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Social capital and change in psychological health over time - a panel study

Abstract

The positive association between social capital and *general* health outcomes has been extensively researched over the past decade; however, studies investigating social capital and *psychological* health show less consistent results. Despite this, policy-makers worldwide still employ elements of social capital to promote and improve psychological health. This United Kingdom study aims to investigate the association between changes in psychological health over time and three different *individual-level* proxies of social capital, measures of socio-economic status, social support and the confounders age and gender. All data are derived from the British Household Panel Survey data, with the same individuals (N = 7994) providing responses from 2000-07.

The data were split according to baseline psychological health status ('Good' or 'Poor' psychological health – the dependent variable). Using Generalised Estimating Equations, two separate models were built to investigate the association between changes from baseline *psychological* health over time and considered variables. An autoregressive working correlation structure was employed to derive the true influence of explanatory variables on psychological health outcomes over time.

Generalised trust was the only social capital variable to maintain a positive and highly significant (OR 1.32, $p < 0.001$) association with *psychological* health in multivariable models. All measures of socioeconomic status and social support were rendered insignificant, bar one.

We argue that the breakdown of the traditional family unit (and subsequent reduction in family capital investment), along with psychosocial pathways, demonstrate plausible mechanisms by which a decrease in generalised trust could lead to an increasing trend of

worse *psychological* health in youth over successive birth cohorts. Policy makers, while providing welfare solutions in response to breakdown in traditional family structure, must also consider perverse incentives they provide. If perceived as a viable lifestyle choice, welfare provision could inadvertently promote further decline of trust, at even greater cost to society.

Introduction

According to the World Health Organisation (WHO), mental health disorders caused 13.1% of the global burden of disease in 2004; with unipolar depression predicted to be the greatest cause of disability burden worldwide by 2030, this already high percentage is set to rise further (WHO, 2004). However, funding for mental health services is still considered low priority, with almost one third of all countries not having a specific mental health budget (Saxena, Thornicroft, Knapp, & Whiteford, 2007). Of the countries that do, around one fifth spends less than 1% of their total health budget on mental health (Saxena et al., 2007) and decision makers have been considering community-based resources to address this shortfall (Cutler, Bevilacqua, & McFarland, 2003; Thornicroft & Tansella, 2004; WHO, 2006).

One such community resource is social capital. Defined by Putnam (2004) as "social networks and norms of reciprocation", communities deemed rich in social capital consist of individuals who demonstrate high levels of generalised trust, high social and civic participation and high levels of generalised reciprocity (Putnam, 1993; Putnam, 2000). These individual-level social capital proxies are described as having a 'structural' dimension, relating to social networks, and a 'cognitive' dimension, relating to individuals' perceptions of trust and reciprocity (Harpham, Grant, & Thomas, 2002). The two dimensions have been hypothesised to act in different ways to affect health outcomes, with many studies showing strong association between high levels of social capital and positive *general* health outcomes

(Kawachi, Kennedy, & Glass, 1999; Kawachi, Kennedy, & Lochner, 1997; Lindström, Hanson, & Östergren, 2001; Giordano & Lindström, 2010). In comparison, studies researching social capital and *psychological* wellbeing demonstrate less consistent results, with individual-level 'cognitive' social capital studies showing a more consistent inverse association with poor psychological health than studies investigating 'structural' measures; and no obvious pattern of association emerging from ecological-level social capital studies and psychological health (De Silva, McKenzie, Harpham, & Huttly, 2005). Despite this fact, policy-makers worldwide, including WHO and the World Bank, have employed elements of social capital as a means to promote and improve the mental health of populations (Henderson & Whiteford, 2003).

How social capital affects health outcomes is considered contentious (Muntaner, 2004; Pearce & Davey Smith, 2003). Kawachi et al. (1999) originally postulated that communities with high levels of social capital were more likely to deter 'deviant' behaviours such as drinking, smoking and crime, maintain access to local resources and even promote healthier behaviours, such as regular exercise. It has been further postulated that individuals perceiving high levels of trust and reciprocity in their communities have better health, due to reduced exposure to chronic stressors (Wilkinson, 1996; Giordano & Lindström, 2010). These theories equally apply to *psychological* health, as regular physical exercise and maintaining access to resources affect psychological health outcomes, and high crime levels and chronic stressors are known precursors to worse psychological wellbeing (Aneshensel & Sucoff, 1996; Tennison, Rodgers, Beker, Vorobjeva, Creed, & Simonenko, 2010). Further, active social participation, considered the "cornerstone" of social capital generation (Putnam, 2000), has a positive affect on psychological wellbeing through increasing social ties and community integration (Kawachi & Berkman, 2001).

A further issue surrounding social capital is that as a contextual phenomenon, it cannot be directly observed or quantified; this begs the question as to how social capital and its effects are empirically measured and tested. Regarding measurement, social capital is often quantified using individual-level proxies, such as generalised trust, voluntary group participation, voting levels and perceived reciprocity (De Silva, Harpham, Tuan, Bartolini, Penny, & Huttly, 2006). Once measured, however, there is still the issue of testing. One school of thought is to aggregate individual-level indicators to a contextual level (such as neighbourhood or community) in order to capture contextual effects (Kawachi, Kim, Coutts, & Subramanian, 2004). In practice, however, contextual levels are often chosen solely by availability of data (e.g. postcode sectors, constituencies or states) and may hold little relevance to individuals' day-to-day social interactions. Furthermore, any contextual-level effects may be the result of confounding if individual-effects are not also taken into account (Poortinga, 2006).

In the absence of appropriate community-level contextual units (as is the case with our data), the only option is to measure the effects of social capital at the individual-level. In doing so, however, one invites criticism that it is the effects of social support being measured, as social isolation and poor social networks have long been associated with poor health (Durkheim, 1897, 1951; Hawe & Shiell, 2000; Kawachi & Berkman, 2001). This is most apparent when 'social participation' is used as a measure of social capital, as it is not difficult for readers to equate this source of social capital as a potential source of social support. To avoid such critique, we must therefore include social support variables alongside the individual-level social capital proxies in our investigation, to reduce any potential confounding of association. Furthermore, it is also vital that we keep 'cognitive' and 'structural' dimensions of social capital as separate entities, as the 'structural' dimension is the one most likely to influence health along social support pathways (Giordano & Lindström, 2010).

One social support mechanism known to influence health is the role of marriage. Marriage has independently been shown to reduce morbidity and mortality (House, Landis, & Umberson, 1988) and is thought to reduce risk-taking behaviour and stress (Wyke & Ford, 1992), mirroring presumed causal pathways that elements of social capital act upon (Kawachi et al., 1999). Marriage is also thought to provide a level of health 'protection' via emotional and financial support for the individuals concerned (Umberson, 1992). Though happy marriages are shown to contribute to better psychological health (Kiecolt-Glaser & Newton, 2001), marital distress/breakdown and remaining unmarried are, however, strongly associated with worse psychological health (Beach, Fincham, & Katz, 1998).

Socio-economic status (SES) also has a positive association with psychological health outcomes (Lorant, Deliege, Eaton, Robert, Philippot, & Ansseau, 2003; Wang, Schmitz, & Dewa, 2009), though its influence seems to depend on which measures of SES are used (income, social class, education or employment status) and how psychological health is measured (Wiggins, Schofield, Sacker, Head, & Bartley, 2004).

From the above, the potential for confounding the association between social capital and psychological health is great, unless multiple measures of social support and SES are also considered. The aim of this panel study is to research different dimensions of individual-level social capital (generalised trust, community group participation and informal local networks), SES (education level, social class, employment status and household income) and social support (marital status, cohabitation and support networks) against self-rated psychological health over a seven year period. Along with known confounders (age and gender), considered variables will be individually and simultaneously tested, revealing any association with changes in psychological health over time.

Materials and methods

Data collection

The British Household Panel Survey (BHPS) is a longitudinal survey of randomly selected private households, conducted by the UK's Economic and Social Research Centre. Details of the selection process, weighting and participation rates can be found on-line in the BHPS User manual (Taylor, Brice, Buck, & Prentice-Lane, 2007). Since 1991, individuals within selected households have been interviewed annually with a view to identifying social and economic change within the British population. The Research Centre fully adopted the Ethical Guidelines of the Social Research Association; informed consent was obtained from all participants and strict confidentiality protocols were adhered to throughout data collection and processing procedures. The raw data used for this panel study come from the BHPS individual level responses in years 2000, 2003, 2005 and 2007.

Dependent variable

The dependent variable in this study is self-rated psychological health, obtained using the 12-item General Health Questionnaire (GHQ-12). Depending on the answers obtained from the twelve items offered by this instrument, respondents were deemed to have either 'good' or 'poor' psychological health (see appendix for more detail). Although there are more complex instruments (28- or 60-item) to measure psychological health, there seems little difference in validity between them and the GHQ-12 item used here (Goldberg, Gater, Sartorius, Ustun, Piccinelli, Gureje et al., 1997).

All data were stratified by baseline psychological health ('Good' or 'Poor' PH) to create two distinct cohorts. This was done in order to track changes in PH over time from baseline. Individuals from the 'Good PH' at baseline cohort whose PH *deteriorated* over time were the

subject of investigation in model one. Likewise, those in the 'Poor PH' at baseline cohort whose PH *improved* over time were the subject of investigation in a second separate model.

Independent variables

Social capital variables

Our individual-level social capital items were interpersonal trust, active social participation and frequency of talking with neighbours. According to Putnam (1993, 2000), communities with high levels of social capital consist of individuals who are more able to trust one another, who actively participate in local groups, and demonstrate high levels of generalised reciprocity. Though no specific reciprocity data were available, we also deemed 'frequency of talking with neighbours' a suitable social capital proxy.

Interpersonal trust was assessed by asking people: 'Generally speaking, would you say that most people can be trusted, or that you can't be too careful?' Those respondents who stated that most people could be trusted were labelled 'Can trust others'; all other responses (including 'It depends') were labelled 'Can't trust others'.

Social participation was measured by asking respondents questions about being *active* members of community groups, local voluntary organisations, or any sports, hobby or leisure group activity within the community. Only those who answered positively to any of these were judged to participate, with all others being labelled 'No participation'.

Frequency of talking to neighbours was also considered a measure of social capital. Possible responses were: 'Most days, once or twice a week, once or twice a month, less than once a month, or never'. Those answering 'most days' or 'once or twice a week' were assigned the label 'two or more times per week'; the rest were assigned the label 'less often'.

Socio-economic status variables

Education level was categorised as ‘University or higher’, ‘Year 12’ and ‘Year 10 or less’.

Social class was determined by occupation (derived from the Registrar General’s Social Classification of occupations). The usual six categories were dichotomised into ‘higher’ (1-3) and ‘lower’ (4-6) social class.

Household income was weighted according to size by summing the income of all household members and dividing this sum by the square root of the household size (Burkhauser, Smeeding, & Merz, 1996). This item was maintained as a continuous variable per £1000 increase and was an expression of total income, net of any taxation.

Employment status was categorized as ‘Employed’, ‘Retired’, ‘Fulltime student’ or ‘Unemployed’.

Social support variables

Respondents were asked if they were ‘married, separated, divorced, widowed or never married’. Marital status was recoded into married and unmarried (widow, divorced, single)’. A further variable ‘Lives alone’ (yes/no) was also used to try to capture more information about those individuals who co-habited.

Frequency of meeting with friends was considered a measure of potential social support. Possible responses were: ‘Most days, once or twice a week, once or twice a month, less than once a month, or never’. Those answering ‘most days’ or ‘once or twice a week’ were assigned the label ‘two or more times per week’; the rest were assigned the label ‘less often’.

Confounders

Age and gender were considered confounders in this study, age being stratified into quintiles (see tables 1-3).

Statistical analyses

Each independent variable was run against the dependent variable ('Worse PH over time' or 'Better PH over time') in bivariate analyses using Generalized Estimating Equations (GEE), with an autoregressive working correlation structure (AR1), utilising the 'sandwich' covariance estimator (Fitzmaurice, Laird, & Ware, 2004) . Reasoning behind this choice of model was twofold: firstly, repeated observations within the same subject are not independent of each other - the correlation structure corrects for this. Secondly, when examining time-dependent variables (such as PH, marital status, employment status, etc), GEE (AR1) estimates the "real influence" of independent variables on outcome (Y) over time, by also correcting for the previous value of the outcome (Y) at (t -1) (Twisk, 2003), as illustrated by the equation:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-1} + \cdots + u_{t.}$$

All analyses were conducted within the statistical software package STATA 11.0 (StataCorp, 2009). The presence of social capital, higher education, household income and social class, employment, being married, cohabiting and meeting friends more often were all hypothesized to be associated with better psychological health over time.

Results

Table 1 shows the frequencies and total percentages of all the variables at baseline, stratified by psychological health, derived from Wave ten (2000) of the BHPS. This stratification represents the two separate cohorts under investigation, as previously explained in the 'dependent variable' section.

The bivariate analyses results are presented in table 2 as prevalence (%) and odds ratios (ORs) with 95% confidence intervals (95% CI). The prevalence percentage demonstrates those individuals with 'Worse' or 'Better' psychological health compared to the baseline within each variable investigated. A multivariable GEE (AR1) model was also built for both PH cohorts, adjusting for all statistically significant ($p < 0.05$) variables identified from bivariate analyses. Results from these models are presented in table 3 as ORs with 95% CI.

Bivariate analysis – 'Worse PH over time'

As shown in table 2, column 1, the social capital variables 'cannot trust' and 'do not participate' were more likely to have worse PH compared to baseline (OR 1.30 and 1.09 respectively). Talking less with neighbours was also associated with worse PH over time (OR 1.17). None of the SES variables were statistically significant in bivariate analyses. Regarding the confounders, those individuals who were younger seem more likely to have worse PH over time, and females were 56% more likely to experience worse PH at follow-up than males. Being unmarried was the only measure of social support showing significant association with worse PH over time.

Bivariate analysis – 'Better PH over time'

As shown in table 2, column 2, the only social capital variable significantly associated with better PH over time was generalised trust. Regarding SES variables, increasing household

income and higher social class were also associated with better PH over time. Being married and not living alone were the only social support variables significantly associated with better PH compared to baseline levels in bivarate analysis.

The confounders age and gender were also strongly associated with better PH over time.

Multivariable analysis – 'Worse PH over time'

As shown in table 3, column 1, being unable to trust (OR 1.25) and talking less with neighbours (OR 1.12) maintained their significant association with worse PH over time. Being unmarried (OR 1.22) was the only social support variable still significant in multivariable analysis. The confounders age and gender maintained their significant association with worse PH over time.

Multivariable analysis – 'Better PH over time'

As per table 3, column 2, only the variables trust, marital status and household income, along with confounders age and gender maintained significant association with better PH over time. All other measures of social support, social capital and SES were rendered insignificant in multivariable analysis.

Discussion

The aim of this panel study was to compare any association between different individual-level indicators of social capital, SES and social support with changes in individual psychological health (PH) outcomes over time. In multivariable GEE analysis with an autoregressive working correlation structure, only the social capital variable generalised trust, the social support variable marital status and confounders age and gender maintained their

association with PH over time (see table 3). No SES variable remained statistically significant bar one, household income (OR 1.01).

Our results mirror previous research regarding gender differences in psychological wellbeing. As numerous international studies also show that females are 1.5 to 3.0 times more likely to experience worse PH than males (Weissman, Bland, Canino, Faravelli, Greenwald, Hwu et al., 1996; Piccinelli & Wilkinson, 2000), this adds plausibility to our other results.

The results also support previous research demonstrating that marriage protects against worse PH over time. As the autoregressive working correlation structure corrects for changes in individuals' marital status over time, this 'robust' result confirms that remaining married, or becoming married during this seven year period, is strongly associated with better PH (see table 3). Marriage is thought to have both a 'selection' and a 'protection' effect regarding PH, i.e. healthy individuals self-select into marriage and, as touched upon in the introduction, marriage is thought to 'protect' via emotional and financial support mechanisms (Umberson, 1992).

It is interesting to see that increased age seems to offer protection against worse PH. In the past, the reverse seemed more commonplace (Sheldon, 1948), but our results show, as do others, that worse PH is becoming more prevalent in younger age groups (Hankin, Abramson, Moffitt, Silva, McGee, & Angell, 1998; Pelkonen, Marttunen, Kaprio, Huurre, & Aro, 2008).That younger age groups are also strongly associated with better PH over time (see table 3) at first glance appears to contradict the previous statement. However, what this most likely demonstrates is younger individuals' greater ability to recover.

After considered confounders, generalised trust has the strongest association with PH over time in both multivariable models. Though there are fewer studies specifically examining association between social capital and PH compared with general health, (Almedom, 2005), our results reflect earlier research implying some level of consistency concerning the 'conceptual' dimension trust (De Silva et al., 2005). It may seem obvious that there is association between trust levels and psychological health, as lack of trust (or 'paranoia') is often associated with clinical psychoses. However, we should point out that the GHQ-12 instrument is not a diagnostic tool used by professionals to determine the mental health of patients, but a screening instrument designed to ascertain levels of anxiety, depression and loss of confidence, in non-clinical settings (Hu, Stewart-Brown, Twigg, & Weich, 2007). Therefore, generalised trust should be considered as an individual's expression of their community's level of social capital in this study (Putnam, 2001), not paranoia.

The 'cornerstone' of social capital generation, active participation shows no significant association with PH in multivariable models. This result adds to the increasing volume of research demonstrating that the separate dimensions of social capital are not as closely correlated as first thought (Stolle, 2001; Nummela, Sulander, Rahkonen, Karisto, & Uutela, 2008; Giordano & Lindström, 2010).

Fukuyama's (1999) concept of 'miniaturization of community' further describes how active group participation may not necessarily generate interpersonal trust. He distinguishes between *quantity* and *quality* group participation, the 'miniaturization of community' being one by-product of high group participation by individuals with low radii of trust (i.e. distrusting others outside the clique). According to Fukuyama, without *quality* social participation there can be no gains in interpersonal trust within the community (and subsequently no associated health benefits). Interestingly enough, individuals who

demonstrate this ‘high participation-low trust’ combination have worse PH than those who both trust and participate (Lindström, 2004).

‘Miniaturization of community’ is just one consequence of a greater shift in cultural norms described by Fukuyama (1999), which has occurred across many high income countries (the UK included) since the 1960s . This ‘shift’ comprised of, among other things, an increase in levels of crime, higher divorce rates and breakdown of the traditional family unit. Fukuyama (1999) and Putnam (2000) have also described general declines in levels of trust over a similar timeframe. This, in our opinion, is no coincidence; moreover, we hypothesize that the decline in trust could be one reason why there has been an increase in worse psychological health in youth over the same period.

To expand and clarify; Coleman (1990) stressed the importance of the traditional family unit as a conduit for social capital. Coleman believed that if parents spent quality time with their children and clearly articulated codes of conduct regarding acceptable and unacceptable behaviours, this would ensure the next generation understood accepted norms of reciprocity and trust. In other words, family capital investment enabled youth to generate social capital. It is not inconceivable that breakdown of the traditional family unit – e.g. through divorce, lone parent families or both parents working full time – could lead to a reduction in family capital investment in youth by parent(s). This in turn could mean that successive birth cohorts since the 1960s have reduced ability to maintain previous levels of social capital, thus leading to the reported decrease in trust levels across some societies (Fukuyama, 1999). Coleman (1990) also writes that high family capital investment reduces delinquent behaviour; *ipso facto*, reduced family capital investment could also contribute to higher levels of crime and the further decline of trust over time (Sampson, Raudenbush, & Earls, 1997).

From trust to psychological health

It has been argued that generalised trust is not just a reflection of community-level social capital (Putnam, 2001) but is indicative of an individual's level of perceived social stress and possible health status (Wilkinson, 1996; Giordano & Lindström, 2010). The 'psychosocial' pathway from stress to health is via the hypothalamic-pituitary-adrenal (HPA) axis, and is one plausible mechanism by which individuals' perceptions can lead to physical changes in the body over time (Rosmond & Björntorp, 2000).

In recent years, this same pathway has also been linked to *psychological* health; HPA axis dysfunction, in response to perceived stressors, plays a significant role in the development of mood disorders (Watson & Mackin, 2006; Itoi & Sugimoto, 2010; Tennison et al., 2010). If lower levels of trust are indicative of higher social stressors, then it seems plausible that the decline in trust could lead to deteriorating *physical* and *psychological* health in individuals.

Following this line of discussion, we could further hypothesise that maintaining traditional family structure is a determinant of social capital for future generations, which in turn may protect against worse PH. Results from previous studies lend credence to this hypothesis: social capital (as measured by network size and norms of trust) has been reported at higher levels within 'intact' families than within single-parent families (Ravanera & Rajulton, 2009), and population-based research has shown that youths born of teenage mothers are more susceptible to worse PH (Ekeus, Olausson, & Hjern, 2006). Thus breakdown of traditional family structure could be the first step in one pathway affecting PH in future generations.

With this in mind, policy makers, whilst developing welfare solutions in response to breakdown in traditional family structure (for example, lone parents receiving priority

housing and financial support), must also consider any perverse incentives they provide. Education empowers individuals; providing welfare without maintaining excellent levels of free/subsidized education could inadvertently promote further breakdown in traditional family structure, if disempowered individuals perceive welfare as a viable lifestyle choice.

Strengths and weaknesses

A major strength of this study is the fact that it is longitudinal, covering a seven year time frame with a high number of individual respondents (N = 7994). The unique design of this study captures association between our independent variables and any change in psychological health. Coupled with the auto-lag correlation structure, baseline stratification further allows us to infer causality by estimating the true influence of explanatory variables on changes in psychological health over time. The fact that the data were obtained via interview rather than relying on postal questionnaires contributed to the very high participation rate of around 90%, year on year (Taylor et al., 2007). Despite us being unable to compare our results against longer assessment tools, the GHQ-12 item is still considered a valid and reliable indicator of psychological health (Goldberg et al., 1997). By investigating three different individual-level indicators of social capital, along with multiple SES and social support variables, we ensured that well-known health determinants were also included in the analyses, thus reducing the risk of potential confounding. Though there is no 'gold standard' with which to validate against, generalised trust is considered a proxy of social capital (Putnam, 2001).

A major limitation of this study is that the BHPS sample was originally selected to reflect the UK population as a whole and deliberately avoided oversampling of smaller sized communities. Due to sampling and collection methods, the longitudinal data were unsuitable to perform any meaningful contextual analysis at the community-level. By year 2000, only

62.0% of the original cohort members were able to answer the questions posed (Taylor et al., 2007). This would have introduced further selection bias into this study. Another limitation is our social capital variables were only available in four of the seventeen 'waves'. Marital status was reduced to the dichotomous 'married' and 'not married'; though this method of reduction has been previously validated (Afifi, Cox, & Enns, 2006), it may hide more complex pathways regarding cohabitation, common in society today. The 'Lives alone' variable was included in an attempt to recapture this detail. Allowing significance levels to dictate the content of our final model could have similar disadvantages to using a stepwise analysis. However, we ran *all* hypothesized variables in one separate analysis for the sake of 'correctness'; the results on the independent variables in table 3 essentially did not differ (results not published).

Conclusion

Our study confirms that a strong positive association remains between the 'cognitive' social capital measure generalised trust and psychological health over time, even after taking many other social support and SES variables into consideration. We consider the decline in trust over recent decades to be associated with reduced family capital investment, a possible consequence of traditional family unit breakdown. Furthermore, we argue that this decline in trust may be associated with increases in worse PH in successive birth cohorts.

Policy makers, whilst justified in providing welfare solutions in response to breakdown in traditional family structure, must also consider perverse incentives they provide. If perceived as a viable lifestyle choice, welfare provision could inadvertently promote further decline of trust, at even greater cost to society.

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Appendix

The items included in the GHQ-12 are ‘Have you felt tense during the past weeks?’, ‘Have you had problems with your sleep during the past weeks?’, ‘Have you been able to concentrate on what you have been doing during the past weeks?’, ‘Do you feel that you have been useful during the past weeks?’, ‘Have you been able to make decisions in different areas during the past weeks?’, ‘Have you during the past weeks been able to appreciate what you have been doing during the days?’, ‘Have you been able to deal with your problems during the past weeks?’, ‘Generally speaking, have you felt happy during the past weeks?’, These eight items had four alternative answers: ‘More than usual’, ‘As usual’, ‘Less than usual’ and ‘Much less than usual’. The items were dichotomized with two alternatives denoting ‘good’ psychological health and two alternatives denoting ‘poor’ psychological health, i.e. for the two first questions ‘More than usual and ‘As usual’ denoted ‘poor’ psychological health and for the following six questions they denoted ‘good’ psychological health. Four other items had somewhat different alternative answers: ‘Have you felt unable to deal with your own personal problems during the past weeks?’, ‘Have you felt unhappy and depressed during the past weeks?’, ‘Have you lost faith in yourself during the past weeks?’ and ‘Have you felt worthless during the past weeks?’. The four alternative answers to these four items were: ‘Not at all’, ‘No more than usual’, ‘More than usual’ and ‘Much more than usual’. The answers to these items were also dichotomised to denote either ‘poor’ psychological health

(‘more than usual’ and ‘much more than usual’) or ‘good’ psychological health (‘not at all’ and ‘no more than usual’). If three or more of all the 12 items denoted ‘poor’ psychological health, the general psychological health (GHQ-12) was denoted as ‘poor’.

Table 1: Frequencies of all considered variables expressed as integers and percentages (%) of N_T (7994) stratified by psychological status at baseline (GHQ12)

		Psychological health (PH)		
		Good PH	Poor PH	Total (N_T)
Age	16-34	1770	617	2387
		29.8%	*30.1%*	*29.9%*
	35-44	1218	495	1713
		20.5%	*24.2%*	*21.4%*
	45-54	1117	394	1511
		18.8%	*19.2%*	*18.9%*
	55-64	876	281	1157
		14.7%	*13.7%*	*14.5%*
	65+	965	261	1226
		16.2%	*12.7%*	*15.3%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Gender	Male	2814	733	3547
		47.3%	*35.8%*	*44.4%*
	Female	3132	1315	4447
		52.7%	*64.2%*	*55.6%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Generalised trust	Yes, can trust others	2436	651	3087
		41.0%	*31.8%*	*38.6%*
	No, cant trust others	3510	1397	4907
		59.0%	*68.2%*	*61.4%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Social Participation: Local groups, organisations or group leisure activities	Active participation	2311	773	3084
		38.9%	*37.7%*	*38.6%*
	Zero participation	3635	1275	4910
		61.1%	*62.3%*	*61.4%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Frequency of meeting with friends [a]	Two or more times/week	5104	1743	6847
		85.9%	*85.1%*	*85.7%*

	Not that often	840	305	1145
		14.1%	*14.9%*	*14.3%*
Total		5944	2048	7992
		100.0%	*100.0%*	*100.0%*
Frequency of talking with neighbours [b]	Two or more times/week	4675	1516	6191
		78.7%	*74.1%*	*77.5%*
	not that often	1269	530	1799
		21.3%	*25.9%*	*22.5%*
Total		5944	2046	7990
		100.0%	*100.0%*	*100.0%*
Marital status	Married	3592	1121	4713
		60.4%	*54.7%*	*59.0%*
	Not married	2354	927	3281
		39.6%	*45.3%*	*41.0%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Lives alone	Yes	767	297	1064
		12.9%	*14.5%*	*13.3%*
	No	5179	1751	6930
		87.1%	*85.5%*	*86.7%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*
Education achieved [c]	University or higher	1233	396	1629
		20.9%	*19.5%*	*20.5%*
	Year 12	1061	390	1451
		18.0%	*19.2%*	*18.3%*
	Year 10 or less	3612	1246	4858
		61.2%	*61.3%*	*61.2%*
Total		5906	2032	7938
		100.0%	*100.0%*	*100.0%*
Employment status [d]	Employed	3363	1245	4878
		61.1%	*60.8%*	*61.0%*
	Retired	1132	411	1543
		19.0%	*20.1%*	*19.3%*
	FT student	290	90	380
		4.9%	*4.4%*	*4.8%*
	Unemployed	889	302	1191
		15.0%	*14.7%*	*14.9%*

Total		5944	2048	7992
		100.0%	*100.0%*	*100.0%*
Social class [e]	High	3324	1131	4455
		42.5%	*56.5%*	*56.9%*
	Low	2359	800	3159
		30.1%	*40.0%*	*40.3%*
Total		5683	1931	7614
		100.0%	*100.0%*	*100.0%*
Household income (annual) - size weighted	< £9588	1371	615	1986
		23.1%	*30.0%*	*24.8%*
	£9589-£15 055	1476	512	1988
		24.8%	*25.0%*	*24.9%*
	£15 056-£22 493	1535	474	2009
		25.8%	*23.1%*	*25.1%*
	£22 494 +	1564	447	2011
		26.3%	*21.8%*	*25.2%*
Total		5946	2048	7994
		100.0%	*100.0%*	*100.0%*

Source: The British Household Panel Survey Wave J, 2000

[a] Missing N = 2

[b] Missing N = 4

[c] Missing N = 56

[d] Missing N = 2

[e] Missing N = 380

Table 2: Prevalence (%) and odd ratios (ORs) with 95% confidence intervals (95% CI) of worse and better psychological health over time (2000-07) according to bivariate GEE (AR1) analysis of variables in social capital, SES, social support and potential confounders (N_t =7849)

Independent variables		Psychological health (GHQ12) over time			
		Worse psychological health (N = 5836)		Better psychological health (N = 2013)	
		Prevalence (%)	ORs (95% CI)	Prevalence (%)	ORs (95% CI)
Age (years)	16 - 34	20.3	1.39 (1.19-1.62) ***	44.8	2.32 (1.85-2.90) ***
	35 - 44	19.6	1.34 (1.14-1.59) ***	41.2	1.89 (1.50-2.39) ***
	45 - 54	16.9	1.12 (0.94-1.34)	41.2	1.89 (1.48-2.41) ***
	55 - 64	12.1	0.76 (0.62-0.93) **	38.4	1.63 (1.25-2.13) ***
	65 +	15.4	1.0	29.0	1.0
Gender	Male	14.2	1.0	43.0	1.24 (1.08-1.42) **
	Female	20.5	1.56 (1.41-1.72) ***	38.9	1.0
Household income - size weighted	Per £1000 increase	100.0	0.99 (0.99-1.00)	100.0	1.01 (1.01-1.02) ***
Social class: derived from occupation-based RGSC schema	Higher social class	18.3	1.0	42.1	1.15 (1.01-1.30) *
	Lower social class	17.1	0.94 (0.85-1.03)	37.8	1.0
Generalised trust	Trusts others	15.2	1.0	45.8	1.35 (1.20-1.51)***
	Cannot trust others	19.4	1.30 (1.20-1.41) ***	37.5	1.0
Social participation: Active in local groups	Participates	16.5	1.0	43.5	1.09 (0.97-1.21)
	Zero participation	18.5	1.09 (1.01-1.19)*	38.1	1.0
Social support: Meets with friends	2+ times/wk	17.4	1.0	40.8	1.12 (0.97-1.30)
	Less than this	18.6	1.06 (0.94-1.19)	37.8	1.0
Social networks: Talks with neighbours	2+ times/wk	16.8	1.0	40.8	0.98 (0.87-1.12)
	Less than this	20.5	1.17 (1.05-1.30) **	39.0	1.0
Employment status	Employed	17.7	1.0	39.7	1.03 (0.88-1.21)
	Retired	16.6	0.95 (0.85-1.05)	42.8	1.18 (0.98-1.41)

	FT student	17.1	0.99 (0.78-1.26)	45.0	1.23 (0.86-1.78)
	Unemployed	18.4	0.99 (0.88-1.11)	38.6	1.0
Education achieved	University or more	17.8	1.0	42.0	1.15 (1.00-1.31) *
	Year 12	17.1	0.97 (0.85-1.10)	41.3	1.07 (0.93-1.22)
	Year 10 or less	17.5	0.98 (0.89-1.09)	39.5	1.0
Marital status	Married	16.1	1.0	41.8	1.18 (1-04-1.33) **
	Not married	20.0	1.31 (1.19-1.44) ***	38.6	1.0
Lives alone	No	17.3	1.0	40.9	1.29 (1.10-1.52) **
	Yes	19.0	1.11 (0.97-1.25)	38.0	1.0

Source: The British Household Panel Survey, Waves J, M ,O & Q (2000-2007)
* 0.05 significance
** 0.01 significance
*** 0.001 significance

Reference group = 1.0

Table 3: Odd ratios (ORs) with 95% confidence intervals (95% CI) of better or worse psychological health over time within a multivariable GEE (AR1) model containing all significant variables from previous bivariate analyses (N_T = 7399)

Independent variables		Psychological health status (GHQ12) over time	
		Worse psychological health (N = 5836) ORs (95% CI)	Better psychological health (N = 2013) ORs (95% CI)
Age (years)	16 - 34	1.0	2.16 (1.69-2.75) ***
	35 - 44	1.03 (0.90-1.18)	1.65 (1.29-2.12) ***
	45 - 54	0.88 (0.76-1.01)	1.66 (1.28-2.15) ***
	55 - 64	0.59 (0.50-0.70) ***	1.54 (1.18-2.02) **
	65 +	0.74 (0.63-0.87) ***	1.0
Gender	Male	1.0 [a]	1.21 (1.05-1.39) **
	Female	1.55 (1.41-1.71) ***	1.0 [a]
Household income/£1000 increase	Continuous	NA	1.01 (1.00-1.01) *
Social participation: Active in local groups	Participates	1.0 [a]	NA
	Zero participation	1.03 (0.95-1.13)	NA
Generalised trust	Trusts others	1.0 [a]	1.32 (1.17-1.48) ***
	Can't trust others	1.25 (1.15-1.36) ***	1.0 [a]
Social networks: Talks with neighbours	Talks 2+/wk	1.0 [a]	NA
	Talks less	1.12 (1.01-1.24) *	NA
Social class: derived from occupation-based RGSC schema	High SC	NA	1.06 (0.93-1.21)
	Low SC	NA	1.0 [a]
Living alone	Lives alone	NA	1.0 [a]
	Lives with others	NA	1.01 (0.84-1.22)

Marital status	Married	1.0 [a]	1.15 (1.03-1.38) *
	Not married	1.22 (1.10-1.35) ***	1.0 [a]
Education achieved	University or higher	NA	1.07 (0.93-1.23)
	Year 12	NA	1.00 (0.87-1.15)
	Year 10 or less	NA	1.0 [a]

Source: The British Household Panel Survey, Waves J, M, O & Q (2000-07)

* 0.05 significance
** 0.01 significance
*** 0.001 significance

[a] Reference group
NA = Not significant in bivariate analyses