Social engagement and health and social care use and medication use among older people.

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ABSTRACT

Social engagement has been associated with improved health outcomes in older people, although the precise mechanisms by which this is mediated are not clear. The aim of this study was to examine the relationship between social engagement and health and social care use and medication use in older people. Data were derived from the 1985, 1989 and 1993 waves of the Nottingham Longitudinal Study of Activity and Ageing, a nationally representative sample of people aged 65 and over. Logistic regression models were used to determine whether social engagement predicted cross-sectional and longitudinal health and social care use and medication use. People with higher social engagement were significantly less likely to have seen their family doctor, the District Nurse or home help services, and to be taking two or more medications cross-sectionally. This relationship was independent of demographic factors, physical and mental health and physical activity for contact with the District Nurse or home help services. Higher social engagement was associated with reduced contact with home help services after four years, independent of demographic factors, physical and mental health, and with reduced medication use after four years in unadjusted models. Higher social engagement was associated with increased contact with home help services after eight years, when controlling for demographic factors, physical and mental health and physical activity. Higher social engagement may help to reduce cross-sectional health and social care service and medication use but further research is required to understand the benefits of social engagement and medium- and long-term service/ medication use.

Keywords: social engagement; health and social care use; medication use.

INTRODUCTION

Social engagement has been shown to be associated with better health and health outcomes across a number of studies (e.g., Berkman and Syme, 1979; House et al., 1982; Kaplan et al., 1988; Glass et al., 1999, Bassuk et al., 1999; Mendes de Leon et al., 2003; Wang et al., 2002) and is regarded as an important component of successful ageing (Rowe and Kahn, 1997). Three separate, but related, components of social engagement have been assessed in the research literature in relation to health outcomes (Andersson, 1998; Bennett, 2002): social participation, i.e., the involvement in activities that have a social element; social networks, i.e., the number of contacts with friends and relatives etc.; and social support, instrumental and emotional help available to an individual (Bath and Deeg, 2005). In this paper we examine social participation as a component of social engagement, and here we summarise research that has assessed this component in relation to mortality and health.

Research that has evaluated the role of social participation in promoting healthy ageing includes the early work of Berkman and Syme (1979), which showed that social ties and social participation were both associated with reduced mortality in the general population. This work was extended by Seeman et al., (1987) who reported that membership in a church group, as well as social networks, were predictive of survival among people aged 70 and over. House et al. (1982) reported that involvement in certain, more active, social relationships and activities was associated with improved long-term survival among older men and women and that passive activities were associated with reduced survival. Schoenbach et al. (1986) showed that a higher social network index score was associated with improved survival when controlling for sex, race, race × sex,

and age. The social network index included spending spare time in church activities, and when the index was broken down into its component parts it was found that this activity was associated with improved survival among white males and black females. Bygren et al. (1996) showed that people who attended cultural events occasionally had increased risk of mortality compared with people who attended cultural events often, when adjusting for age and gender. Glass et al. (1999) showed that increased participation in social activities, e.g., church attendance, visits to the cinema, restaurants sporting events, day or overnight trips, playing cards, was independently associated with increased survival among older people. What emerges from these studies is that social engagement, in the form of social participation, has been demonstrated to be predictive of survival, but that social participation is measured in different ways in different studies.

The different measures suggest an inherent complexity in measuring social engagement, as well as raising important questions about how the benefits of social participation might be mediated, e.g., through better health, increased physical activity or psychological well-being. However, some social engagement activities require mobility, health, physical activity and immobility, poor health, low levels of physical activity or feeling depressed, may be barriers to participation. Therefore, studying the relationship between social activity and health outcomes requires levels of health, physical activity and psychological well-being to be taken into account.

The range of health outcomes measures that has been assessed in relation to social engagement includes not only mortality (Berkman and Syme, 1979; Kaplan et al., 1988; Bygren et al, 1996; Glass et al., 1999; Lennartsson and Silverstein; 2001;) but also functional health (Everard et el., 2000); disability (Mendes de Leon et al., 2001; Mendes

de Leon et al., 2003), cognitive decline (Bassuk et al., 1999; Aartsen et al., 2002) and the risk of dementia (Wang et al., 2002). However, health outcomes that have not been examined in relation to the social participation component of social engagement in older people include health and social care service utilisation and medication use. Given the positive association between social engagement and cross-sectional physical health demonstrated by Everard et al. (2000), being more socially active might also be associated with reduced service and medication use. Developing an understanding of relationships between social engagement and service/medication use could provide useful for developing interventions that incorporate social activity to reduce consumption of services/medications in later life.

The aim of this study was to examine relationships between social engagement and health and social care service use and medication use among older people. More specifically, objectives of the study were to determine whether overall social activity was a predictor of recent contact with the family doctor, or General Practitioner (GP) as it is termed in the UK, and the district nurse, receipt of home help support and use of two or more prescribed medications in a nationally representative sample of community-dwelling older people. The use of a single combined measure of a social engagement, the Brief Assessment of Social Engagement (BASE) (Morgan, Dalosso & Ebrahim, 1985), rather than different components of social engagement, enabled us to examine the overall benefits of social activity, irrespective of the activities undertaken. In order to understand the importance of health, psychological well-being, and physical activity in any observed relationships, the study included these components in successive models. In addition to examining cross-sectional associations, the study sought to determine whether social

engagement was a predictor of future health and social care service use and prescribed medication use.

METHODS

Data for this study were derived from the Nottingham Longitudinal Study of Activity and Ageing [NLSAA] (Morgan, 1998), an ongoing survey of activity, health and well-being among older people.

Sample

Using electoral ward-level statistics from the 1981 census, three areas of Nottingham were combined to provide a study population whose demographic composition (as regards age, sex, social class, ethnicity and proportion of elderly people living alone) reflected the average national pattern for England and Wales (Morgan, 1998). The resulting area included a total of 48 733 individuals served by 25 family doctors. A total of 8409 elderly people aged 65 years and over living in the community within the survey areas were identified from Nottinghamshire Family Practitioner Committee age-sex lists, from which 1299 eligible individuals (those alive and still living at the address provided) were randomly selected for interview. The age-sex structure of the interviewed sample was not significantly different from the original sample. The baseline survey was conducted between May and September 1985. Of the 1299 individuals approached, 1042 were interviewed, a response rate of 80%. Follow-up surveys among the survivors were conducted at four yearly intervals in 1989 (n = 781) and 1993(n = 540), with re-interview rates of 88% (n = 690) in 1989 and 73% (n = 410) in 1993 (Morgan, 1998).

Survey Assessments

The relevant parts of the structured questionnaire are described briefly below: further details of the other parts of the questionnaire are described elsewhere (Morgan, 1998).

Cognitive impairment

Respondents were screened for cognitive impairment using the 12-item Information/ Orientation (I/O) scale from the Clifton Assessment Procedures for the Elderly (Pattie and Gilleard, 1979). If, after appropriate prompting, the respondent failed to achieve a maximum I/O score of 8, the interview was discontinued.

General physical health

General physical health was assessed using a health index previously validated (Ebrahim et al 1987). This health index contained 12 items for the cross-sectional analyses. The health index scored from zero (no health problems) to 12 (multiple health problems) covering the presence or absence of: heart, stomach, eyesight, sleep, or foot problems; giddiness, headaches, urinary incontinence and falls; long-term disabilities and mobility status. For the longitudinal analyses, a 14-item health index was used containing additional items relating to contact with health and social care use and medication use, as described below, in order to control for baseline levels. Current smoking status was assessed.

Contact with health and social care services and medication use

Contacts with family doctor, community nurses and home help services in the previous month were assessed. The number of current drugs prescribed by a doctor within the previous six months, and being taken in accordance with the doctor's instructions, was also recorded. The interviewer asked to see the prescribed drugs and details of these were recorded, e.g., name, and dose.

Social engagement

Survey assessments of social engagement were undertaken to act as an index of well-being, and as a control variable for the social component of many physical activities. The Brief Assessment of Social Engagement (BASE) scale was formed from a 20-item additive scale, previously reported, with an overall reliability alpha of 0.7 (Morgan, Dalosso & Ebrahim, 1985). The components of this scale included: access to a telephone; whether the person had made a or received a telephone call in the previous week; whether the person attends religious services or meetings; whether they had voted in the last election; whether they had taken a holiday in the previous year; whether they were planning to take a holiday in the forthcoming year; whether they used the public library; whether they had attended a group meeting or club/ society in the previous month; whether they had a senior citizen's rail pass; whether they had access to a car; whether the respondent felt they had sufficient contact with family or friends; whether they got out and about as much as they would like; whether they lived alone; whether they had many friends in the area; whether they had many friends/ neighbours or relatives whom they could ask for help; whether they were employed; whether they were mobile; whether they had a television or radio; whether they had took a newspaper or magazine on a weekly/monthly basis. Each item of the scale was given a score of 0 = no and 1 = yes and all items were added together to give a score ranging from 0 (no participation) to 20 (participation in all activities).

Depression and morale

Depression was assessed using the 14-item Symptoms of Anxiety and Depression (SAD) Scale, derived from the Delusions, Symptoms and States Inventory (DSSI) (Bedford, Foulds & Sheffield, 1976). The SAD scale focuses exclusively on recent

symptoms, and comprises two 7-item subscales relating to anxiety and depression respectively. In a clinical validation exercise conducted at baseline, total SAD scores of ³ 6 (with depression sub-scale scores ³ 4) showed high levels of concordance with clinical diagnostic ratings of depression made by experienced psychiatrists (kappa coefficient = 0.7, $p<0.001$) (Morgan et al., 1987). Assessments of morale were provided by a modified version of the 13-item Life Satisfaction Index (the LSIZ) (Morgan et al., 1987).

Customary physical activity

'Customary' physical activity was defined as, those activities with a probable minimum energy cost of 2kcal/min, performed continuously for a minimum of three minutes, at least weekly, for at least the previous six weeks (Dallosso et al., 1988; Morgan, 1998). These activities were divided into mutually exclusive functional categories that included: outdoor productive activities (e.g. gardening, house and car maintenance); indoor productive activities (e.g. housework, decorating, indoor maintenance); walking (purposeful walking outside the house or garden). In administering the questionnaire, the interviewer first determined whether the respondent's participation in the activity met the criteria for 'customary', and then asked in detail about the frequency and duration of participation. Each reported activity was scored as minutes per week. Non-participation was scored as zero. In the assessment of walking, the interviewer asked in detail about walking done on the day prior to interview. If, however, this day had been atypical, then another was selected (up to a maximum of six days previously).

Non-continuous activities likely to contribute to muscle strength (e.g. climbing high steps, dragging heavy loads) and joint flexibility (e.g. reaching for high shelves, bending

for low shelves) were also included. Typically, these tasks form discrete units of physical activity and were therefore scored in terms of frequency of performance on a 5-point scale (i.e. performed never, occasionally, once or several times a week, daily, or several times a day).

Tables 1 and 2 show the distribution of the categorical and continuous variables used in this study.

[Insert Table 1 here]

[Insert Table 2 here]

Statistical analyses

Cross sectional analyses

Four sets of logistic regression models were used to determine whether there was a relationship between the social engagement score in 1985 and contact with health and social care providers and medication use in 1985. In the first set of models the dependent variable was whether or not the person had had contact with their family doctor in the month prior to interview in 1985. In the second set of models the dependent variable was whether or not the person had had contact with a community nurse in the month prior to interview in 1985. In the third set of models the dependent variable was whether or not the person had received home help support in the month prior to interview in 1985. In the fourth set of models the dependent variable was whether or not the person was taking two or more prescribed medicines in 1985. For each dependent variable a set of five models was developed containing the independent variables described below.

Longitudinal analyses

Four sets of logistic regression models were used to determine whether there was a relationship between the social engagement score in 1985 and contact with health and social care providers and medication use in 1989. In the first set of models the dependent variable was whether or not the person had had contact with their family doctor in the month prior to interview in 1989. In the second set of models the dependent variable was whether or not the person had had contact with a community nurse in the month prior to interview in 1989. In the third set of models the dependent variable was whether or not the person had received home help support in the month prior to interview in 1989. In the fourth sets of models the dependent variable was whether or not the person was taking two or more prescribed medicines in 1989. These four sets of regression models were repeated for the same dependent variables in 1993. For each dependent variable a set of five models was developed containing the independent variables described below.

Independent variables

For each set of models for each dependent variable, the independent variables were added cumulatively in the following order: social engagement score (models 1); demographic variables (i.e., age gender and socioeconomic class) (models 2); physical health index score and smoking status (models 3); psychological well-being (i.e., SAD score and Life Satisfaction Index) (models 4); physical and functional activity (total activities contributing to muscle strength and joint flexibility) indoor and outdoor productive activities and time spent walking (models 5):

Models 1: social engagement score only.

Models 2: social engagement score, age, sex and social class.

Models 3 social engagement score, age, sex and social class, health index score and smoking status

Models 4 social engagement score, age, sex and social class, health index score, smoking status SAD score and LSI score

Models 5 contained social engagement score, age, sex and social class, health index score, smoking status SAD score, LSI score, joint flexibility activities score, muscle strength activities score, total indoor activity, total outdoor activity and time spent walking.

In the cross-sectional analyses, the 12-item physical health index score in 1985 was included in models 3 to 5. In the longitudinal analyses, the 14-item physical health index score in 1985 was included in models 3 to 5, to control for baseline health and social care service use and medication use.

For categorical variables (i.e., gender, socioeconomic class and smoking status) the odds ratio and 95% confidence intervals were calculated for each category relative to the reference category. For the remaining (continuous variables) the odds ratio and 95% confidence intervals were calculated for each increment in the variable.

RESULTS

Social Engagement and baseline service /medication use

Table 3 shows the relationships between the social engagement score in 1985 and contact with the health and social care services in the month prior to interview in 1985 and prescribed medication use in 1985. In the unadjusted model (model 1), a higher social engagement score was significantly associated with a reduced likelihood of having seen the family doctor in the month prior to interview (Odds ratio (OR) =0.94 (95% confidence interval (CI) = 0.90, 0.99; *p*£0.01). When age, gender and socioeconomic class were included in the model (model 2) the social engagement score was significantly associated with having seen the family doctor in the month prior to interview (OR=0.94; 95% CI=0.89, 0.98; *p*£0.01), but when the 12-item health score and smoking status were added to the model (model 3) the association was no longer significant.

[Insert Table 3 here]

A higher social engagement score was significantly associated with a reduced likelihood of having seen the nurse in the month prior to interview (OR = 0.78 (95% CI = 0.72, 0.84; *p*£0.001) (model 1). When age, gender and socioeconomic class (model 2), the 12-item health score and smoking status (model 3), depression and morale (model 4), and physical activity (model 5) were included in the model, the social engagement score remained significantly associated with a reduced likelihood having seen the community nurse in the month prior to interview (OR=0.89; 95% CI=0.80, 0.99; *p*£0.05).

A higher social engagement score was significantly associated with a reduced likelihood of having received home help support in the month prior to interview (OR =

0.70 (95% CI = 0.66, 0.75; *p*£0.001) (model 1). When age, gender and socioeconomic class (model 2), the 12-item health score and smoking status (model 3), depression and morale (model 4), and physical activity (model 5) were included in the model, the social engagement score remained significantly associated with a reduced likelihood having received home help support in the month prior to interview (OR= 0.84; 95% CI= 0.77, 0.92; *p*£0.001).

A higher social engagement score was significantly associated with a reduced likelihood of taking two or more medications (OR =0.90; 95% CI = 0.86, 0.94; *p*£0.001) (model 1). When age, gender and socioeconomic class were included in the model (model 2) the social engagement score was still significantly associated with a reduced likelihood of taking two or more medications (OR=0.91; 95% CI=0.87, 0.96; *p*£0.001), but when the 12-item health score and smoking status were added to the model (model 3) the association was no longer significant.

Social Engagement and service /medication use in 1989

Table 4 shows the relationships between the social engagement score in 1985 and contact with the health and social care services in the month prior to interview in 1989 and prescribed medication use in 1989. There were no significant associations between social engagement score in 1985 and contact with the family doctor in the month prior to interview in 1989 in the unadjusted or adjusted regression models. There were no significant associations between social engagement score in 1985 and contact with the community nurse in the month prior to interview in 1989 in the unadjusted or adjusted regression models.

[Insert Table 4 here]

A higher social engagement score was significantly associated with a reduced likelihood of having received home help support in the month prior to interview (OR = 0.82; 95% CI =0.76, 0.88; *p*£0.001) (model 1). When age, gender and socioeconomic class (model 2), the 12-item health score and smoking status (model 3) and depression and morale (model 4), were included in the model, the social engagement score remained significantly associated with a reduced likelihood having received home help support in the month prior to interview. In the final model, when physical activity was added (model 5), the social engagement score remained significantly associated with having received home help support in the month prior to interview in 1989 (OR=0.91; 95% CI=0.83,1.00; *p*£0.05).

A higher social engagement score was not significantly associated with taking two or more medications in 1989 in the unadjusted model (Model 1), nor when age, gender and socioeconomic class (model 2), the 14-item health score and smoking status (model 3) and depression and morale (model 4) were included in the model. However in the final model, when physical activity was added (model 5), a higher social engagement score was significantly associated with an increased likelihood of taking seen two or more medications (OR =1.09; 95% CI = 1.00, 1.18; *p*£0.05).

Social Engagement and service /medication use in 1993

Table 5 shows the relationships between the social engagement score in 1985 and contact with the health and social care services in the month prior to interview in 1993 and prescribed medication use in 1993. There were no significant associations between

social engagement score in 1985 and contact with the family doctor in the month prior to interview in 1993 in the unadjusted or adjusted regression models. There were no significant associations between social engagement score in 1985 and contact with the community nurse in the month prior to interview in 1993 in the unadjusted or adjusted regression models.

[Insert Table 5 here]

A higher social engagement score was not significantly associated with having received home help support in the month prior to interview in 1993 (OR = 0.92; 95% CI =0.84,1.01; *p*=0.06) (model 1). When age, gender and socioeconomic class (model 2), the 14-item health score and smoking status (model 3) and depression and morale (model 4) were included in the model, the association was not significant. However in the final model, when physical activity was added (model 5), a higher social engagement score was significantly associated with an increased likelihood of having received home help support in the month prior to interview in 1993 (OR =1.14; 95% CI = 1.00,1.30; *p*£0.05).

There were no significant associations between social engagement score in 1985 and medication use at the time of interview in 1993 in the unadjusted regression models. However, in model 3, when age, sex and social class, 14-item health index score and smoking status were included in the model, a higher social engagement score was significantly associated with an increased likelihood of taking two or more prescribed medications in 1993 (OR =1.12; 95% CI = 1.01, 1.24; *p*£0.05), although this was no longer significant in models 4 and 5.

DISCUSSION

This study examined the relationship between social engagement and use of health and social care services and medication use among older people. First, the results show that current social engagement is a powerful cross-sectional predictor of recent contact with the family doctor, district nurse and home help and of multiple prescribed drug use, independent of age, gender and socioeconomic class. People who had higher social engagement were significantly less likely to have seen these service providers in the month prior to the baseline interview or to be taking two or more prescribed medications. There were, however, clear differences in the relationship between social engagement and utilisation of different services, and in the factors explaining these relationships. There are several possible explanations for these findings that include relationships between social engagement and physical health, physical activity and mobility among older people.

One plausible explanation for the observed relationships is that people who are more socially engaged are healthier (Everard et al., 2000), and therefore less likely to need to visit their family doctor or a district nurse, receive home help support or be taking medications, and indeed, physical health fully accounted for the relationships between social engagement and contact with the family doctor and medication use. However, the relationship between social engagement and contact with the district nurse and home help was not accounted for by physical health, or by psychological well-being, so that although social engagement might be expected to reduce levels of depression and improve overall morale (Morgan et al., 1987), these aspects of well-being appeared to have little or no impact on contact with these services. This might be because district

nurses provide clinical support for physical problems and home help provides practical support with day-to-day activities, rather than help with psychological problems.

Another possible explanation for the relationship between social engagement and service use is that older people who participate in particular social activities are more likely to be more physically active and/or mobile (Glass et al., 1999), and less likely to require district nurse care or home help support. The inclusion of variables relating to various physical activities and walking, however, still failed to explain the relationship between social engagement and contact with the district nurse and home help support. Mendes de Leon et al. (2001) showed that social interaction with friends is associated with a reduced risk of functional disability among older people, and the variables for indoor (e.g., cooking, DIY) and outdoor (e.g., household maintenance, gardening) activities used in the models in this study include activities measuring functional ability, but these, and the variables representing activities contributing to joint flexibility (e.g., reaching up high) and muscle strength (e.g., carrying loads) and time spent walking did not wholly explain the relationship between social engagement and district nurse and home help support. It appears that the benefits derived from being socially engaged extend beyond physical and psychological health and physical and functional activity and the reasons for this are not clear.

A further possible explanation for the observed cross-sectional relationships is that specific groups within the population of older people in the UK at the time of the study may have been given preferential allocation of certain health and social care services and these groups may have had lower levels of social engagement than others. For example, subgroups of people with lower levels of social engagement may have

included people who were unmarried, or who were widowers and these may have received higher levels of nursing and home help support than people who were married or than widows. Additionally, the inclusion of living alone as a variable in the social engagement scale may have also been a confounder in this way, as people who lived alone may also have been allocated services preferentially. While such explanations, are unlikely to account for the observed relationships between social engagement and seeing the family doctor and medication use, further analyses could explore the importance of these potentially confounding variables in explaining the relationship with nursing and home help support.

A limitation of the cross-sectional analyses reported here is that health and social care service use *in the month prior to interview* was assessed and social engagement was assessed *at the time of interview*. It may be that an episode of care from the family doctor, home help or district nurse occurred in the month before interview but ended before the interview and the person was able to undertake or resume social engagement activities between then and the interview. However, given the short duration involved we feel that is unlikely that this would have a major effect on the relationships observed, and would have reduced the size of the observed relationships rather than exaggerating them.

A further limitation of the analyses reported in this paper is that the most recent measures of health and social care utilisation and medication use were in 1993. However, although there have been some changes in the organisation and delivery of health and social care services during the intervening time, which may have affected factors associated with specific service usage, the paper demonstrates important cross-sectional and longitudinal relationships between social engagement and general health and social

service use. While the details of these services may have changed we do not feel that these would have affected the findings reported here.

The finding that social engagement is a predictor of future receipt of home help service provides further evidence of the importance of this relationship, although the results appear contradictory over the different follow-up periods. Increased social engagement was associated with reduced contact with home help services after four-years, independent of age, sex, and of baseline physical health, psychological well-being and customary physical activity. A rather puzzling finding was that higher social engagement was associated with *increased* contact with home help services after eight years when adjusting for age, gender, physical and psychological health and physical activity. It appears that older people who are socially engaged benefit from the associated physical activity over the next few years, which has helps to reduce the need for home help support in that time, but, in the longer term, have greater needs for support. This suggests a possible non-linear relationship between social engagement and service use over time, the precise nature of which is not clear and requires further investigation to develop a better understanding of how changes in social engagement might affect contact with home help support.

The complexity of the benefits of social engagement was emphasised by the finding that increased social engagement was associated with increased medication use when adjusting for age, gender, physical and psychological health and physical activity after four years and when adjusting for age, gender and physical health after eight years. It may be that older people who have active social engagement, are, generally, less likely to use medications, but if health and/or levels of activity are declining, they may need to

increase their medication consumption over time to maintain their level of engagement. However, further longitudinal analyses would be required to verify this possibility or to investigate other possible explanations.

The measure of social engagement used in this study contains a variety of activities relating to social engagement and the study examined the relationship between the *overall* social engagement score and the outcomes investigated. The demonstrated benefits of active social engagement are irrespective of the activities undertaken, and the greater the number of activities the greater are the potential benefits. However, an examination of the individual components of the scale and their relationship with demographic and other variables may help to understand the observed relationships with the outcomes used in this study. It may be that specific social engagement variables are more closely associated with age (e.g., employment), gender (e.g., taking a newspaper), marital status (e.g., living alone) and socioeconomic class (e.g., planning a holiday) than other variables. A finer grained analysis of the variables comprising the BASE scale may also be useful in trying to explain some of the longitudinal results observed here. For example, while some of the social engagement activities require a certain level of physical activity and mobility (e.g., taking holidays, using the public library) and may facilitate social interaction (e.g., attending religious services or clubs/ meetings), others do not necessarily involve physical activity (e.g., making or receiving telephone calls) or social interaction (e.g., getting a newspaper or magazine, having a radio or television) but they still enable the person to be engaged with the world around them. These different components may possibly help to understand the clearly complex relationship between social engagement and service/medication use and further research is seeking to identify

the precise components of social engagement that contribute this aspect of successful ageing.

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Table 1: Descriptives of categorical variables.

Variable	Category	*N* in category (%)
Gender	Male	406 (39)
	Female	636 (61)
Socioeconomic class	I and II	153 (15)
	III	614 (60)
	IV and V	259 (25)
Smoker?	No	775 (76)
	Yes	250 (24)
Seen family doctor in last month? (1985)	No	668 (66)
	Yes	349 (34)
Seen district nurse in previous month? (1985)	No	922 (91)
	Yes	96 (9)
Seen home help in last month? (1985)	No	855 (84)
	Yes	164 (16)
Taking two or more prescribed medications? (1985)	No	559 (55)
	Yes	464 (45)
Seen family doctor in last month? (1989)	No	448 (65)
	Yes	243 (35)
Seen district nurse in previous month? (1989)	No	631 (91)
	Yes	60 (9)
Seen home help in last month? (1989)	No	551 (81)
	Yes	126 (19)
Taking two or more prescribed medications? (1989)	No	329 (49)
	Yes	345 (51)
Seen family doctor in last month? (1993)	No	229 (59)
	Yes	158 (41)
Seen district nurse in previous month? (1993)	No	300 (78)
	Yes	87 (22)
Seen home help in last month? (1993)	No	297 (77)
	Yes	90 (23)
Taking two or more prescribed medications? (1993)	No	155 (40)
	Yes	234 (60)

Table 2: Descriptives of continuous variables.

Variable	**Range**	**Mean**	**Median**	***N***
Social Engagement Score	2-20	12.13	12	979
Age (years)	65-99	75.21	75	1042
14-item health index score	0-14	4.76	5	1007
12-item health index score	0-12	3.65	3	1018
SAD score	0-28	2.59	1	979
LSI score	0-26	16.74	18	986
Joint flexibility activities score	0-19	9.46	10	1013
Muscle strength activities score	0-19	8.85	9	1010
Total indoor activity (minutes week^{-1})	0-3240	433.72	360	1016
Total outdoor activity (minutes week^{-1})	0-2850	203.95	8	1018
Time spent walking	0-250	25.08	10	927

Table 3: Social engagement in 1985 and contact with health and social care services and medication use in 1985.

1985 dependent variable (*n*)	Odds Ratios (95% CI)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Seen family doctor in previous month (868)	0.94 (0.90,0.99)†	0.94 (0.89,0.98)†	0.98 (0.93,1.04)	1.00 (0.95,1.06)	1.02 (0.96,1.08)
Seen district nurse in previous month (868)	0.78 (0.72,0.84)§	0.82 (0.75,0.89)§	0.86 (0.78,0.94)§	0.84 (0.76,0.93)§	0.89 (0.80,0.99)*
Seen Home Help in previous month (868)	0.70 (0.66,0.75)§	0.76 (0.70,0.81)§	0.79 (0.73,0.85)§	0.80 (0.73,0.87)§	0.84 (0.77,0.92)§
Taking two or more prescribed medications (868)	0.90 (0.86,0.94)§	0.91 (0.87,0.96)§	0.98 (0.93,1.04)	1.02 (0.96,1.08)	1.05 (0.99,1.12)

* p£0.05; †p£0.01; §p£0.001; ns = not significant

Odds ratios are presented for each increment in the social engagement score in 1985 in relation to the contact with each of family doctor, district nurse and home help in the month prior to interview in 1985 and prescribed medication use in 1985 in separate sets of unadjusted and adjusted models. Models 1 contained social engagement score only; models 2 contained social engagement score, age, sex and social class; models 3 contained social engagement score, age, sex and social class, 12-item health index score and smoking status; models 4 contained social engagement score, age, sex and social class, 12-item health index score, smoking status, SAD score and LSI score; models 5 contained social engagement score, age, sex and social class, 12-item health index score, smoking status, SAD score, LSI score, joint flexibility activities score, muscle strength activities score, total indoor activity, total outdoor activity and time spent walking.

Table 4: Social engagement in 1985 and contact with health and social care services and medication use in 1989.

1985 dependent variable (*n*)	Odds Ratios (95% CI)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Seen family doctor in previous month (592)	0.99 (0.94,1.05)	1.00 (0.94,1.06)	1.02 (0.95,1.08)	1.05 (0.98,1.13)	1.05 (0.98,1.13)
Seen district nurse in previous month (592)	0.93 (0.85,1.02)	0.96 (0.87,1.06)	0.99 (0.89,1.11)	0.94 (0.83,1.06)	0.97 (0.85,1.10)
Seen Home Help in previous month (580)	0.82 (0.76,0.88)§	0.85 (0.79,0.92)§	0.87 (0.80,0.95)§	0.89 (0.81,0.97)†	0.91 (0.83,1.00)*
Taking two or more prescribed medications (577)	0.95 (0.90,1.01)	0.96 (0.90,1.01)	1.03 (0.96,1.10)	1.07 (0.99,1.15)	1.09 (1.00,1.18)*

* p£0.05; †p£0.01; §p£0.001; ns = not significant

Odds ratios are presented for each increment in the social engagement score in 1985 in relation to the contact with each of family doctor, district nurse and home help in the month prior to interview in 1989 and prescribed medication use in 1989 in separate sets of unadjusted and adjusted models. Models 1 contained social engagement score only; models 2 contained social engagement score, age, sex and social class; models 3 contained social engagement score, age, sex and social class, 14-item health index score and smoking status; models 4 contained social engagement score, age, sex and social class, 14-item health index score, smoking status, SAD score and LSI score; models 5 contained social engagement score, age, sex and social class, 14-item health index score, smoking status, SAD score, LSI score, joint flexibility activities score, muscle strength activities score, total indoor activity, total outdoor activity and time spent walking.

Table 5: Social engagement in 1985 and contact with health and social care services and medication use in 1993.

1985 dependent variable (*n*)	Odds Ratios (95% CI)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Seen family doctor in previous month (337)	1.00 (0.93,1.09)	0.99 (0.91,1.08)	1.03 (0.94,1.13)	1.06 (0.96,1.17)	1.08 (0.97,1.19)
Seen district nurse in previous month (337)	0.94 (0.85,1.03)	0.95 (0.86,1.05)	0.98 (0.88,1.09)	1.01 (0.90,1.13)	1.07 (0.94,1.21)
Seen Home Help in previous month (337)	0.92 (0.84,1.01)	0.96 (0.87,1.06)	1.01 (0.91,1.12)	1.03 (0.92,1.16)	1.14 (1.00,1.30)*
Taking two or more prescribed medications (339)	0.98 (0.91,1.07)	1.02 (0.93,1.11)	1.12 (1.01,1.24)*	1.08 (0.96,1.20)	1.11 (0.98,1.25)

* p£0.05; †p£0.01; §p£0.001; ns = not significant

Odds ratios are presented for each increment in the social engagement score in 1985 in relation to the contact with each of family doctor, district nurse and home help in the month prior to interview in 1993 and prescribed medication use in 1993 in separate sets of unadjusted and adjusted models. Models 1 contained social engagement score only; models 2 contained social engagement score, age, sex and social class; models 3 contained social engagement score, age, sex and social class, 14-item health index score and smoking status; models 4 contained social engagement score, age, sex and social class, 14-item health index score, smoking status, SAD score and LSI score; models 5 contained social engagement score, age, sex and social class, 14-item health index score, smoking status, SAD score, LSI score, joint flexibility activities score, muscle strength activities score, total indoor activity, total outdoor activity and time spent walking.