	Fair	Bad/Very Bad
<i>Hackney (Borough)</i>	82.9	11.1	6.0
Hackney (Participants)	83.6	10.3	6.0
<i>Haringey (Borough)</i>	83.2	10.8	6.0
Haringey (Participants)	82.6	11.4	6.1
<i>Hammersmith &amp; Fulham (Borough)</i>	85.7	9.3	5.0
Hammersmith & Fulham (Participants)	80.6	12.9	6.5
<i>Islington (Borough)</i>	82.4	11.6	6.0
Islington (Participants)	83.3	10.5	6.2
<i>Kensington &amp; Chelsea (Borough)</i>	86.3	8.7	5.0
Kensington & Chelsea (Participants)	82.0	11.4	6.6
London Average	88.8	11.2	4.9

**Table 1b: Deprivation Index Status: Participants Compared to Borough & London Means**

Borough	Index of Multiple Deprivation Score*		
	Participant Mean	Difference from Borough Mean	Difference from London Mean
Hackney	31.6	3.7	-6.41
Haringey	37.8	-6.7	-12.53
Hammersmith & Fulham	35.6	-11.2	-10.34
Islington	31.7	0.9	-6.46
Kensington & Chelsea	33.5	-10.1	-8.30

\*The lower the score the worse the deprivation

Tables 1a and 1b show data on the health and Index of Multiple Deprivation (IMD). The health status measure is for the individuals; the IMD is for the Wards in which the participants resided relative to their Borough and London as a whole. . It was true that both health and deprivation indicators were worse for each of the five Boroughs in the study than they were for London as a whole although participants in both Hackney and Islington scored lightly better on the IMD than the mean for their Boroughs. Similarly the health status of participants although clearly worse than London as a whole was not always obviously worse than that for their Boroughs although the differences were more marked in the two most prosperous Boroughs, Hammersmith and Fulham and Chelsea and Kensington. Appendix Figure 1 maps the wards in which there are observations and indicates the class of each ward with respect to the IMD (darkest are worst off).

### 2.3 Interventions

Two types of interventions were tested in this study; a modest signposting and a full-treatment 'handholding' intervention.

The signposting intervention (group 2) was provided by the Neighbourhood Manager, the social housing provider’s frontline staff member responsible for managing the properties and tenancies within a given patch. The intervention entailed the Neighbourhood Manager reviewing the assessments carried out (see Section 2.4) and identifying any needs from these. They would then refer participants to a suite of interventions available (see Appendix One). Subsequent contact would then be on a quarterly basis either through phone or visit.

The handholding intervention (group 3) was delivered by a newly formed in-house team of Health and Wellbeing Support Workers. Support workers would review the assessment and would identify any potential needs or areas for intervention (see Appendix Two). Whilst the focus of the interventions remained largely similar to those received by group 2 participants, the means of accessing the services differed. Participants would be actively supported to engage with the relevant interventions, with support in doing so ranging from helping to make travel arrangements to actually accompanying participants to sessions to build their confidence in attending. Participants would be visited and their needs assessed by their support worker on anything from a weekly to monthly basis dependent on their level of need.

## 2.4 Outcomes

For the purposes of the analysis, participants were assessed twice<sup>2</sup>:

1. A baseline assessment at 0 months
2. Final assessment at 18 months

The baseline assessments were carried out in participants’ homes through a face-to-face interview. Due to problems in arranging meetings or getting access and the need to maintain participant goodwill if they were to continue in the study , some of the 9 and 18 month assessments were also carried out by phone and post. On all occasions where there was an ambiguity in self-completed assessments a member of the Health and Wellbeing Team would follow this up with the participant.

The majority of the assessments were carried out by in-house trained health assessors. Occasionally support workers also carried out assessments dependent on resource demands. Wherever possible the individual worker supporting a participant would not be the one to carry out the assessment.

Their primary outcomes assessed were:

**Table 2: Primary Outcome Measures**

Outcome group	Measures	Scale
	General health rating	5 point Likert scale

<sup>2</sup> An assessment was also carried out halfway into the study at 9 months. This was used as a check on progress and to refine action plans where necessary. The data from the 9 month assessment has not been used in this analysis due to some inconsistencies in data collection and recording.

Self-reported health outcomes	Average health rating (asked at beginning and end of survey, average of these taken)	0-10 numeric scale
Mental wellbeing	ONS Wellbeing measure <sup>3</sup>	0-10 numeric scale
	Short Warwick Edinburgh Mental Wellbeing Scale <sup>4</sup>	0-10 numeric scale
	Loneliness	0-10 numeric scale
NHS Usage	Planned GP appointments in last 6 months	Frequency
	Emergency GP appointments in last 6 months	Frequency
	Planned hospital appointments in last 6 months	Frequency
	Accident and Emergency attendances in last 6 months	Frequency
	Nights in Hospital in last 6 months	Frequency
Falls	Number of falls in last 6 months	Frequency
Self-reported activity and mobility ratings	Activity rating	0-10 numeric scale
	Mobility rating	0-10 numeric scale
Health Behaviours	Completion of breast cancer tests	Binary (yes/no)
	Completion of cervical cancer tests	Binary (yes/no)
	Completion of bowel cancer tests	Binary (yes/no)
	Smoking levels	5 point Likert scale
	Alcohol consumption	5 point Likert scale
	Completion of blood pressure test	Binary (yes/no)

Secondary outcomes looked at the impact of services on enabling people to better manage their back conditions and arthritis. There were also a set of questions around fuel poverty. Whilst primarily used as diagnostic tools for those in treatment groups, the outcomes were also assessed as part of the final analysis.

## 2.5 Sample size

The target sample size of 200 per group was judged to be large enough to allow for a small effect size (0.25) to be picked up (alpha = 0.05, power= 0.8) including an allowance for attrition. At an attrition rate of 20% the sample size would remain sufficiently large. In the event a final sample size of 532 was obtained.

<sup>3</sup> For further information see [http://www.ons.gov.uk/ons/dcp171778\\_319478.pdf](http://www.ons.gov.uk/ons/dcp171778_319478.pdf) [accessed 16/09/2015]

<sup>4</sup> For further information see <http://www.healthscotland.com/documents/1467.aspx> [accessed 16/09/2015]



The distribution of the final sample by group is shown in Table 3:

**Table 3: Distribution of Participants by Treatment Group**

<b>Group</b>	<b>Number</b>
Control (group 1)	186
Signposting (group 2)	172
Handholding (group 3)	174

There were a further 15 who, after the initial health assessment, were immediately removed from the study because of serious, untreated health problems (see Section 2.1).

## **2.6 Randomisation**

The entire process of random number generation and assignment was carried out through an automated function in the data entry system. A restricted randomisation was used, with a stratification by age (over and under 70) and gender. No blocking was used.

## **2.7 Blinding**

Assessors were not told about the assignment group of participants, but those providing support (either the neighbourhood manager or support worker) necessarily were.

Towards the end of the study it was not always possible to maintain truly blind assessments due to the assessors being in-house and thus occasionally interacting with participants or being aware of their cases. Due to demands on resources, support workers also occasionally carried out assessments, but never of their own client.

Furthermore, during the process of assessment, discussion of the participant's health sometimes resulted in a disclosure of treatment (for example, if a participant referred to their support worker). This was primarily an issue for those in group 3, whereas for those in group 2 and the control group the intervention difference was less marked.

## **2.8 Statistical methods**

After some preliminary exploration and discussion it was decided to use ANOVA/Mixed ANOVA as the preferred method for analysing the between-group differences in mean baseline outcomes and improvements in these outcomes during the trial. Non-parametric ANOVAs (Kruskal-Wallis) were also run on variables where there were outliers as a check on the ANOVA results. The results of the Mixed ANOVAs are reported except for those cases – in particular outcomes relating to NHS usage – where there was evidence of outliers and a contradiction with non-parametric results. In these cases non parametric Kruskal Wallis tests are reported.

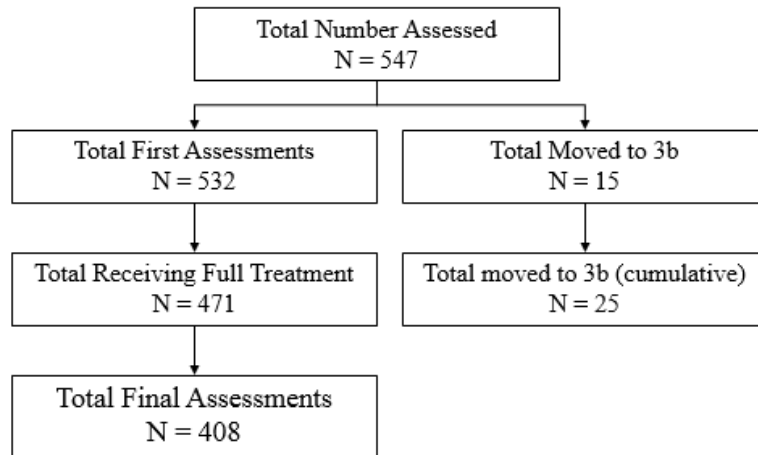
When handling categorical dependent variables, Chi-Square analysis was used with Phi and Cramer's as an estimate of effect size.

### 3 Results

#### 3.1 Participants

Overall, 77% of the original sample<sup>5</sup> was retained through to the point of final assessment. The main cause of sample attrition was the inability to make contact with participants to conduct their final assessment.

**Figure 1: Participant flow diagram**



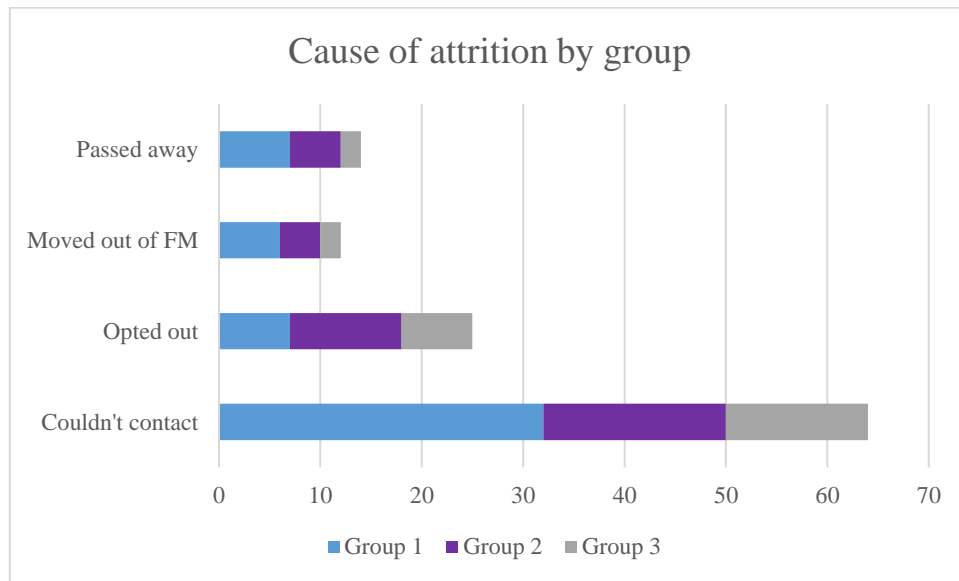
Causes and numbers of drop-outs by group are shown in Figure 2. The highest attrition rates were amongst the control group, followed by group 2: that is the groups who had least to gain by continued participation. The drop-out was perhaps not surprisingly most marked for those with whom contact could not be made on follow-ups. A Chi-Square Analysis did not reveal any of the differences in attrition rates or their causes to be statistically significant ( $p = 0.005$ ).

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<sup>5</sup> Excluding those moved to 3b

\* Excludes all drop-outs except those who contact could not be made with for the final assessment

Figure 2: Participant drop-out reasons by group



### 3.2 Recruitment

Recruitment to the study began in January 2013 through a process of mail-outs, phone calls and door knocking. The first assessments were carried out in February 2013. Recruitment continued for a period of 12 months in order to achieve a sample size as close to the original target of 600 as possible. Recruitment ended in February 2014 despite the sample still being below the target so as to ensure the study could be completed within a 3 year time frame.

Figure 3: Recruitment timeline



The trial continued for a period of 29 months, with all final assessments being completed by May 2015. The intended assessment timeframe was 18 months but because of unexpected difficulties with some final assessments some had to be carried out beyond an 18 month period. In order to minimise retention problems and ensure access to participants some assessments were also brought forward. As a result of these adjustments, on average each

participant was in the study for a period of 606 days (approx. 20 months). However those receiving an intervention, only received it for 18 months. The duration of participation was even across groups, with group 1 and 3 participants being in the study for an average of 605 days and group 2 608 days.

### 3.3 Baseline data

Overall, analysis of the baseline data for participants identified no statistically significant differences across the groups.

**Table 4: Participant demographics by groups**

	<b>Total (n)</b>	<b>Average Age</b>	<b>Female</b>	<b>Black and Ethnic Minorities</b>
<i>Group 1</i>	186	64	63%	65%
<i>Group 2</i>	172	65	70%	72%
<i>Group 3</i>	174	64	67%	67%
<b>Between groups difference (p value)</b>		0.771	0.854	0.348

A total of 94% of the original 532 (that is excluding the 15 transferred to group 3b after their initial assessment) participants identified themselves as suffering from one or more long-term health conditions, with on average each suffering from three. On average participants rated their health 'fair'<sup>6</sup>.

**Table 5: Averages on key health variables by groups**

	<b>Group one</b>	<b>Group two</b>	<b>Group three</b>	<b>Between groups difference (p value)</b>
<i>No. long-term health conditions</i>	3	3	3	0.960
<i>General health rating</i>	3	3	3	0.462
<i>SWEMWB rating (35= max)</i>	24	25	25	0.625
<i>ONS wellbeing rating (40= max)</i>	23	23	23	0.933
<i>Loneliness rating (5= not lonely)</i>	4	4	4	0.890
<i>Planned GP appointments</i>	654	726	693	0.226
<i>Emergency GP appointments</i>	84	42	66	0.182
<i>Planned hospital appointments</i>	369	446	554	0.253
<i>A&amp;E attendances</i>	70	68	47	0.500
<i>Nights in hospital</i>	175	205	148	0.286
<i>Falls (in 6 months)</i>	2	2	2	0.533
<i>Activity levels (10= highly active)</i>	6	5	6	0.097
<i>Mobility levels (10= highly mobile)</i>	7	7	7	0.230

<sup>6</sup> In general, how would you rate your health? (Census, 2011)

In a 6 month period all participants together made, a total of 2073 planned visits to their GP, 192 emergency visits to their GP, 1369 planned hospital appointments, 185 visits to A&E and spent 528 nights in hospital.

Table 5 illustrates a full breakdown of participants' baseline health on key variables by group.

### 3.4 Numbers analysed

Analysis was undertaken on two separate datasets. An as-treated (AT) analysis was conducted on the 408 sample dataset for all those who completed their time in the study. An intention-to-treat (ITT) analysis was conducted on an imputed dataset for the 532 participants with a valid first assessment.

The ITT dataset was produced through multiple imputation, where missing data points were replaced with substituted values calculated through the expectation-maximisation (EM) algorithm. A Little's test was conducted and there was no evidence to suggest that data was not Missing Completely At Random (Chi-Square = 48182.277, DF = 49747, p= 1.000). Some invalid data points were produced by the imputation (some slightly negative scores on the NHS usage for example) but on rounding to one decimal place virtually all negative values became zeros, and so this imputation was treated as valid.

**Table 6: Total numbers analysed by group for ITT and AT analysis**

	<b>Intention to Treat</b>	<b>As Treated</b>
<i>Group 1</i>	186	133
<i>Group 2</i>	172	128
<i>Group 3</i>	174	147

The outcomes below are drawn from the ITT analysis since this is judged to be a more robust analysis which reduces potential issues of bias in the sample. For purposes of comparison, the results of the AT analysis are reported on in section 3.6.

### 3.5 Final Outcomes

This section summarises the findings of comparisons between the baseline and final assessment scores for each group on a range of indicators.

#### *Health ratings*

On self-reported health ratings, two measures were used; a general health rating out of five (very good to very poor) and an average health rating (out of 10) which was taken at the beginning and end of the survey. This latter score was calculated by taking an average of the two responses to the question.

There was a general, albeit slight (within 1 decimal point), improvement in scores across the groups but the ANOVA analysis identified no significant difference (general health, p= 0.674, average health p= 0.487).

### Wellbeing ratings

#### Short Warwick Edinburg Mental Wellbeing (SWEMWB) Scale

Whilst group 3 witnessed a slight improvement in their SWEMWB (+0.21), both groups 1 (-0.1) and 2 (-0.9) experienced a decline. ANOVA analysis revealed a substantial interaction between study group and time ( $F_{(2, 529)} = 2.593$ ,  $p = 0.076$ ,  $n^2 = 0.01$ ). Post-hoc analysis identified significant differences between groups 2 and 3 ( $p = 0.019$ ) with group 2's wellbeing being on average 1.5 ( $\pm 1.3$ ) points lower.

#### ONS Wellbeing Scale

There was a general decline in ONS scores across the groups, but we found no significant differences between groups for the ONS wellbeing measures, ( $F_{(2,525)} = 1.029$ ,  $p = 0.358$ ,  $n^2 = 0.004$ ).

#### Loneliness and connections to community

Slight but not statistically significant improvements in loneliness scores, but reductions in scores on connection to community were witnessed across all groups. The measures used for loneliness and social isolation are however less reliable indicators of wellbeing as they are not validated measures. ANOVA analysis revealed no significant differences for loneliness ( $F_{(2,525)} = 0.717$ ,  $p = 0.489$ ,  $n^2 = 0.003$ ) or social isolation ( $F_{(2,525)} = 1.10$ ,  $p = 0.334$ ,  $n^2 = 0.004$ ).

### NHS usage

Analysis of the difference in usage of individual NHS services revealed three significant results. A Kruskal-Wallis test revealed significant differences on emergency GP visits, planned hospital appointments and nights in hospital. These findings are explored in more detail below.

**Table 7: Baseline and Final NHS Usage per Person and Kruskal-Wallis tests**

	<i>Planned GP visits</i>	<i>Emergency GP visits</i>	<i>Planned Hospital appointment</i>	<i>A&amp;E attendances</i>	<i>Nights in Hospital</i>
<b>Group 1</b>					
<i>Baseline</i>	3.52	0.45	1.98	0.38	0.94
<i>Final</i>	3.67	0.55	2.20	0.33	1.10
<i>%Change</i>	4.28	22.62	11.11	-13.16	17.14
<b>Group 2</b>					
<i>Baseline</i>	4.22	0.24	2.59	0.40	1.19
<i>Final</i>	4.42	0.55	2.50	0.33	0.79
<i>%Change</i>	4.68	129.16	-3.47	-17.50	-33.66
<b>Group 3</b>					
<i>Baseline</i>	3.98	0.38	3.18	0.27	0.85
<i>Final</i>	3.55	0.32	1.94	0.28	0.33
<i>%Change</i>	-10.97	-15.15	-38.99	2.13	-61.49
<i>Kruskal-Wallis independent samples tests for differences between groups in change in NHS usage</i>					
<i>H statistic</i>	1.598	5.704	10.746	1.175	7.655
<i>p-value</i>	0.450	0.058	0.005	0.556	0.022

On planned hospital appointments, group 3's reduced usage (by 216 appointments or 1.24 per person) against group 1's increased usage (by 41 appointments, 0.22 per person) amounted to a significant difference ( $p= 0.004$ ). The difference between group 3 and 2 was also substantial ( $p= 0.065$ ), where group 2's usage reduced by 16 appointments (0.09 per person).

**Table 8: Planned hospital appointments: Kruskal-Wallis pairwise comparisons**

Group comparison	Test statistic	Std. Error	Test Statistic	p-value	p-value (Bonferroni adjustment)
Group 1- Group 2	13.406	16.081	0.834	0.404	1.000
Group 3- Group 1	50.979	16.032	3.180	0.001	0.004
Group 3 - Group 2	37.573	16.345	2.299	0.024	0.065

On comparing nights in hospital, group 2 showed significantly fewer (by 68 nights in total) in hospital in comparison to group 1 who increased their usage by 30 nights. This seems to have been a product of the high variance in outcomes for group 3 (20.217), for whom there was in fact a larger reduction in nights spent in hospital (a total of 91 nights).

**Table 9: Nights in hospital Kruskal-Wallis pairwise comparisons**

Group comparison	Test statistic (H)	Std. Error	Test Statistic	p-value	p-value (Bonferroni adjustment)
Group 1- Group 2	37.765	14.106	2.677	0.007	0.022
Group 3- Group 1	26.744	14.064	1.902	0.57	0.172
Group 3 - Group 2	-11.021	14.338	-0.769	0.442	1.000

On emergency GP visits, group 3 reduced their usage by 15 percent (10 appointments) against group 2's 124 percent increased usage (52 appointments). This reduction was statistically significant ( $p= 0.045$ ). The control group increased their visits by 23 percent (19 appointments) but this did not emerge as significantly different to group 3. Group 2's usage was also not significantly different from the control group's.

**Table 10: Emergency GP appointments Kruskal-Wallis pairwise comparisons**

Group comparison	Test statistic (H)	Std. Error	Std. Test Statistic	p-value	p-value (Bonferroni adjustment)
Group 1- Group 2	-22.839	15.008	-1.522	0.128	0.384
Group 3 -Group 1	13.158	14.963	0.879	0.379	1.000
Group 3- Group 2	35.997	15.254	2.360	0.018	0.055

### *Falls*

The average number of falls per person remained stable at 2 across the groups so obviously there were no significant differences ( $F_{(2,525)} = 0.778$ ,  $p = 0.251$ ,  $n^2 = 0.001$ ).

### *Activity and mobility*

Looking at self-reported activity and mobility ratings, scores remained stable across time across all groups and no significant differences were identified (Activity:  $F_{(2,525)} = 0.162$ ,  $p = 0.851$ ,  $n^2 = 0.001$ ., Mobility:  $F_{(2,525)} = 2.138$ ,  $p = 0.119$ ,  $n^2 = 0.007$ ).

### *Health behaviours*

A Chi-Square analysis revealed no significant differences between groups on completion of breast ( $X^2_{(4)} = 0.103$ ,  $p = 0.273$ ), bowel ( $X^2_{(2)} = 1.444$ ,  $p = 0.486$ ) or cervical ( $X^2_{(4)} = 4.617$ ,  $p = 0.099$ ) cancer tests.

### *Secondary Outcomes*

A Chi-Square analysis found no significant differences ( $X^2_{(4)} = 2.125$ ,  $p = 0.713$ ) between the groups on fuel poverty (that is whether people struggled to pay for their fuel bills).

ANOVA analysis of pain-scores on both back pain and arthritis revealed no significant differences ( $F_{(2,525)} = 1.023$ ,  $p = 0.360$ ,  $n^2 = 0.004$ .,  $F_{(2,525)} = 0.782$ ,  $p = 0.694$ ,  $n^2 = 0.002$ ).

## **3.4 Group 3b**

Whilst it is not possible to provide a robust statistical analysis of the data, because of the small sample size and transparent selection bias, the data from those moved to group 3b was also analysed. In some ways the finding that in a group of randomly selected social housing tenants aged over 50, some 4.5 percent had urgent – in most cases life-threatening but untreated health problems - is both the most interesting and most disturbing revealed by the whole study.

Results are shown in Table 12. Across all measures the participants allocated to group 3b improved. There were improvements on wellbeing scores, self-reported health and activity/mobility ratings and reductions in all forms of NHS usage. As for the intensively treat group, group 3, the most notable change in NHS usage was in planned hospital appointments, with a net reduction of 58 appointments across all the 25 group 3 participants. Other notable



changes included the improvements in wellbeing, particularly on the ONS rating (increased average score by  $7 \pm 1.9$ ).

**Table 11: Mean differences for group 3b**

	<b>Average change in scores (over 18 months)</b>	<b>Standard Error</b>
General health	0.4	0.2
Planned GP appointments	-1.2	1.3
Emergency GP appointments	-0.5	0.2
Planned hospital appointments	-2.2	1.9
A&E attendances	-0.4	0.2
Nights in hospital	-0.9	0.9
ONS score	6.6	1.9
SWEMWB score	1.0	1.6
Loneliness score	0.2	0.5
Community connection score	0.3	0.2
Falls score	-0.5	0.7
Activity score	1.1	0.7
Mobility score	1.0	0.9

### 3.6 Supplementary Analysis

#### *Interventions*

The impact of different types of services and interventions was also assessed, although the data on interventions is incomplete due to issues with record keeping. Holding group and other interventions constant, significant interactions were identified between information provision (such as the activities timetable or healthy eating advice) and planned GP appointments. Those receiving information increased their GP attendances by an average of 2 visits within a 6 month period ( $B= 1.88, p= 0.027$ ).

Significant interactions were also identified between attendance at activities (both those run by Family Mosaic and those available in the local community) and self-reported health ratings, with those attending activities reporting slightly lower levels of general health in their second assessment ( $B= -0.369, p= 0.005$ ).

In all cases, when group and interventions were not held constant the same trend remained. Further, when interventions were not held constant, significant interactions between repairs and housing-related interventions with SWEMWB scores emerged ( $B= -1.074, p=0.063$ ).

#### *As-treated analysis*

An as-treated analysis was also carried out as a point of comparison. Within the as-treated analysis the only outcome where significant differences were identified between the groups was for planned hospital appointments ( $F_{(2, 391)}= 5.366, p= 0.05$ ) and SWEMWB scores ( $F_{(2, 391)}= 3.790, p= 0.023$ ).

### *Sensitivity analysis*

Due to the high number of outliers within the NHS data, a sensitivity analysis was also run to assess for the impact of these extreme values. The extreme values have been kept in the main analysis as the qualitative evidence provided around these values (assessors were asked to provide details of the attendances) confirmed that these were genuine data points. Further, the size of the samples means that such outliers should occur relatively evenly across the groups.

Significant differences remained for planned hospital appointments but not for other variables. A Kruskal-Wallis analysis identified significance for a dataset trimmed by 2 and 10% for planned hospital appointments, with planned hospital appointments being significantly lower for group three than group one ( $H_{(2)}= 43.078$ ,  $p= 0.013$ ,  $H_{(2)}= 46.102$ ,  $p=0.016$ ).

### *Harms*

The only significant adverse effect identified was for group 2 on their SWEMWB score. Feedback from staff delivering the service highlighted the difficulties in delivering health and wellbeing interventions, both in terms of time available and the limited involvement entailed. Signposting in isolation was not felt to be enough to translate into actual action, with a resultant sense that participants may have felt frustrated by becoming aware of services which could potentially be helpful, but feeling uncertain or unable to actually take advantage of them.

Qualitative analysis of the reflections gathered from participants at the end of the study support this hypothesis, with the main difficulty and negative experience of participants being that they had difficulties in attending activities (mainly due to timing or location) and that more support would have been beneficial. By contrast, this was infrequently mentioned by those in group 3, suggesting that having a support worker helped to overcome these issues.

## **4 Conclusions**

It is useful to put this study and its participants into context. The participants were drawn from the tenants aged over 50 living – apparently successfully – in decent social housing provided by a housing association with a substantial waiting list. These participants, although disadvantaged, were far from representing the most vulnerable in society. As was discussed in section 2.2 their status on the Index of Multiple Deprivation or health indicators was below that of the London average and in most – but not all cases – below that of their Borough averages. Nevertheless a simple health assessment revealed that 4.5 percent of the participants needed immediate health interventions. This it seems to us is a worrying finding. In many cases the participants with urgent health needs were not registered with a GP but attended A & E when they had a health crisis. This finding suggests not only a lack of co-ordination in health provision but the possibility of a useful role for social landlords as agencies for improving the health of their tenants while saving significant National Health Service resources. This warrants further investigation.

Overall, whilst results were mixed, the analysis revealed evidence of a positive impact from the more intensive, handholding support provided by the health and wellbeing team, particularly on planned hospital usage. By contrast, there was no evidence of a positive effect from the sign-posting intervention even some indication that this intervention might in fact have a negative impact on wellbeing.

The main limitations of the study concerned the assessments questions, which were designed to be broad so as to encompass all potential outcomes of the intervention. The study would have benefited from using a more standardised measure to assess outcomes to enhance the objectivity of the results. The inability to access objective NHS data was also a significant limitation. As a result the study had to rely on inevitably imperfect recall of hospital usage. There is likely also to be a degree of bias in the sample, with those with higher subjectively felt health needs being more likely to be willing to participate. This may be reflected in the difference between the responses to the initial scoping survey of 360 over 50s residents, where only 71% ( $\pm 4.97\%$ ) reported a one or more long term health conditions, compared to 92% ( $\pm 2.27\%$ ) of the study sample.

The sample obtained was representative of the broader over 50s general needs London tenant population in terms of age, gender and ethnicity making the generalizability of the findings strong. The only potential bias is the higher health needs of the sample population, although it is arguable that only those with higher health needs would choose to engage with the service in practice.

Other studies (for example, Bardsley *et al.*, 2015; or Elkan *et al.*, 2001) have indicated the challenges in identifying significant changes in health when evaluating community-based interventions for older people. This is particularly the case with a new service. This was evidently the case within this study, where the service continued to develop throughout.

The Nuffield Trust's review of the Older People Projects identified no significant changes around acute usage (the usual priority for such interventions due to the associated costs), but did find evidence for reduction in planned hospital admissions and outpatient attendances, which are asserted as potential early indicators of a change in emergency care usage. This pattern is reflected in the findings from this study and so further exploration of whether this eventual reduction in acute usage emerges would be beneficial, as would further exploration of how to develop and refine the interventions offered by the health and wellbeing team.

Feedback from staff in the health and wellbeing team highlighted several directions for the future development of the service. One potential harm they identified was the growing sense of reliance engendered amongst some of the participants as a result of the length and intensity of support provided. It was felt that shorter-term interventions would be more beneficial, and cost effective, in supporting independence, self-management and more sustainable changes in health.

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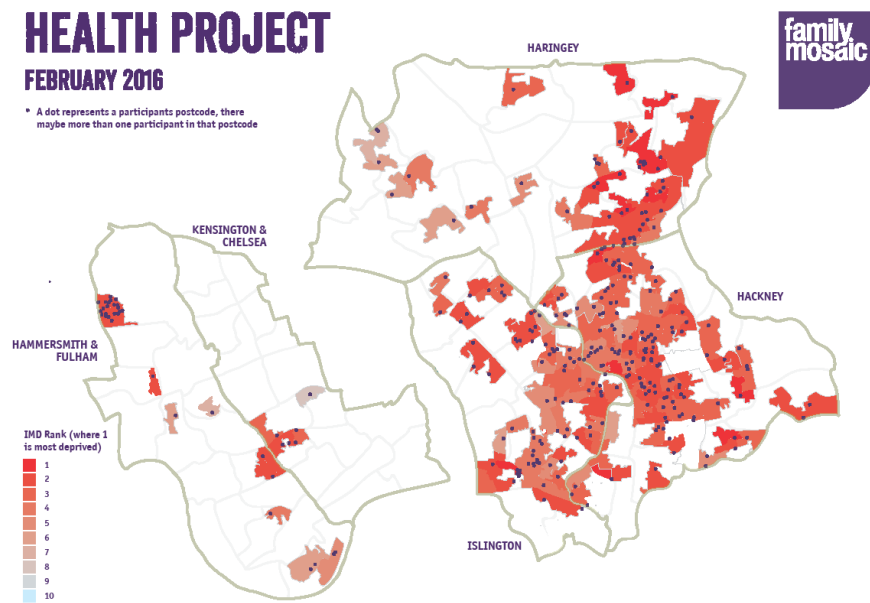
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Appendix Figure 1: Location of Participants and Ward Index of Multiple Deprivation



### **Appendix 1: Group 2 Interventions on Offer**

1. Sign post to GP or other health service.
2. Sign post to community groups/social activity (non- FM)
3. Signpost to Social and Financial inclusion team -welfare rights
4. Signpost to Social and Financial inclusion team –employment team
5. Signpost to Social and Financial inclusion team –social inclusion
6. Refer to gas team/boiler repair/energy advice/draft proofing
7. Refer to handyman service
8. Refer to Housing Options team
9. Report repair
10. Advice around home safety, including warmth/condensation and slips, trips and falls hazards
11. Advice and support around areas of general health (Diabetes, blood pressure, BMI), back pain and mobility or mental health
12. Provide direct minor assistance around home e.g. change light bulbs
13. Complete grant application

### **Appendix 2: Group 3 Interventions on Offer**

1. Support access to GP or other health service:
  - a) GP
  - b) IAPT
  - c) Occupational therapy
  - d) Physiotherapy
  - e) Other acute or community hospital service
  - f) Other NHS mental health service
  - g) Other health related service (provided by community or third sector organisation)
2. Support access to community groups/social activity (non- FM)
3. Support access to Social and Financial inclusion team -welfare rights
4. Support access to Social and Financial inclusion team –employment team
5. Support access to Social and Financial inclusion team –social inclusion
6. Refer to gas team/boiler repair/energy advice/draft proofing
7. Refer to handyman service
8. Refer to Housing Options team
9. Report repair
10. Advice around home safety, Inc. warmth/condensation and slips, trips and falls hazards
11. Advice and support around areas of general health (Diabetes, blood pressure, BMI), back pain and mobility or mental health
12. Provide direct minor assistance around home e.g. change light bulbs