Healthy by Association: The relationship between social participation and self-rated physical and psychological health

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Keywords: social participation, physical health, psychological health, British Household Panel Survey
Funding information: There are no funding or sources of support to report.
Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

*I am thankful to Kristian Bolin, Maria Elena Bontempi, Ylenia Brilli, Davide Dragone, Hieu Minh Nguyen and two anonymous referee for insightful comments.

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Abstract

This paper investigates the relationship between social participation and subjective health. Using individual-level data from the British Household Panel Survey (BHPS), we show that being an active member of a social or sport organization increases self-rated physical and psychological health. For men, the benefits of social interaction work primarily via physical pathways, while women report a more psycho-social channel. We separate the main results by occupation and document some heterogeneity. Manual workers find more physical and psychological relief via social involvement, whereas non-manual workers are more likely to take relief from sport participation. Interestingly, as the number of associations in which the individual is active increases, the incremental increase of social benefits diminishes. Our findings point to the importance of promoting social and sport activities in health communication and policy-making.

- Being an active member of social and/or sport organization has a positive relationship with individuals' mental and physical health;
- Such positive relationship varies depending on gender and on the type of job the individual is employed in;
- Policy concern should support social association as an indirect investment in individuals' health.

1 Introduction

Since the beginning of the 20th century, the structure of social interaction has changed dramatically. Individuals are now less likely to develop social relationships outside their families. This pattern is especially noticeable in developed countries (Putnam, 1995, 2001). Using data from the US General Social Survey, Putnam (2001) shows a decline in social capital along several dimensions (e.g., memberships in civic organizations, participation in labour unions, etc.) to the point where many feel isolated and reluctant to even talk about important matters. Putnam suggest that one of the major causes for this is the fact that the only organization which increased their membership from 1950 until today do not tend to foster face-to-face interaction[1]. More recently, McPherson et al. (2008) documented that the number of Americans reporting no one to discuss important matters with nearly tripled between 1985 and 2005, with a reduction in mean network size of about a third to only one friend. McPherson et al. (2008) further show that both family and non-family peers were declining, but the greater decrease of non-family ties leads to more confidant networks being centered on spouses and parents, with fewer external contacts. The largest losses have come from the ties that connect individuals to the community. The loss in socializing time is also attributable to the changes in working schedules and opportunity costs of time, making it even more costly for individuals to undertake time-intensive health-enhancing activities with their friends (Campbell, 2002, Burton and Turrell, 2000, Kouvonen et al., 2005).

Social isolation is pervasive in modern society, prompting many countries around the world to take action[2]. This is because social isolation is not just a problem by itself but it poses some serious health concerns. Less socially connected individuals have disrupted sleep patterns, altered immune systems, more inflammation and higher levels of stress hormones[3]. There is also evidence these effects start early[4]. Despite the rich evidence on the health effects of social isolation, it is not clear what works best to address the issue. Masi et al. (2011) have evaluated various approaches to isolation and concluded that the most effective intervention lies in helping people re-examine their interactions with others. In this respect, neighborhood and environmental factors play a central role in supporting socially isolated individuals and in improving social capital.

This paper explores the connection between social capital and health outcomes. We examine whether being an active member of a social or sport organization improves an individual's mental and physical health. If a positive relationship is found, then social associations can provide a potential solution to isolation. If, however, a null effect is present, policy tools can be redesigned to maximize the benefits of existing interventions.

[1] Putnam uses bowling as an example to illustrate this. Although the number of people who bowl has increased at the beginning of the 20th Century, the number of people who bowl in leagues has decreased. If people bowl alone, they do not participate in social interaction and civic discussions that might occur in a league environment.

[2] A 2017 Commonwealth Fund (Osborn et al., 2017)study of 11 high-income countries showed that between 10 percent and 30 percent of adults 65 and older report feeling isolated from others

[3] Holt-Lunstad et al. (2015) pooling data from 70 studies and 3.4 million people found that socially isolated individuals had a 30 percent higher risk of dying in the next seven years, and that this effect was largest in middle age.

[4] Socially isolated children have significantly poorer health 20 years later, even after controlling for other factors (Caspi et al., 2006). Loneliness is as important a risk factor for early death as obesity and smoking (House, 2001, Holt-Lunstad et al., 2015)

We build upon the existing literature on the subject[5] and provide several contributions. First, we focus on a specific classification of social capital: active membership. This enables us to isolate the health effect of social capital from the overall selection into social activity. Second, we condition our sample on socially active individuals and look more closely at their sport and non-sport activities to document the heterogeneous effects of different types and levels of engagement. Third, we provide suggestive evidence to shed light on how the nature of employment (manual vs. non-manual) factors into the health effects of social participation. This analysis is motivated by the idea that having a more (or less) physically demanding job might affect the type of relief (physical/mental) that an individual gets from being an active member of a social organization. For example, those holding manual jobs and staying physically active for most of the working hours might suffer different levels of stress from those employed in white-collar professions. Lastly, we document some non-linearity in the social activity-health relationship and discuss its policy implications.

2 The effect of social isolation on health

Engaging in social activities is a critical input for improving physical, mental and cognitive health (House et al., 1988, Tominaga et al., 1998, Gump and Matthews, 2000, Ryff et al., 2004, Cohen, 2004, Uchino, 2006, Umberson and Montez, 2010). Members of a network are subject to social and peer pressures, which might in turn influence their normative attitudes, and ultimately, investment in health (House et al., 1988, Cohen, 2004, House, 2001, Uchino, 2006, Umberson and Montez, 2010). This feedback mechanism suggests that social ties can be important in understanding individuals' health behaviors and outcomes.

Previous work has shown that social relationships can mitigate the harmful effects of psychosocial stress or other health hazards via community support and integration (House et al., 1988, Lindström and Giordano, 2016). For example, social networks can influence whether individuals make healthy investments (e.g., exercising, eating low-fat food, etc.) or engage in risky health behaviors (smoking, drinking, or using drugs). Integration may also foster the feelings of responsibility for others if members within a group recognize the externality of their actions. Having a wide range of network ties also provides multiple sources of information, which in turn might result in a more effective use of available health services. Various studies show that social activism is associated with psychosocial and physical measures relevant for health and well-being such as stress and depression, blood pressure, total cortisol, waist circumference, and body mass index (Pressman et al., 2009, Kenkel, 1995, Sickles and Yazbeck, 1998, Contoyannis and Jones, 2004, Bolin et al., 2003). Social isolation, on the other side, can become a stressor if it reinforces the senses of alienation, loneliness, and stress while decreasing an individual's feelings of control, self-esteem, and belonging.

Medical evidence shows that the negative psychological states associated with being socially isolated can increase neural and cardiovascular responses, suppress immune function, and interfere with health behaviors (Cacioppo et al., 2002, House et al., 1988, House, 2001, Cacioppo and Cacioppo, 2014). The magnitude of the risks associated with social isolation is comparable to that of cigarette smoking and other major biomedical

[5]See Fiorillo et al. (2017), Yu et al. (2015)

and psychosocial risk factors (House, 2001, Holt-Lunstad et al., 2015). Alcaraz et al. (2018), using one of the largest sample on the subject (more than 580,000 observations), show that social isolation not only increases the probability of death but also compounds the mortality risks associated with cardiovascular diseases. The researchers also document large disparities across genders and racial groups. A recent meta analysis found that isolation increases the risk of heart diseases by 29 percent and stroke by 32 percent (Valtorta et al., 2016).

Leisure activities such as sport participation have been shown to have a direct and significant impact on individuals' subjective evaluations of their well-being. Ross et al. (2019), for example, found that health has an indirect effect on the relationship between leisure time sport participation and happiness. Downward et al. (2017) find a multiplier effect of sport participation on subjective well-being (SWB) and health. The multiplier effect occurs because past participation in sport activities might influence future participation and determine long-run physical and mental health outcomes. To target traditional non-participants, the research suggests that physical activity should be promoted first for enjoyment, and then for the accompanying health benefits. An interesting finding from Kumar et al. (2019) indicates that the largest influence on sport and social participation results from using facilities with others that were previously met there. This suggests that social networks and interconnectedness in participation not only affect how much individuals engage in sport but also how these activities affect their SWB.

Several studies found a positive association between social capital and health. McCulloch (2001), Lindström (2004) focused on self-reported psychological health, with the former using neighborhood problems as a proxy for social capital and the latter employing a measure of trust. Bassett and Moore (2013), instead, investigated the link between depressive symptoms and social network size. Other researchers have looked at the effect of social capital and health using longitudinal data (Lindström and Giordano, 2016, Giordano and Lindström, 2011). For instance, Giordano and Lindström (2011) investigated the link between social capital, measured by interpersonal trust, active social participation, frequency of talking with neighbors, and changes in self-rated psychological health. In a follow-up work, Lindström and Giordano (2016) compared the buffering effects of generalized trust and social participation against worse psychological health during and after the 2008 financial crisis.

Our paper is close to two recent papers that explored the relationship between social capital and health using British Household Panel Survey (BHPS) data. Yu et al. (2015) established a reciprocal relationship between social capital and perceived health status, finding that social participation predicts subsequent changes in perceived mental health, and vice versa[6]. Fiorillo et al. (2017) investigated the effects of participation in social associations on self-rated psychological health measured by single items in the General Health Questionnaire (GHQ-12). They found that being both a member and active in associations matters for psychological health, by having a significant effect on the single GHQ-12 items mainly associated with positive psychological traits. Our investigation extends these two papers by separating the health effects of social participation by

[6]Such a reverse effect is also found for mental and physical health. Finally, loneliness is significantly related to perceived mental and physical health.

level of engagement. We also consider multiple behavioral channels, which are related to workplace conditions and gender differentials, to better understand the mechanisms underlying these effects.

3 Data and methodology

3.1 Data

The analysis is based upon all the waves of the British Household Panel Survey (BHPS), from 1991/92 to 2007/08, where the history of social participation is available. The BHPS is a longitudinal survey of households in Great Britain, including a rich set of information on occupational, socio-demographic and health variables. It contains observations about each adult member (16 years old or older) of a nationally representative sample of households. For our econometric analysis we use an unbalanced panel sample, containing all the available observations at each wave that provide complete information for the variables used in the model. The sample also includes new entrants to the survey as well as missing respondents respondents lost due to attrition. To control for working time constraint, we restrict our sample to working-age individuals between 18 and 65 years old.

As dependent variables, we use two health metrics: self-assessed physical health and psychological health. In order to construct our measure of physical health we followed a two-step procedure. First of all, since the six categories for self-assessed physical health changed across all survey waves, we recoded them into a new categorical variable with the following categories: poor or very poor, fair, good or very good, excellent (like in Robone et al. (2008))[7]. Then, we collapse these six ordinal categories into a dichotomous variable, coded 0 if the individual reported poor/very poor and fair health and 1 otherwise. We decide to create a dichotomous variable capturing the two lowest categories in order to focus our attention on the individuals which are potentially more distressed and might benefit more from social relief.

As a measure of self-assessed psychological health, we use the reduced version of the General Health Questionnaire (GHQ) in the BHPS. For each of the 12 items present in the GHQ (concentration, loss of sleep, playing a useful role, capable of making decisions, constantly under strain, problem overcoming difficulties, enjoy day to day activities, ability to face problems, unhappy or depressed, losing confidence, believe is self-worth, general happiness), respondents are asked to indicate on a four-point scale how they recently felt in relation to each item. In order to be consistent with our measure of self-assessed physical health which attaches zero value to the worst outcome we decided to recode the answers of the GHQ questionnaire such that 3 is the best scenario and 0 is the worst. As a proxy for overall psychological health we use the Likert scale (Likert, 1952), which reports an overall score summing the individual components of the GHQ. The Likert scale, therefore, ranges from 0 to 36, where 36 is the best scenario and 0 is the worst[8]. In this way any positive effect of social interaction will have a positive effect of our measures of health. In the following

[7] As was also reported by Hernández-Quevedo et al. (2004) from the ninth wave of the BHPS includes the SF-36 general health questionnaire, which incorporates a different wording to the self-assessed health variable used at other waves.

[8] Differently from other literature on the subject (see Fiorillo et al. (2017)) we decided to keep the Likert scale collapsed into a single category in order to capture the overall phsycological condition of the individual.

analysis, therefore, we will have a dichotomous variable capturing the individual self-assessed physical health, while a quantitative scale for self-assessed psychological health, both coded positive for better outcomes. Our decision to not transform psychological health into a dichotomous variable lies in the fact that there is no evidence on where the cutpoint should be; with physical health such cut point was easier to make since two out of three answers are objectively positive. With the Likert scale, this is not so easy to make. Therefore, we preferred to keep the original (and continuous) variable since we had not objective way of separate positive and negative values. The main shortcoming is on the interpretation of the effects which will be: (1) an increase/decrease in the probability of good physical health and (2) and an increase/decrease in the score for psychological health. Since the two models are not comparable, in the rest of the paper, we only compare the same model across different subgroups. In the remainder of this paper, for the sake of compactness, we will refer to our two health variable simply as (self-assessed) physical and psychological health.

We assume that social capital is built by means of participation, social interaction and civic discussions in social organization[9]. The BHPS records how many social organizations the individual is either part of or active in[10]. For the purpose of our analysis we focus on the social organization in which the individual is active in to construct three social participation indicators. The first one is a dichotomous variable coded one if the individual is active in any social organization, while the second is coded one if the individual is active in a sport organization. Lastly as an additional indicator for social participation we also use the number of social organizations in which the individual is active. We include this last variable in square to address possible non-linearities of social participation and check if engaging in social activities could potentially have higher-order effects.

Differently from previous literature we decided to divide the organizations in non-sport and sport since being an active member of the latter one is associated with a double investment in health. One immediate and more devoted towards physical enhancement and a second one, more delayed and assumed to have an indirect effect on stress and mental condition. While being an active member of non-sport organization still produce a direct health investment which, however, is assumed to be more targeted towards enhancing psychological health via for example stress relief. In this way we are able to divide the possible positive health effect of social participation into a social components (i.e. active in non-sport organization) and one related mainly to physical fitness and sport participation (i.e. active in sport organization) and also to check if such effect dominates the mental relief produced by physical activity. Intuitively, we expect the beneficial effect of sport participation to be higher than generic attendance in a social association due to the reinforcement of physical activity

Finally, to control for other factors that simultaneously affect individual health and his likelihood of being socially active and mitigate the omitted variable bias, we include several sociodemographical variables such as age, educational level (with five ascending categories), marital status, household's tenure indicator for ownership, whether the individual has a limiting disability, yearly number of visits to general practitioner

[9]Following Putnam (1995, 2001)

[10]These include political party, trade union, environmental group, parents association, tenants group, religious group, social group, sport organization and women institute.

(GP), log of net monthly income, socio-economic group of current job[11], weekly working hours and overtime[12]. Year and regional fixed effects are also included to account for macroeconomic shocks, which might influence health status.

Table 1 reports the means of the variables used in our empirical models[13] for the sub-samples of women, men, manual and non-manual workers. Overall, male and non-manual workers have higher working/overtime weekly hours and consequently higher monthly wages and are more active both in social and sport organization than are their female and manual-worker counterparts, respectively. Males and non-manual workers also tend to report higher physical and psychological health and make less doctor visits. There is a clear socioeconomic gap between non-manual and manual workers, with the latter having lower house ownership rates, lower education and lower monthly wages.

[Table 1 about here.]

3.2 Methodology

To analyze the effect of social participation on individual health, we estimate the following fixed-effect (FE) model:

$$h_{it} = \alpha_i + \beta X'_{it} + \gamma S_{it} + \theta_t + \epsilon_{it} \tag{1}$$

where h_{it} denotes the health indicator of individual i at time t which is either: (1) a dichotomous variable, coded 0 if the individual reported poor/very poor and fair health and 1 otherwise and (2) the Likert scale a continuous variable which reports an overall score summing the individual components, ranging from 0 to 36, where 36 is the best scenario and 0 is the worst; α_i is the individual's fixed affect; X'_{it} is the set of individual time-varying characteristics (e.g. age, age squared, education, dichotomous variable for type of job, hours and over-time worked, log of wage rate, GP visits); S_{it} is our social participation variable of interest which can be either: (1) a dichotomous variable, coded 1 if the individuals is active in any non-sport organizations and zero otherwise; (2) a dichotomous variable, coded 1 if the individual is active in any sport organization sand zero otherwise and (3) a continuous variable capturing the number of associations in which the individual is active in, also included in square terms. Lastly ϵ_{it} is the error term. We also include survey year fixed effects, θ_t, and a full set of regional fixed effects at the Government Office Region (GOR). We used robust standard error for every regression and all estimates were performed using the *xtreg* command in Stata 14.

Model (1) can be fitted as a random effects (RE) model or a fixed effects (FE) model. The RE model assumes that the unobserved time-invariant effects (i.e. α_i) are uncorrelated with the time-variant regressor vector (X_{it}), whereas the FE model allows for the possibility of correlation. Selection of the appropriate

[11]The groups are divided into: (1) employer; (2) manager; (3) professional worker; (4) non-manual worker; (4) skilled manual; (5) un-sklilled manual; (6) farmers and (7) military.

[12]The sample also includes unemployed individual for whom we define a separate socio-economic class and working hours and overtime are set to zero.

[13]We excluded the socio-economic class of individual for the sake of compactness.

modelling method was determined by a Hausman test[14], which produced a result in favour of the fixed effect approach. In addition to this, we also evaluated the robustness of our choice of using a linear probability model by performing a similar Hausman test against a non-linear panel data methods (i.e. random effect Probit model); in this case also the result of the test supported our choice. We stratify our analysis by gender and by type of job (manual vs. non-manual job).

The fixed effect model allows us to control for the impacts of time-invariant determinants of social participation. In addition to this the inclusion of control variables is intended to capture as much variation as possible, and thereby minimise variation due to unobserved sources. In the sections that follow, we draw qualitative conclusions on the sign and magnitude of the association between leisure time decision and individual health; the term effect is used in a technical sense which is not taken to imply causation.

4 Results

In this section we present the estimations of the empirical model described in the previous section. Table 2-4, report the results for the fixed effect models of equation (1), using longitudinal data from 1991/92 to 2007/08, for the probability of reporting good/excellent health (columns (1)-(3)) and the Likert scale of the reduced version of the GHQ-12 (columns (4)-(6)). In all tables, columns (1) and (4) present the effects on health of being active in social association; columns (2) and (5) the effects of being active in sport organization; and finally columns (3) and (6) the effects of the number of active organization. The regression coefficients represent the change in Y (health) in response to a 1-unit increase in X (e.g. being active); when Y is a proportion (e.g. physical health), the change can be expressed in percentage points (PP). For example, in Table 1 column (2) the coefficient of 0.041 means that a one unit increase in the X (i.e. being active) is associated with a 4PP increase in the probability of report excellent/good physical health.

Overall, the effects of social participation have the expected positive sign, in relation to self-rated health (i.e. an increase in the probability of reporting good/excellent health and a better score in the Likert scale). The estimated coefficients are all statistically significant across specifications. Another noteworthy pattern that is consistent in all regressions is that the number of associations in which the individual is active has a a positive effect, although with progressively decreasing magnitude (indicated by a negative second order term).

[Table 2 about here.]

The results from the whole sample (Table 2), as expected, show that being active in sport organization yields a higher return on health than being active in social organization. Being an active member of a sport organization produce a 4 PP increase in the probability of report good/excellent health against a 3 percentage point of just being socially active; such a difference is still present but less pronounced for psychological health

[14]It is a test whether the errors are correlated with the regressors, the null hypothesis is they are not (see Greene (2003), chapter 9)

where being socially active increases the Likert scale by 0.5 while being active in sport organization increases it by 0.4. The number of social associations the individual is active in has a positive effect on both measures of health although the effect is declining, providing evidence of non-linear relationships.

[Table 3 about here.]

[Table 4 about here.]

Tables 3 and 4 present the results for men and women separately. For both genders, the health effects of being active in sport organization is higher than the one associated with being active in social associations. The effects on physical health for men (columns (1) and (2), table 3) are slightly higher than the one reported for female (columns (1) and (2), table 3). For men being active in any organization increases by 4 PPs the probability of reporting good/excellent health versus a 3 PP increase for women; the effects of sport participation is also higher for men (5PP vs. 4.6PP) although such a difference is less pronounced. For what concern the effect of social participation on psychological health the pattern is reversed. In fact, women report a higher positive effects of social participation on health, both from being active in any organization (0.43 vs. 0.36 increase in Likert scale) and sport' ones (0.5 vs. 0.4 increase). This evidence shows that the beneficial effect from social participation works for men mostly via physical pathways, whereas for women, the transmission mechanism is primarily psychological. This evidence might also be reflective of the possibility that men are generally more likely than women in being active in sport organization.

4.1 Social relief and working conditions

In this section, we explore the possibility that working conditions are a discriminating variable for the magnitude and sign of social association effects on health. Individual undergoing different types of jobs seek different forms of social association to gain physical and mental relief from work-related stress. To explore this possibility, we divide our sample into manual and non-manual workers. In fact, depending from the type of stress they are exposed to, being socially active, either from social or sport organization, is most certainly able to create different (positive) impacts on manual and non-manual workers. Manual workers, for example, could benefit from social support and/or sport activities shared with friends since the nature of their job is more isolating and repeated. Non-manual workers, on the contrary, have more socially active jobs and might find more relief from different leisure activities. In order to divide our sample of employed individuals in manual ad non-manual workers we exploit the socio-economic group provided in the questionnaire which explicitly categorizes jobs in manual and non-manual.

Tables 5 and 6 present the results for non-manual and manual workers, respectively. Interestingly, the positive effects of social and sport participation on physical health are higher for manual workers (columns (1) and (2), table 6) than for non-manual workers (columns (1) and (2), table 5). The effect of being active in any social organization increase the probability of reporting good/excellent health for manual workers by 4PP compared toto 2PP for non-manual workers; sport participation yields a higher association for manual

worker (5PP vs. 4PP) although the difference is less pronounced. The effect of social participation in any organization on psychological health is also higher for manual workers (0.5 vs 0.3 increase in the Likert scale by participation in any social organization), especially for sport participation (0.6 vs. 0.4). Overall these results show that manual workers, who perform more repeated and physically strenuous jobs, have a higher physical and psychological relief associated with social interactions than individual engaged in non-manual jobs, especially from being active in sport. Such findings support the health-enhancing mechanism that social associations play, especially for individuals undergoing more isolating and physical demanding jobs.

[Table 5 about here.]

[Table 6 about here.]

5 Conclusion

Engaging in social activities is a critical input for improving physical, mental and cognitive health. Social networks influence whether individuals exercise, eat well, smoke or make use of drugs. Social integration may also foster feelings of connectedness and responsibility. In this paper, we provide evidence that being socially active increases psychological and physical health. Our subgroup analysis indicates that the beneficial effects of social participations operate via physical pathways for men and psychological channels for women. Additionally, the our results show that manual workers have a higher physical and psychological relief associated with social interactions while non-manual workers derive pleasures from sport participation. We also provide suggestive evidence of decreasing returns to social memberships, especially among men and manual workers.

Our results could be reconciled with some other evidence from previous literature. Bolin et al. (2003) show theoretically and empirically that the amount of social capital is positively related to the level of health. Differently from us they define social capital as having a close friend outside the family, which does not provide any information on the form of association. Also Petrou and Kupek (2008) find a positive association between social capital and health status; among all the variables used to define social capital the authors also use a dichotomous measure of civic participation, measured as individual's activities in a range of political, environmental, educational, religious, voluntary, sporting and social organisations. However they do not divide the associations as we did to capture any differences in the results. To the best of our knowledge Sirven and Debrand (2008) is one of the few papers investigating such possibility and its effect on health, however their analysis is narrower than ours since they only focus on elderly. Overall our paper supports even further the evidence from Folland (2007) social capital, measured as civic degree of sociability and community mindedness, is positively correlated with many health measures outcomes.

Our first policy implication is that more efforts should be devoted to fostering social participation to increase individual health investment. This change in behavior might also translate to reduced healthcare spending in the long-run. Several attempts have been made, especially in developed countries, to develop efficient strategies for counteracting the harmful effects of loneliness and social isolation. Such efforts were

commonly developed via primary care. This study shows that neighborhood and community-related interactions also play a crucial role

The United Kingdom, for example, has made reducing loneliness a national priority. In 2016, Parliament established a nongovernmental Commission on Loneliness to study the problem and make recommendations which resulted in 2018 with the creation of a new Minister of Loneliness to design and implement a national strategy to combat social isolation and loneliness across the UK. Such Ministry established the Campaign to End Loneliness[15] which is a network of more than 2,500 individuals and advocacy groups aiming to raise awareness about loneliness. In the US, the National Academies of Sciences, Engineering, and Medicine has formed an ad hoc committee evaluating social isolation and loneliness in older adults[16].

Social isolation, loneliness management and their health consequences are also very salient in European countries. Among others, policy interventions include low-tech community-based programs, high-tech digital approaches, nurse-led care coordination models, and proactive national policies. For example, several countries have organised volunteer telephone support services to assist older and isolated adults (e.g France, Ireland[17], Canada[18], Australia[19]). A Norwegian company, No Isolation[20],, instead, developed a one-button computer designed to help people with no experience using smartphones or computers to connect with others. In the Netherlands, as part of the Proactive Primary Care Approach for the Frail Elderly (UPROFIT), nurses assess patients' health and social needs or issues, including loneliness, using a structured questionnaire. If patients screen positive for loneliness, a nurse follows an evidence-based protocol ranging from building a social district team of informal caregivers and community volunteers to work with the patients to primary care provided by professional practitioners to increase social interactions.

In this paper, we provide supporting evidence that neighbourhood-oriented actions do have a significant positive influence on health. Our findings point to the potential role of simple community-focused interventions in improving health services, and ultimately, mental and physical health. These activities are highly promising in tackling social isolation without placing additional burdens on the existing health and social care system.

Our work has several shortcomings. First, we only focus on active membership and therefore our results show the overall association between social participation on individuals already engaging in social activities. Future research can examine isolated individuals to deliver deeper insights into the health consequences of social participation among this subgroup as well as highlight the unique challenges facing these individuals. Second, we study only the potential direct consequences of social contact while many other aspects of the built and natural environment, including transport infrastructure, remain unexplored. The lack of data prevents us from undertaking this analysis, yet represents a meaningful route of contribution for future work.

[15] https://www.campaigntoendloneliness.org/

[16] https://www.nationalacademies.org/our-work/the-health-and-medical-dimensions-of-social-isolation-and-loneliness-i

[17] urlhttps://friendsoftheelderly.ie/what-we-do/friendly-call-service/

[18] https://www.redcross.ca/how-we-help/community-health-services-in-canada/saskatchewan-friendly-phone-program

[19] https://friendsforgood.org.au/

[20] https://www.noisolation.com

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Table 1: Summary statistics - means and proportions of selected variables

Variable	Statistic	Full sample	Men sub-sample	Women sub-sample	Non-manual job sub-sample	Manual job sub-sample
Excellent Good Health	prop.	0.71	0.73	0.69	0.78	0.63
Psychological health	mean	24.76	25.47	24.14	25.12	24.41
Age (years)	mean	39.90	39.84	39.95	38.23	41.49
Married	prop.	0.57	0.58	0.57	0.59	0.56
Educ: none	prop.	0.01	0.01	0.01	0.01	0.01
Educ: Primary	prop.	0.26	0.24	0.28	0.13	0.39
Educ: Secondary/GCE ord.	prop.	0.32	0.30	0.35	0.32	0.33
Educ: GCE adv./Diploma/Certi.	prop.	0.28	0.31	0.25	0.33	0.22
Educ: Undegrad/Higher	prop.	0.13	0.14	0.12	0.22	0.05
Own house	prop.	0.73	0.74	0.72	0.82	0.64
Has limit daily activity	prop.	0.12	0.10	0.13	0.06	0.17
Visits to GP	prop.	2.34	2.08	2.57	2.21	2.47
(Net) monthly pay (punds)	mean	621.44	795.82	471.45	932.00	326.36
Weekly hours worked	mean	21.26	25.15	17.92	29.60	13.34
Weekly overtime hours	mean	2.38	3.29	1.60	3.12	1.68
Active in social org.	prop.	0.47	0.49	0.44	0.51	0.42
Active in sport ass.	prop.	0.19	0.26	0.14	0.23	0.15
N. of org. active in	mean	0.69	0.71	0.66	0.78	0.59
Observations		103,228	47,733	55,495	50,295	52,933

Note: The table reports mean values for quantitative variables and proportions for categorical variables, for all variables used in the regression analysis; divided by gender and type of jobs.

Table 2: Models for self-rated physical and psychological health: persons

	Model					
	Physical health			Psychological health		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Active in social org.	0.0292***			0.423***		
	(0.000722)			(0.0182)		
Active in sport ass.		0.0412***			0.516***	
		(0.00340)			(0.0152)	
N. of org. active in			0.0280***			0.400***
			(0.00196)			(0.0331)
N. of org. active in (sq.)			-0.00433***			-0.0722***
			(0.000996)			(0.00731)
Observations	102051	102051	102051	102051	102051	102051
R^2	0.316	0.316	0.316	0.123	0.123	0.123

In all regression we controlled for age (also squared), marital status, education, housing tenure, number of GP visits, working status, (log) net montly pay, working and overworking hours, individual and time fixed effects. Standard (clustered robust) errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Models for self-rated physical and psychological health: men

	Model					
	Physical health			Psychological health		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Active in social org.	0.0376***			0.363***		
	(0.00117)			(0.0155)		
Active in sport ass.		0.0491***			0.419***	
		(0.00354)			(0.0362)	
N. of org. active in			0.0390***			0.336***
			(0.00380)			(0.0285)
N. of org. active in (sq.)			-0.00694**			-0.0612***
			(0.00195)			(0.00804)
Observations	47201	47201	47201	47201	47201	47201
R^2	0.305	0.306	0.306	0.113	0.113	0.113

In all regression we controlled for age (also squared), marital status, education, housing tenure, number of GP visits, working status, (log) net montly pay, working and overworking hours, individual and time fixed effects. Standard (clustered robust) errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Models for self-rated physical and psychological health: women

	Model					
	Physical health			Psychological health		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Active in social org.	0.0254***			0.438***		
	(0.00111)			(0.0246)		
Active in sport ass.		0.0464***			0.491***	
		(0.00231)			(0.0471)	
N. of org. active in			0.0228***			0.421***
			(0.00276)			(0.0318)
N. of org. active in (sq.)			-0.00333**			-0.0734***
			(0.000898)			(0.00738)
Observations	54850	54850	54850	54850	54850	54850
R^2	0.326	0.326	0.326	0.115	0.114	0.115

In all regression we controlled for age (also squared), marital status, education, housing tenure, number of GP visits, working status, (log) net montly pay, working and overworking hours, individual and time fixed effects. Standard (clustered robust) errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Models for self-rated physical and psychological health: non-manual jobs

	Model					
	Physical health			Psychological health		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Active in social org.	0.0208***			0.302***		
	(0.00103)			(0.0385)		
Active in sport ass.		0.0377***			0.468***	
		(0.00312)			(0.0106)	
N. of org. active in			0.0240***			0.260**
			(0.00265)			(0.0609)
N. of org. active in (sq.)			-0.00354*			-0.0510**
			(0.00138)			(0.0139)
Observations	49763	49763	49763	49763	49763	49763
R^2	0.226	0.227	0.191	0.063	0.063	0.062

In all regression we controlled for age (also squared), marital status, education, housing tenure, number of GP visits, working status, (log) net montly pay, working and overworking hours, individual and time fixed effects. Standard (clustered robust) errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Models for self-rated physical and psychological health: manual jobs

	Model					
	Physical health			Psychological health		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Active in social org.	0.0378***			0.543***		
	(0.00161)			(0.0144)		
Active in sport ass.		0.0462***			0.578***	
		(0.00372)			(0.0299)	
N. of org. active in			0.0348***			0.525***
			(0.00180)			(0.0194)
N. of org. active in (sq.)			-0.00438***			-0.0806***
			(0.000534)			(0.00445)
Observations	52288	52288	52288	52288	52288	52288
R^2	0.347	0.347	0.348	0.165	0.164	0.165

In all regression we controlled for age (also squared), marital status, education, housing tenure, number of GP visits, working status, (log) net montly pay, working and overworking hours, individual and time fixed effects. Standard (clustered robust) errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$