Coastal proximity, health and well-being: Results from a longitudinal panel survey

Abstract

Analysis of English census data revealed a positive association between self-reported health and living near the coast. However that analysis was based on cross-sectional data and was unable to control for potential selection effects (e.g. generally healthier, personality types moving to coastal locations). In the current study we have used English panel data to explore the relationship between the proximity to the coast and indicators of generic and mental health for the same individuals over time. This allowed us to control for both time-invariant factors such as personality and compare the strength of any relationship to that of other relationships (e.g. employment vs. unemployment). In support of cross-sectional analysis, individuals reported significantly better general health and lower levels of mental distress when living nearer the coast, controlling for both individual (e.g. employment status) and area (e.g. green space) level factors. No coastal effect on life satisfaction was found. Although individual level coastal proximity effects for general health and mental distress were small, their cumulative impact at the community level may be meaningful for policy makers.

Keywords: Coast; health; well-being; greenspace; bluespace.

Post-review preprint. Published as:

White MP, Alcock I, Wheeler BW, Depledge MH (2013) Coastal proximity, health and well-being: Results from a longitudinal panel survey. Health & Place. 23: 97-103. http://dx.doi.org/10.1016/j.healthplace.2013.05.006

Introduction

A growing body of research suggests that the physical health and mental well-being of people in developed countries is better when they have access to “natural” green space environments such as woodlands, parks and gardens (de Vries et al., 2003; Maas et al., 2006; Maas et al., 2009; Mitchell & Popham 2007, 2008). A recent investigation using English Census data extended these findings to coastal proximity. Specifically, it reported that the rate of self-reported good health in communities was higher for those communities located nearer the coast, after controlling for a range of variables such as employment levels, crime rates and, crucially, green space (Wheeler et al., 2012). However, this research was at the community rather than individual level, and controlled for only those aspects of communities reported in small area statistics. Moreover, the study was cross-sectional and unable to rule out selection effects such as those arising from healthier people already living near, or gravitating towards, the coast. This might occur, for instance, if happier, healthier people earn more (de Neve & Oswald, 2012) and are thus more able to afford any premiums on homes near the sea. The aim of the current research was to address this potential confound by examining longitudinal data on self-reported health from the same individuals when living at different distances from the coast in England. If the coastal proximity effect remains when the effect of all time invariant individual level heterogeneity is accounted for, and time-varying factors are adequately controlled by their inclusion as covariates, then greater confidence in the initial conclusions is warranted.

To investigate this issue we have built on work by White et al. (2013a) that used data from the British Household Panel Survey (BHPS) to examine individuals’ mental health while living in urban areas with more or less green space. Using fixed-effects regression models to control for time-invariant individual level heterogeneity, as well as individual and local area level control variables, these authors found significantly lower mental distress and higher life satisfaction to be associated with living in greener areas. The current research uses a similar approach to examine the effects of coastal proximity on both self-reported general health

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(Wheeler, et al., 2012) and well-being in terms of mental distress and life satisfaction (White et al., 2013a). Importantly the current analyses also control for green space within an area in an attempt to understand the additional effects of coastal proximity over and above those more typically associated with green space studies.

The fixed effects analysis derives estimates for coastal proximity by comparing all the health and well-being scores of an individual in years when they were living in one location (e.g. ≤ 5km from the coast) with all their health and well-being scores in the years when they were living in a different location (e.g. >5-50km from the coast) and pooling this information for all the individuals in the sample. Individuals who do not move between coastal proximity categories are still included in the estimates but there is no within-person difference on this particular variable for these individuals (though there may be differences for these individuals on other variables such as employment status). Although the data is longitudinal in structure, our analytic approach is thus not a time-series analysis following individuals over a series of consecutive years, e.g. during the years pre and post a home move closer to the coast. Rather, our analysis compares the deviation from the overall individual mean for all years when individuals are in one location with the deviation from the overall individual mean for all the years in other locations.

A full discussion of the relative merits of the two approaches is beyond the scope of this paper, but one of the main advantages of the current approach is that more robust estimates of the effects of coastal proximity can be obtained because it retains people in the estimation sample even if they have not moved between coastal proximity categories and because it averages effects across years in the same location for those who have.

Thus, our central hypothesis is that general health, mental health and well-being will, on average, be improved, after controlling for the effects of covariates, the closer people live to the coast. Since estimates are based on within-individual differences at different times, they control for time-invariant characteristics of people across different settings. This analytic approach also enables us to compare the effects of living nearer to the coast with the effects

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of other changes in state (e.g. years of employment vs. unemployment), including in individuals who have not changed coastal proximity category.

Methods

Participants/sample

The BHPS was a nationally representative longitudinal survey of households in the UK that ran annually from 1991-2008. It contained over 5,000 households and 10,000 individual adults, and used data collection techniques which maintained representativeness over time (Taylor et al., 2004). As land use data was only available for England (see below) our analysis was also restricted to England. The measure of general health was included in 17 of the 18 waves and analysis is based on an estimation sample of 109,844 observations from 15,471 individuals. Mental distress was measured in all 18 waves and resulted in an estimation sample of 114,133 observations from 15,361 individuals. Mental well-being, as measured by life satisfaction, was only collected in 12 waves resulting in analysis of 74,121 observations from 12,360 individuals. Our estimation samples were drawn from BHPS respondents in England in the relevant waves: from 130,966 observations in the case of the model of general health; from 139,632 observations in the case of mental distress; and from 91,765 observations in the case of life satisfaction. The estimation samples for general health, mental distress and life satisfaction thus comprise 83.9%, 81.7% and 80.8% of all possible observations respectively; item non-response on the dependent variable or one or more of the predictor variables accounts for those observations not included in the estimation samples (ISER, 2010). Table 1 allows comparison of descriptive statistics for the three estimation samples and the full BHPS sample from England, and shows the estimation samples are broadly representative of the wider BHPS sample.

Self-reported health & well-being

General health was measured by the item "Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been ...", "very poor" (1) to "excellent" (5). This single-item

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self-report measure was close to that used by Wheeler et al. (2012) from the Census. Mental health was measured using the short-form General Health Questionnaire (GHQ), responses to which are predictive of mood disorders such as anxiety and depression (Goldberg et al., 1997). The GHQ asks respondents to consider their recent experience of twelve thoughts and feelings indicative of mental distress (e.g. "thinking of yourself as a worthless person"). Respondents are asked to compare their experience of these thoughts in the last few weeks with what they consider to be usual for them. In the current analysis we adopted the widely used 0-12 scoring range, where two responses to each question were scored 0 (low risk of mental distress) and the remaining two responses were scored 1 (risk of mental distress). A robustness check using an alternative 0-36 scoring range was also conducted. Scores on the GHQ were inverted so that higher scores suggested lower mental distress (i.e. better mental health). Well-being was measured using the global Life Satisfaction question: "How dissatisfied or satisfied are you with your life overall?" with responses ranging from 1 (Not satisfied at all) to 7 (Completely satisfied). All three measures were treated as interval scales in our analyses as previous research suggests it makes little difference whether analyses assume a linear or ordinal structure for these kinds of measures, and that what matters more is whether a fixed-effects approach is adopted or not (Ferrer-i-Carbonell & Frijters, 2004).

Mean general health was 3.84 (SD = 0.92), mean (inverse) GHQ was 10.13 (SD = 2.90) and mean Life Satisfaction was 5.23 (SD = 1.25). On average, individuals in the sample were relatively healthy and had good levels of mental health and well-being, though considerable variance around these average levels was also present. As shown in Table 1, the mean scores on the three outcome variables in the subsamples used for analysis were almost identical to the overall means for the entire English sub-set of the BHPS.

Coastal Proximity

Following Wheeler et al. (2012) coastal proximity was defined as the linear distance (in km) to the coast from the population-weighted centroid of the Lower-layer Super-Output Area (LSOA) where individuals lived. LSOAs have a mean physical area of 4km^2 and an

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average population of 1,500 individuals. There are 32,482 LSOAs in England and as with earlier research (Mitchell & Popham 2007, 2008; Wheeler et al., 2012; White et al., 2013a), these were also used to derive area controls (see below). Furthermore, Wheeler et al.'s (2012) findings suggested three distinct distance categories with respect to health and coastal proximity: a) 0-5km; b) >5-50km; and c) >50km. We operationalize coastal proximity using these three categories, with the middle distance as the reference category. In this way we could determine whether living 'near the coast' (i.e. ≤ 5km) would be associated with greater benefits than living 'within day-trip distance' (i.e. >5-50km) and whether living yet further 'inland' (i.e. >50km) would be associated with fewer benefits than living between >5-50km. Although these distance categories are based on observed step changes in health outcomes from Wheeler et al. (2012) they are consistent with data on coastal visits from Natural England's nationally representative Monitor of Engagement with the Natural Environment (MENE) survey (Natural England, 2011). Specifically, analysis of the MENE data set undertaken for this paper suggests that of all coastal visits (estimated to be around 260 million per year), 51.4% are undertaken by people who live ≤5km of the coast (despite being only 16% of the population), 34.8% are undertaken by people who live between >5-50km of the coast and only 13.8% are undertaken by people who live more than 50km from the coast. Therefore and perhaps not surprisingly, there is a decreasing gradient in the number of coastal visits as people live further inland.

Area Controls

Consistent with the methods of Mitchell & Popham (2007) several LSOA controls were taken from the English Indices of Deprivation (DCLG, 2008) including indicators of area employment, education, income and crime. The first three of these were reverse scored in the estimates so that higher scores indicated areas with higher levels of income, employment and education. Following White et al. (2013a) green space was defined as the percentage of the LSOA in which an individual lived that was covered in "green space" and "domestic gardens" as derived from the Generalised Land Use Database (ODPM, 2005).

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Following de Vries et al. (2003) freshwater coverage was also included as a separate predictor. All area level data, including coastal proximity dummies, were distributed to an individual's BHPS profile based on LSOA of residence.

Individual Controls

Following White et al. (2013a) individual controls were based on a review of the socio-demographic correlates of subjective well-being in large surveys (Dolan et al., 2008). These included age; diploma/degree level qualification; being married (including living with a partner); living with children; income; work-limiting illness (including work in the home); and labour market status (employed/self-employed, unemployed, retired, in education/training, family carer). As our primary interest was in people's living situation, we also controlled for residence type (detached, semi-detached, terraced, flat, other), household space (rooms/person ratio) and commute length in minutes (Table 1). Models also accounted for period effects by the inclusion of indicators of BHPS survey wave (i.e. year), although these were not included in the presentation of regression results. Time-invariant variables (e.g. gender) were not included because they are stable across time and location.

Analyses

Analyses were conducted using the xt suite of functions in STATA 12 (StataCorp, College Station, TX). We used a Fixed Effects (FE) regression approach which estimates the effects of coastal proximity on generic and mental health and well-being based on scores for the same individuals at different points in time. Specifically, coefficients represent the scale point difference in the dependent variable given a scale point increase, or a category change from the reference in the independent variable, when other independent variables were held constant, controlling for fixed individual differences and time fixed effects.

Results

Main results

Consistent with hypothesized associations, living ≤5 km from the coast was associated with better general health ($p = .028$) and mental health ($p = .023$) than living

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between >5 and 50 km from the coast (Table 2). There was also evidence of a marginally significant association between lower mental health and living over 50km from the coast compared to living >5 to 50 km from the coast ($p = .059$). In contrast, no significant associations were observed between coastal proximity categories and well-being as measured by life satisfaction.

The estimated benefits to general and mental health of living ≤5km, rather than >5-50 km from the coast are 0.039 and 0.147 scale points respectively, which represent 4.2% and 5.1% of one standard deviation on these scales. Another way to gauge the estimated effects of coastal proximity is to compare the magnitude of the regression coefficients with those for other factors. For example, with regard to general health, living ≤ 5km, compared to >5-50 km, from the coast is associated with 0.22 times the beneficial effect of being employed rather than unemployed, and 0.07 times the effect of not having a work-limiting health condition. The model of mental health (using GHQ) suggests that greater coastal proximity has 0.12 times the benefit of employment and 0.17 times the benefit of not having a work-limiting health condition. Importantly, these effects emerged even after controlling for local area green space which, replicating White et al., 2013 with respect to urban areas, were again significant for both GHQ and life satisfaction scores.

Robustness checks

The model of GHQ was robust to the alternative 0-36 scale. Compared to living >5-50km from the coast, living ≤5 km from the coast had a B coefficient of 0.278 ($p = .015$) and living over 50 km from the coast had a B coefficient of -0.202 ($p = .073$). Moreover, the effects we found for both general health and GHQ were not simply due to health improvements from people retiring to the coast. Specifically in two further models we examined the associations between coastal proximity and both general health and GHQ excluding those observations where individuals were aged 65 or over to test whether the effects remained among the working age population. In the model of general health (N. observations = 88,767), living ≤5 km from the coast had a B coefficient of .0373 ($p = .049$)

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and living over 50 km from the coast had a B coefficient of .0080 (p = .683). In the model of GHQ (N. observations = 92,801), living ≤5 km from the coast had a B coefficient of .1649 (p = .021) while living over 50 km from the coast had a B coefficient of -.1071 (p = .128). In sum, the coastal proximity effects for both outcomes remained among the working age population.

To help understand the role of control variables on the outcomes, Table 3 presents the results for coastal proximity controlling for different sets of variables. In the first series of models, without any control variables, the coastal proximity effect is not significant for any of the three dependent variables. When the effect of coastal proximity is modeled in combination with area level controls it is significant for both general health and mental distress, whereas when the effect of coastal proximity is modeled in combination with individual level controls it is only marginally significant in both cases. The final models show the effect of coastal proximity in combination with both area and individual controls; (these results from the full models are repeated from Table 2, and added here for ease of comparison). The main implication is that the effects of costal proximity are relatively small and operating at the margins. It is only when we partial out factors such as local area unemployment rates and green space levels that the effects clearly emerge. Again, there were no significant effects of coastal proximity on life satisfaction under any specification.

Discussion

Analysis of panel data from the BHPS found that once potential area and individual level confounds were controlled for, individuals who lived in England reported better general health and lower mental distress in years when they lived near, i.e. within 5 km of, the sea. The finding concerning self-reported general health was consistent with an ecological cross-sectional study in England showing higher rates of self-reported good health among communities living closer to the coast (Wheeler, et al., 2012). The finding concerning mental distress extended White et al.'s (2013a) BHPS analysis of local urban green spaces to

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coastal proximity. The results were not merely due to a coastal retirement effect as they remained significant when observations were limited to the working age population.

However, in contrast to Wheeler et al. (2012), where two step changes in self-reported health in relation to coastal proximity were found, the current results suggest that the benefits are almost exclusively from living quite near the coast (≤5km). Apart from a marginal effect on GHQ, there was no evidence that living >5-50km from the sea had any benefits compared to living >50km. Further, contrary to White et al.'s (2013a) analysis of urban green space no evidence was found of a beneficial effect of coastal proximity on life satisfaction. Thus, at least in this analysis, the benefits of living near the sea appear more strongly associated with reductions in negative outcomes (i.e. mental distress) than increases in positive ones (i.e. feelings of well-being).

Why might the effects for general and mental health occur? We suggest the same mechanisms used to explain the benefits of 'green space' are also likely to be applicable to the coast. Specifically, exposure to coastal environments may aid stress reduction, promote physical activity and encourage positive social interactions, all of which have been associated with positive health outcomes (Maas et al., 2008; 2009). For instance, in our analysis of the MENE survey above, we reported that the closer people live to the sea, the more likely they are to visit it. This is important because visits to the coast, along with woodland and upland areas, are associated with particularly strong feelings of 'restoration' which, over time, can help attenuate stress (White, et al., 2013b). In terms of physical activity, studies in Australia have shown that people who live closer to the coast are more likely to meet recommended levels of physical activity (Bauman, et al.,1999; Humpel, et al., 2004). In terms of social interactions, evidence is also beginning to emerge that visits to the beach may be particularly good for promoting and enhancing family relationships (Ashbullby, et al. 2013). In other words, coastal environments seem to encourage a number of health and well-being promoting behaviours and people who live near the coast are more likely to make use of these opportunities.

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That green space also remained significant in our analyses suggests that the beneficial effects of the two types of environment may be cumulative and that previous analyses focusing only on green space may have under-estimated the overall beneficial effects of the range of natural environments available. Nonetheless, we recognise that there was no significant effect of inland water, such as rivers and lakes. In part this may be due to the very small amounts of land covered by water in England (i.e. <2%, cf. Finland or Canada) and the fact that inland waters are possibly more variable in type and quality than coastal environments. For example, inland waters in our estimations included both inner city degraded canals and relatively pristine lakes. Thus further work is needed to explore the potential health benefits from the full range of 'blue space' environments (Volker & Kistemann, 2011; White et al., 2010).

Several limitations of the analyses need to be taken into account. It was assumed, for instance, that the nearer the individuals are to the coast the more likely they are to visit it. Although this is supported from English leisure visit data (Natural England, 2011, see above) we have no visit data on the specific individuals in our sample. Further work is therefore needed to monitor the relationship between visit frequency and health directly, preferably using more objective measures of both health and coastal proximity (i.e. actual distance needed to travel from home). Further work could also examine the relationship between health and different types of coastal environment (e.g. ports, cliffs, mudflats etc.) and in countries other than England, part of an island nation with a strong coastal heritage.

We also recognise that the general and mental health gains for any given individual from living nearer the coast were relatively small. Nevertheless, the cumulative effect of these benefits could be considerable when considering entire coastal communities. Note also that the effects of green space were also smaller than some earlier cross-sectional research suggesting that individual level heterogeneity (e.g. personality) may have been partly explaining the association between green space and well-being outcomes in earlier work. Further, although life satisfaction was again positively related to the amount of local

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green space, it was not related to costal proximity and further work is needed to unpack why coastal environments may be better at reducing mental distress than enhancing positive well-being. Finally, although our analysis did control for a range of individual and area level effects, some of these variables, e.g. green space, were only available for a single year despite possible changes during the sampling period. Further, due to limitations in the datasets, not all potentially relevant variables were controlled for and thus causality cannot be assumed.

To conclude, previous research into the salutogenic effects of natural environments has focused on terrestrial green spaces and tended to overlook the potential benefits of coastal environments. The findings of the current research suggest this may have been an important oversight and that coastal ecosystem services may extend to human health in ways not previously considered (UK NEA, 2011). Policy makers may therefore want to use this information to consider improvements in coastal access, and coastal environmental quality, in an effort to promote public health and well-being, while at the same recognising the need to manage coastal environments and coastal ecosystems in the face of potential increases in visitor numbers.

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Acknowledgements

The ECEHH is supported by investment from the European Regional Development Fund and the European Social Fund Convergence Programme for Cornwall and the Isles of Scilly grant number 11200NCO5. BHPS data were sourced from the UK Data Archive, study numbers 5151, 6136 and 3909. Neither the BHPS data collectors nor the UK Data Archive bear any responsibility for the analyses or interpretations presented here. Data are Copyright: Institute for Social and Economic Research.

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Table 1. Descriptives for the current samples and entire BHPS sample for England

	All BHPS (England) Observations			Model 1: Generic Health Estimation Observations N=109,844		Model 2 : GHQ Estimation Observations N=114,133		Model 3 : Life Satisfaction Estimation Observations N=74,121	
	N	Mean / %	(SD)	Mean / %	(SD)	Mean / %	(SD)	Mean / %	(SD)
Generic Health	130,917	3.84	(0.92)	3.84	(0.92)	/	/	/	/
Inverse Mental Health (GHQ)	136,756	10.12	(2.91)	/	/	10.13	(2.90)	/	/
Life Satisfaction	90,084	5.22	(1.25)	/	/	/	/	5.23	(1.25)
LSOA Level Variables [a]									
% Green space	139,632	70.22	(18.93)	70.50	(18.80)	70.56	(18.77)	70.78	(18.73)
Coastal proximity km	139,632	40.86	(30.47)	41.07	(30.56)	41.02	(30.57)	40.99	(30.59)

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% Water	139,632	1.82	(6.23)	1.84	(6.26)	1.83	(6.24)	1.84	(6.49)
Income	139,632	0.14	(0.11)	0.14	(0.11)	0.14	(0.11)	0.14	(0.11)
Employment	139,632	9.91	(6.47)	9.88	(6.43)	9.86	(6.43)	9.80	(6.41)
Education	139,632	21.36	(18.30)	21.29	(18.21)	21.24	(18.19)	21.19	(18.26)
Crime	139,632	-0.05	(0.81)	-0.06	(0.81)	-0.06	(0.80)	-0.07	(0.81)
Individual Level Variables									
Age									
25 years old and under	139,632	17.17	/	16.07	/	16.13	/	15.70	/
26-35	139,632	19.22	/	19.64	/	19.85	/	19.16	/
36-45	139,632	18.56	/	18.73	/	18.92	/	19.14	/
46-55	139,632	15.99	/	15.36	/	15.46	/	15.59	/
56-65	139,632	12.09	/	12.08	/	12.02	/	12.57	/
66-75	139,632	9.62	/	10.29	/	10.16	/	10.05	/
Over 75	139,632	7.35	/	7.83	/	7.45	/	7.80	/
Diploma/degree level	137,780	36.34	/	36.65	/	36.88	/	40.65	/

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qualified									
Married [b]	139,536	65.05	/	65.24	/	65.52	/	65.78	/
Living with children [c]	139,632	28.29	/	28.95	/	29.20	/	28.84	/
HH income [d]	124,409	9.94	(0.64)	9.94	(0.62)	9.94	(0.62)	9.99	(0.62)
With work-limiting health [e]	137,732	17.67	/	18.35	/	17.84	/	18.21	/
Labour Market Status									
Employed	139,039	59.39	/	58.73	/	59.30	/	59.98	/
Unemployed	139,039	6.96	/	6.95	/	6.85	/	6.43	/
Retired	139,039	19.31	/	20.43	/	20.01	/	20.74	/
In education/training	139,039	6.19	/	5.75	/	5.77	/	5.71	/
Family carer	139,039	8.14	/	8.14	/	8.07	/	7.14	/
HH Residence type									
Detached house	138,450	24.01	/	23.98	/	24.10	/	24.64	/
Semi-detached	138,450	35.95	/	36.21	/	36.23	/	36.32	/
Terraced	138,450	26.73	/	26.62	/	26.64	/	26.71	/

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Flat	138,450	11.50	/	11.72	/	11.60	/	10.93	/
Other, e.g. bedsit, sheltered	138,450	1.80	/	1.47	/	1.43	/	1.39	/
HH Space [f]									
<1 rooms/person	138,424	5.89	/	5.41	/	5.37	/	5.04	/
1-<3 rooms/person	138,424	76.98	/	76.00	/	76.24	/	75.71	/
3->3rooms/person	138,424	17.13	/	18.58	/	18.39	/	19.25	/
Commuting Time									
Non-commuters	136,484	42.65	/	42.57	/	41.97	/	41.15	/
15 minutes and less	136,484	28.48	/	28.22	/	28.52	/	28.40	/
>15-30 minutes	136,484	17.12	/	17.24	/	17.46	/	17.89	/
>30-50 minutes	136,484	6.40	/	6.50	/	6.56	/	6.84	/
Over 50 minutes	136,484	5.34	/	5.47	/	5.49	/	5.73	/

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[a] LSOA = Lower-layer Super Output Area, see text for variable details; [b] Includes living with a partner; [c] Limited to respondents own children under 16 years old; [d] HH= household; [e] Health self-rated as limiting type or duration of work that can be undertaken, including work in the home, imputed from adjacent wave values for two years lacking this variable; [f] Excludes kitchens and bathrooms.

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Table 2. Fixed effects regression coefficients for models predicting self-reported generic health, mental health, and life satisfaction.

	Generic self-reported health			Mental Health (Inverse - GHQ)			Life Satisfaction		
	B	(se)	p value	B	(se)	p value	B	(se)	p value
LSOA Level Variables [a]									
Coastal proximity									
5-50 km from coast (ref)	/	/	/	/	/	/	/	/	/
Less than 5 km from coast	0.0392	0.0179	.028	0.1468	0.0648	.023	0.0441	0.0344	.200
More than 50 km from coast	-0.0051	0.0177	.775	-0.1214	0.0643	.059	0.0486	0.0339	.152
% Green space	0.0006	0.0003	.050	0.0028	0.0010	.007	0.0017	0.0005	.001
% Freshwater	-0.0002	0.0007	.722	-0.0020	0.0024	.406	-0.0004	0.0012	.727
Income	-0.0074	0.1096	.946	0.3566	0.3970	.369	0.2900	0.2040	.155
Employment	-0.0008	0.0017	.620	-0.0058	0.0061	.344	-0.0040	0.0031	.207
Education	-0.0001	0.0005	.907	0.0002	0.0017	.911	-0.0015	0.0009	.083
Crime	-0.0005	0.0076	.946	0.0119	0.0274	.663	0.0052	0.0142	.713
Individual Level Variables									
Age									

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25 years old and under	-0.0864	0.0236	.000		-0.1724	0.0852	.043		-0.0506	0.0424	.233
26-35	0.0033	0.0172	.850		-0.2273	0.0625	.000		-0.0311	0.0315	.323
36-45 (ref)	/	/	/		/	/	/		/	/	/
46-55	0.0238	0.0113	.036		-0.1539	0.0413	.000		-0.0421	0.0209	.044
56-65	0.0014	0.0119	.906		0.4231	0.0433	.000		0.1442	0.0215	.000
66-75	-0.0387	0.0198	.051		0.5055	0.0723	.000		0.1626	0.0361	.000
Over 75	-0.1510	0.0270	.000		0.1653	0.0985	.093		0.0593	0.0489	.225
Diploma/degree level qualified	0.0298	0.0109	.006		0.0297	0.0395	.452		0.0262	0.0198	.185
Married [c]	-0.0034	0.0095	.719		0.4013	0.0346	.000		0.2431	0.0179	.000
Living with children [d]	0.0075	0.0087	.385		-0.0564	0.0315	.073		-0.0541	0.0162	.001
HH income [e]	0.0056	0.0051	.277		0.0303	0.0185	.102		0.0239	0.0090	.008
With work-limiting health [f]	-0.5488	0.0078	.000		-0.8632	0.0289	.000		-0.2665	0.0145	.000
Labour Market Status											
Employed (ref)	/	/	/		/	/	/		/	/	/
Unemployed	-0.1766	0.0143	.000		-1.1906	0.0519	.000		-0.3694	0.0259	.000
Retired	-0.0492	0.0148	.001		-0.0663	0.0536	.216		0.0492	0.0265	.064

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In education/training	-0.0704	0.0154	.000		0.0282	0.0553	.610		0.1053	0.0274	.000
Family carer	-0.0800	0.0144	.000		-0.3549	0.0523	.000		-0.0999	0.0263	.000
HH Residence type											
Detached house (ref)	/	/	/		/	/	/		/	/	/
Semi-detached	0.0071	0.0099	.477		0.0407	0.0360	.258		0.0272	0.0183	.137
Terraced	-0.0024	0.0114	.833		0.0607	0.0414	.143		0.0269	0.0209	.197
Flat	-0.0011	0.0139	.937		0.0805	0.0502	.109		0.0078	0.0254	.758
Other, e.g. bedsit, sheltered	-0.0124	0.0221	.576		0.0294	0.0807	.715		-0.0353	0.0407	.386
HH Space [g]											
<1 rooms/person (ref)	/	/	/		/	/	/		/	/	/
1-<3 rooms/person	-0.0084	0.0126	.505		0.0442	0.0458	.335		0.0193	0.0232	.406
3->3rooms/person	-0.0040	0.0090	.655		-0.0518	0.0327	.113		0.0090	0.0160	.576
Commuting Time											
Non-commuters (ref)	/	/	/		/	/	/		/	/	/
15 minutes and less	-0.0165	0.0113	.143		-0.0426	0.0406	.294		0.0193	0.0232	.406
>15-30 minutes	-0.0462	0.0120	.000		-0.0835	0.0431	.052		0.0090	0.0160	.576

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>30-50 minutes	-0.0551	0.0142	.000		-0.0963	0.0512	.060		0.0193	0.0232	.406
Over 50 minutes	-0.0587	0.0153	.000		-0.1501	0.0551	.006		0.0090	0.0160	.576
Constant	4.0849	0.0603	.000		9.9580	0.2177	.000		4.6750	0.1074	.000
N. observations		109,844				114,133				74,121	
N. individuals		15,471				15,361				12,360	
Model within-individual R^2											
Model overall R^2		.2313				.0600				.0783	

Note: models also control for period effects. [a] LSOA = Lower-layer Super Output Area, see text for variable details; [b] Based on the linear distance from the LSOA's population-weighted centroid; [c] Includes living with a partner; [d] Limited to respondents own children under 16 years old; [e] Household income operationalized as the log of net annual household income in the preceding 12 months adjusted for household composition using the Before Housing Costs equivalence scale indexed to January 2010 prices[15]; [f] Health self-rated as limiting type or duration of work that can be undertaken, including work in the home and imputed from adjacent wave values for two years lacking this variable; [g] Excludes kitchens and bathrooms.

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