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Title:

Socio-demographic influences on referral, uptake and attendance in Physical Activity Referral Schemes

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Exercise referral – uptake – attendance – socio-demographic

## **Abstract**

**Objective** To explore participant characteristics in relation to access, uptake and participation in a Physical Activity Referral Scheme (PARS).

**Design** Prospective population-based longitudinal study.

**Setting** Countywide PARS in a largely rural County.

**Participants** 3568 participants living within Somerset who were referred to PARS during a three-year period, May 2000 - May 2003.

**Main outcome measure** Participant age, gender, and the deprivation level and rurality of their area of residence. Characteristics were first compared with the County population. Logistic regression analyses then identified the participant characteristics associated with referral uptake and completion ( $\geq 80\%$  attendance).

**Results** The proportion of female participants was above the county average (61.1% vs. 51.4%). Referrals increased markedly with age from 7.8% (<30 yrs) to 27.1% (50-59 yrs), dropping off sharply thereafter ( $\geq 60$  yrs). The mean deprivation level in participants was above the county average (0.33 vs. 0.00,  $p < 0.001$ ). Referral uptake ( $n=2864$ ) was most likely in participants aged 60-69 yrs (Odds Ratio (OR) 2.41, 95% Confidence Intervals (95%CI) 1.70 to 3.42) and least likely for those in rural villages (OR 0.67, 95%CI 0.53 to 0.85) and the most deprived quartile (OR 95%CI 0.57, 0.45 to 0.74). For participants who took up referral, women were less likely to complete than men (OR 0.82, 95%CI 0.68 to 0.99) and the over-seventies were three times more likely to complete than the under-thirties (OR 3.22, 95%CI 1.93 to 5.39).

**Conclusions** The PARS format may be inappropriate for younger adults or people living in relative deprivation and rural areas. PARS appear more appropriate for adults of middle-to-old age who are more likely to require supervision.

## **Introduction**

Increasing recognition of the role of physical activity in improving public health has resulted in a large amount of research and policy aimed specifically at physical activity promotion.<sup>1 2</sup> General practice has responded with the development of Physical Activity Referral Schemes (PARS), which have become arguably the most prevalent primary care-based physical activity intervention.<sup>3</sup> However, as a result of inadequate recording of participant characteristics in PARS research, and recommendations to use the randomised controlled trial (RCT) approach to evaluation, it is not yet known which members of the population they are most appropriate for.<sup>4</sup>

Recent guidance recommended a halt to further use of PARS other than for controlled research.<sup>5</sup> It is certainly important to further explore the long-term effects of PARS on physical activity behaviour and health outcomes. Yet scheme effectiveness is likely to be influenced by the characteristics of the individual referred and whether the PARS model is appropriate for them. It is, therefore, important to determine who gets referred and who participates to enable more appropriate participant targeting.

Gaining insight into factors associated with scheme effectiveness is possible with the use of a population-based longitudinal study, an approach largely ignored in PARS research to date. To our knowledge, only one such study has been published for UK data.<sup>6</sup> The aim of this study was to explore individual participant characteristics in relation to access, uptake and participation in PARS.

## Methods

### Sample

This study used data routinely collected on all participants referred to a Somerset-wide PARS between May 2000 and May 2003. Exclusions were necessary for the purposes of analyses (fig 1). A more detailed description of this particular PARS can be found elsewhere.<sup>3 7</sup>

\*\*\*\*\* Fig 1 Cohort profile\*\*\*\*\*

### Assessment of participant uptake and participation

Details of all referred participants were sent by referring health professionals, mostly GPs (72.4%) and practice nurses (13.1%), to the PARS co-ordinator. Participants were then contacted and either assigned to a leisure provider or were removed.\* Removals were for medical reasons (RMed); psychosocial reasons (RPsych); or because they could not be contacted (NC). For all those assigned to a leisure provider, uptake of referral (attendance of  $\geq 1$  session), and subsequent attendance levels were recorded by the supervising exercise professional and participants were categorised accordingly (table 1).

\*\*\*\*\*Table 1 Categories used to determine uptake and participation outcomes\*\*\*\*\*

### Assessment of socio-demographic characteristics

Data collected by health professionals at the point of referral included participant age, gender, address and postcode. Postcodes were verified (Quick Address™, v2.0) and used to characterise Output Areas (OA) in which participants lived. Output Areas are the smallest geographical units for area-level analysis (mean 299 residents), designed to maximise population homogeneity and minimise variation in OA size.<sup>8</sup> Census 2001 data on car ownership, housing tenure, economic activity, and household occupancy were obtained for each OA in the county and used to construct the Townsend score of material deprivation.<sup>9</sup> The Index of Multiple Deprivation (IMD) 2004<sup>10</sup> was also used, although data were only available at Super Output Area (SOA) level (mean 1500 residents).

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\*Participants were excluded from further participation in the scheme.

### **Assessment of rural-urban characteristics**

As the current PARS was based in a relatively rural county, rurality was measured using the Rural and Urban Area Classification 2004.<sup>11</sup> Each OA was classified as urban or rural ( $\geq$  or  $<10,000$  residents within the settlement within which the OA resides). The rural category was further subdivided, creating a four-category variable. Participants' areas of residence were then classified according to their OA.

### **Statistical analysis**

Analyses were performed using SPSS version 12 (SPSS, Inc., Chicago IL). To determine bias in exposure, comparisons were made between the referred participants and the County population. Age, gender, and rurality were compared using chi-squared difference tests, whereas Mann-Whitney tests were used to identify potential differences in deprivation. Logistic Regression was used to identify characteristics associated with uptake and participation (four models).

Four independent variables were entered into each regression model: age<sup>†</sup>, gender, deprivation, and rurality. Analyses were repeated using different measures of deprivation and rurality, and using continuous and categorical variables for age and the Townsend score. Finally, regression analyses were repeated using each of the four Townsend z-scores in turn (data not presented).

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<sup>†</sup> Age was not included in Model 1 as age data were missing for most of the 'No Contact' group (183 out of 195).



## **Results**

### **Exposure to Physical Activity Referral Scheme**

The proportion of PARS participants that were female was markedly higher than for the County population (table 2). Ages ranged from 9-92 yrs (mean  $50.8 \pm 14.4$  yr). The 40-69 yr age group accounted for two-thirds of referrals (67.5%). The rural-urban and settlement type distributions within PARS participants and the County population were similar. On average PARS participants lived in areas of greater material deprivation than the County population (Townsend score). This difference was not significant for the IMD 2004 but was supported by a higher proportion of PARS participants within the most deprived quintile of material deprivation (table 2).

**\*\* Table 2. Characteristics of PARS participants compared with the County population\*\***

### **Uptake and participation in Physical Activity Referral Scheme**

Data from 2864 participants were included in logistic regression analysis (figure 1). Initial analysis was run using continuous variables for the Townsend deprivation score and age. To illustrate fluctuations in the strength of age and deprivation effects across the range, deprivation quartiles and age groups were then used (table 3). This did not alter the direction or significance of associations in any of the regression model outcomes.

**\*\*\*\*\*Table 3 Factors which predict the uptake and participation in Physical Activity Referral Scheme with corresponding Odds Ratios & 95% Confidence Intervals\*\*\*\*\***

The outcome from Model 1 showed that residents of more deprived and rural areas were more likely to remove themselves from the scheme at the earliest opportunity. People living in areas within the most deprived quartile had 40% reduced likelihood of being assigned to a leisure provider compared with those in the least deprived quartile. Compared with rural dwellers, urban dwellers had a 36% increased likelihood of being assigned to a leisure provider. In relation to referral uptake (Model 2), the negative influences of deprivation and rural residency were again evident, in addition to a strong age effect. Compared with the under-thirties, the odds of participants taking up referral increased in sequentially higher age groups up to 70 yrs, reducing thereafter. The effect

was strongest in participants aged 50-69 yrs whose likelihood of uptake was twice that of the youngest age group. Using only data from participants assigned to a leisure provider, outcomes in Model 3 were similar again for age and deprivation, although the rural effect was no longer significant. Model 4 demonstrated that for all those who took up the referral the odds of completion was lower in women than men and increased with age, with a threefold difference between the youngest and oldest age groups.

Data in table 3 demonstrate that the magnitude and direction of relationships described were similar regardless of which deprivation or rurality variables were included. Moreover, repeated analyses with each Townsend z-score revealed that none of the four constituent variables were dominant.

## Discussion

A prospective population-based longitudinal design allowed us to determine the suitability of the PARS model for different socio-demographic groups. Suitability was determined from differential exposure (referral) and the uptake, participation and completion of those referred.

Age and gender characteristics of people referred were similar to other UK PARS evaluations.<sup>4</sup> Only two published studies have considered participant socio-economic position<sup>6 12</sup> but neither made comparisons with the population from which the sample was selected. Comparing socio-demographic influences on outcomes with other PARS is limited because few track participants from the point of referral and record attendance levels.<sup>4</sup> The only published study that has reported data on those lost from PARS immediately following referral (Model 1) involved a subgroup of participants from the present study.<sup>7</sup> Another consideration is the referring behaviour of individual health professionals, which clearly has an influence on people's ability to participate.<sup>13</sup>

An uptake rate of 65% in the present study compares favourably with RCT-style PARS evaluations (23 - 49%)<sup>‡</sup> and most (43 - 60%),<sup>4</sup> but not all (79%),<sup>6</sup> prospective longitudinal evaluations. However, age and gender patterns for uptake have been

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<sup>‡</sup> Calculated as a proportion of the total sample invited to participate.

inconsistent and inadequately reported.<sup>4</sup> Harrison et al<sup>6</sup> found that deprivation was largely unrelated to referral uptake. In contrast we found that the likelihood of taking up referral was less in participants from more deprived areas. However, Harrison et al<sup>6</sup> measured deprivation at ward level using the original IMD,<sup>14</sup> combining more than thirty indicators of social and material deprivation.<sup>10</sup> Social deprivation is notoriously difficult to measure and creating indices of both social and material deprivation can create conceptual confusion regarding exactly what the index represents.<sup>15</sup> The Townsend score has been criticised for its development in largely urban areas and particularly the inclusion of car ownership, which is thought to have different implications in urban and rural areas.<sup>16 17</sup> In the present study rural-urban status was taken into account and independent deprivation and rurality effects emerged. Furthermore, regression analyses using individual z-scores confirmed that car ownership was not dominant. Finally, using data at OA rather than ward level ensured greater sensitivity in the present study because wards typically comprise 5000-6000 residents (compared with 300 in OAs). Nevertheless, all analyses were repeated using the revised IMD 2004<sup>10</sup> in order to make findings accessible to the broadest possible audience in both academia and in practice.

For the outcome of completion, comparisons with existing data from UK PARS are again limited by differences in measurement of attendance and inadequate participant profiling. The completion rate in the present study (31.1%) compares favourably. Only the RCT by Taylor et al<sup>12</sup> defined success on the basis of sessions attended, employing a slightly less stringent 75% attendance criterion that just 16% of respondents to initial invitations achieved. Rates from longitudinal studies range from 12% to 56% but most defined completion as attendance at the final assessment, taking no account of attendance levels.<sup>4</sup> Poor reporting of age and gender in relation to completion in previous studies offer little reason to doubt the positive influences on completion of increasing age and male gender observed in the present study. Only Taylor et al<sup>12</sup> explored the influence of socio-economic characteristics and similarly found no association.

### **Implications for practice and policy**

Priority groups who tend to experience the poorest health or be least active include: women, younger people, older people and disadvantaged groups.<sup>2 18 19</sup> Therefore, over-representation of women, people of increasing age and residents of more deprived areas

in the present study, *on the surface*, suggests that PARS can reach those most in need. However, such over-representation may simply reflect higher primary care consultation rates.<sup>20 21</sup> The reduced likelihood of younger people and residents of more deprived (and rural) areas being assigned to leisure providers or taking up referral, raises important issues concerning the public health role of PARS. However, this does not mean that PARS should be dismissed. As part of an overall physical activity promotion strategy they can reinforce wider national initiatives by providing a safe and supervised environment for people that require it, such as older people and those with specific medical conditions.

### **Study Limitations**

The first limitation of the present study was the dichotomous completion outcome, which was less sensitive than using a continuous attendance variable. Secondly, attendance cannot be used to make inferences about overall physical activity behaviour change. Thirdly, the study may have been strengthened by the retrospective collection of additional individual socio-economic data but anticipated problems of poor response rates and associated response bias prevented this. Finally, missing age data in the *No Contact* group prevented its inclusion in Model 1, which highlights a need for even greater rigour in baseline data collection at the point of referral.

### **Conclusion**

The PARS format may be inappropriate for younger adults or people living in relative deprivation and rural areas. PARS appear more appropriate for adults of middle-to-old age who are more likely to require supervision. The findings from this study suggest that, rather than referrers viewing PARS as *the* physical activity intervention, PARS may provide a local addition to broader policy and environmental initiatives for some but not all groups.

<b>What is already known on this topic</b>
<p>Inadequate monitoring and participant profiling have prevented a detailed examination of who PARS are accessible to and appropriate for.</p> <p>As a result, the nature of the role for PARS within public health is unknown.</p>
<b>What this study adds</b>
<p>Exposure to the PARS appears to reflect primary care consultation rates, suggesting no bias in referral.</p> <p>Uptake, participation and completion outcomes appear to be associated with age, suggesting that adults of middle to old age are most suitable for a Physical Activity Scheme referral.</p>

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#### Contributors:

CG designed the study, collated and analysed the data and wrote the paper and is guarantor. LHJ, DC, DVBJ, AS and CF assisted in study design and paper editing CM, AS and CF assisted in data analysis.

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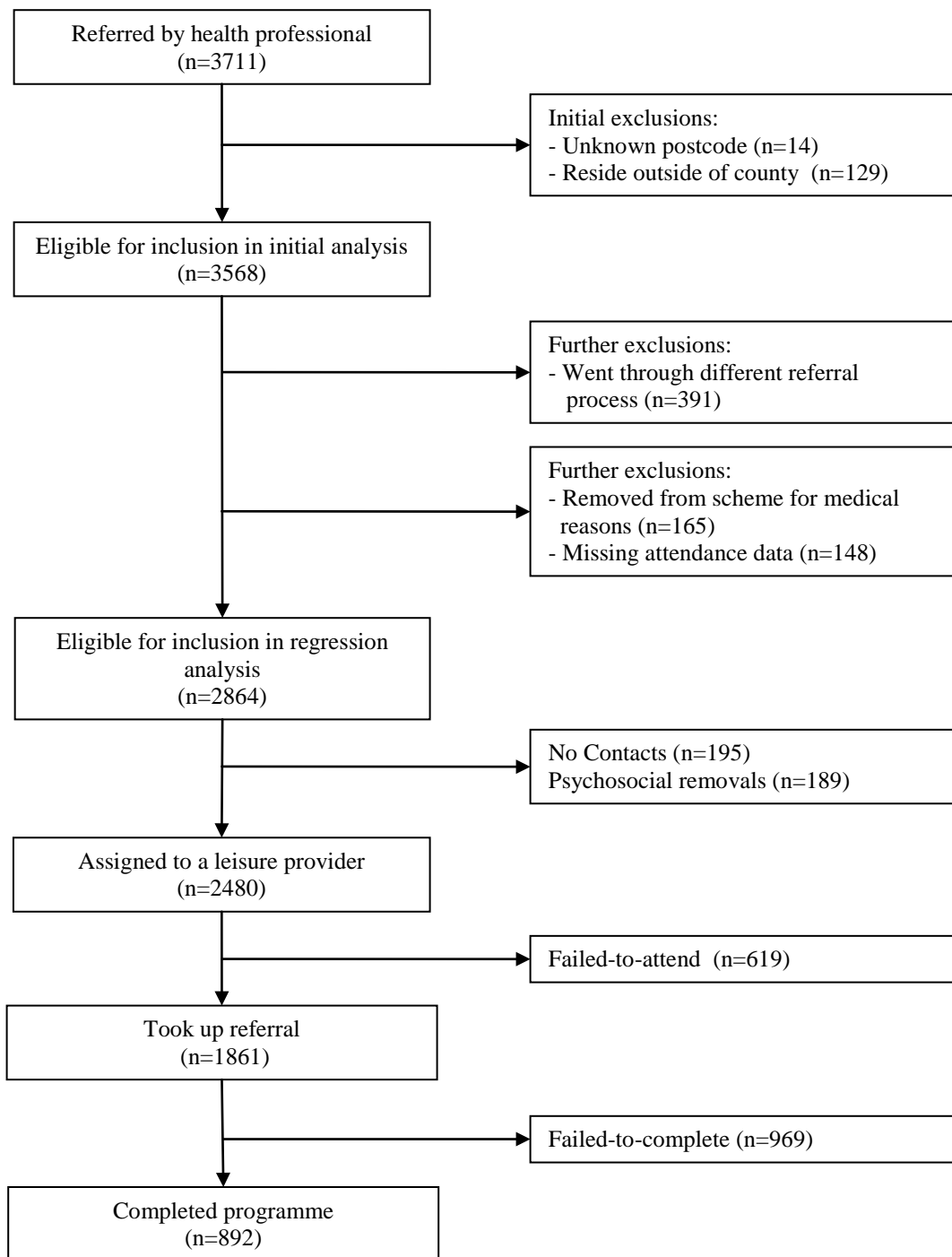
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**Fig 1** Cohort profile



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**Table 1 Categories used to determine uptake and participation outcomes**

<b>Category</b>	<b>Description</b>
<b>Self-removal</b>	
No contact (NC):	Not contactable by PARS co-ordinator following referral
Psychosocial removal (RPsych):	Chose not to proceed with the referral
<b>Assigned to a leisure provider</b>	
Fail-to-attend (FTA):	Assigned to a leisure provider - did not take up referral
Fail-to-complete (FTC):	Took up referral - attended <80% of exercise sessions
Complete (Comp):	Took up referral - attended $\geq$ 80% of exercise sessions

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**Table 2 Characteristics of PARS participants compared with the County population**

Variable		PARS participants	County	Test statistic	<i>p</i>
<b>Total</b>		3568 (100%)	497,266 (100%)		
<b>Gender<sup>a</sup></b>				1305.1	<0.001
	Men	1386 (39.9%)	241,133 (48.6%)		
	Women	2182 (61.1%)	256,133 (51.4%)		
<b>Age (years)<sup>a†</sup></b>				136.3	<0.001
	≤29	235 (6.6%)	168,319 (33.8%)		
	30-39	476 (13.3%)	69,773 (14.0%)		
	40-49	571 (16.0%)	66,425 (13.3%)		
	50-59	810 (22.7%)	69,865 (14.0%)		
	60-69	635 (17.8%)	51,962 (10.4%)		
	≥70	265 (7.4%)	71,749 (14.4%)		
	Not Known	575 (16.1%)	-		
<b>Rurality<sup>a</sup></b>				43.1	<0.001
	Urban	1773 (49.7%)	240,949 (48.4%)		
	Rural (total)	1795 (50.3%)	257,144 (51.6%)		
	Small town and fringe	811 (22.7%)	97,349 (19.5%)		
	Villages	690 (19.3%)	111,675 (22.4%)		
	Hamlets/isolated dwellings	294 (8.2%)	48,120 (9.7%)		
<b>Deprivation<sup>b</sup></b>					
	Townsend score - mean	0.3	0.0	-3.6	<0.001
	IMD 2004 - mean	16.5	15.9	-1.8	0.077
	Townsend score quartiles				
	Q1	1062 (29.8%)	124,398 (25.0%)		
	Q2	883 (24.7%)	124,370 (25.0%)		
	Q3	867 (24.3%)	124,176 (25.0%)		
	Q4	756 (21.2%)	124,322 (25.0%)		

<sup>a</sup> Chi- squared difference test used to compare PARS and County populations ( $\chi^2$  test statistic).

<sup>b</sup> Mann-Whitney difference test used to compare PARS and County populations (Mann-Whitney z-score test statistic).

Townsend quartiles: Q1=most deprived; Q4=least deprived.

**Table 3 Factors which predict the uptake and participation in Physical Activity Referral Scheme with corresponding Odds Ratios & 95% Confidence Intervals**

	Model 1: Self-Removal vs Assigned to leisure provider		Model 2: Did not take up Referral vs Took up Referral		Model 3: Assigned to leisure provider, did not take up referral vs Took up referral		Model 4: Took up referral, failed to complete vs completed programme	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
<b>Gender</b> (male vs female)	1.19 (0.95 to 1.48)	0.124	0.94 (0.79 to 1.12)	0.496	0.90 (0.74 to 1.10)	0.300	0.82 (0.68 to 0.99)	0.046
<b>Age:</b>								
Continuous	N/A	N/A	1.01 (1.01 to 1.02)	<0.001	1.02 (1.01 to 1.02)	<0.001	1.02 (1.01 to 1.02)	<0.001
Age Group				<0.001		<0.001		<0.001
≤29 yr	N/A	N/A	1.00		1.00		1.00	
30-39 yr			1.35 (0.96 to 1.90)	0.085	1.41 (0.98 to 2.03)	0.061	2.02 (1.28 to 3.20)	0.003
40-49 yr			1.48 (1.06 to 2.07)	0.021	1.57 (1.10 to 2.24)	0.013	1.46 (0.93 to 2.28)	0.100
50-59 yr			2.00 (1.45 to 2.78)	<0.001	2.04 (1.44 to 2.90)	<0.001	1.90 (1.24 to 2.91)	0.003
60-69 yr			2.41 (1.70 to 3.42)	<0.001	2.59 (1.78 to 3.78)	<0.001	2.44 (1.57 to 3.79)	<0.001
≥70 yr			1.57 (1.05 to 2.36)	0.029	1.91 (1.22 to 2.98)	0.005	3.22 (1.93 to 5.39)	<0.001
<b>Deprivation:</b>								
Townsend score (continuous)	0.95 (0.92 to 0.98)	0.002	0.94 (0.91 to 0.96)	<0.001	0.93 (0.90 to 0.96)	<0.001	0.98 (0.95 to 1.01)	0.116
Townsend score (quartiles)		0.006		<0.001		<0.001		0.194
Q1 (least deprived)	1.00		1.00		1.00		1.00	
Q2	0.72 (0.52 to 0.99)	0.047	0.85 (0.66 to 1.10)	0.211	0.84 (0.64 to 1.11)	0.212	1.10 (0.85 to 1.42)	0.478
Q3	0.62 (0.45 to 0.85)	0.003	0.75 (0.59 to 0.97)	0.026	0.75 (0.57 to 0.99)	0.042	0.88 (0.68 to 1.15)	0.346
Q4 (most deprived)	0.58 (0.42 to 0.80)	0.001	0.57 (0.45 to 0.74)	<0.001	0.54 (0.41 to 0.72)	<0.001	0.83 (0.63 to 1.09)	0.186
IMD 2004	0.98 (0.96 to 0.99)	<0.001	0.97 (0.96 to 0.99)	<0.001	0.97 (0.96 to 0.99)	<0.001	0.99 (0.98 to 1.01)	0.441
<b>Rurality:</b>								
Rural vs urban	1.36 (1.09 to 1.70)	0.006	1.30 (1.09 to 1.55)	0.004	1.18 (0.97 to 1.43)	0.092	1.00 (0.83 to 1.22)	0.984
Settlement type		0.030		0.008		0.123		0.939
Urban	1.00		1.00		1.00		1.00	
Hamlet/isolated dwelling	0.62 (0.41 to 0.91)	0.016	0.84 (0.60 to 1.18)	0.323	1.07 (0.72 to 1.59)	0.745	0.95 (0.67 to 1.37)	0.794
Village	0.72 (0.53 to 0.97)	0.031	0.67 (0.53 to 0.85)	0.001	0.76 (0.59 to 0.99)	0.043	1.06 (0.82 to 1.38)	0.655
Small town and fringe	0.79 (0.60 to 1.04)	0.092	0.81 (0.65 to 1.01)	0.060	0.84 (0.66 to 1.06)	0.148	0.98 (0.77 to 1.25)	0.852

Odds Ratios (OR) & 95% Confidence Intervals were estimated using logistic regression

Note: Age was not included in Model 1 because of missing age data for a high proportion of the No Contact group.

IMD=Index of Multiple Deprivation