Health & Place 18 (2012) 1198–1201

Contents lists available at SciVerse ScienceDirect

Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Short Report

Does living by the coast improve health and wellbeing?

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ARTICLE INFO

Article history:
Received 6 March 2012
Received in revised form
22 June 2012
Accepted 25 June 2012
Available online 1 July 2012

Keywords:
Coast
Health
Wellbeing
Greenspace
Blue space

ABSTRACT

It is often assumed that spending time by the coast leads to better health and wellbeing, but there is strikingly little evidence regarding specific effects or mechanisms to support such a view. We analysed small-area census data for the population of England, which indicate that good health is more prevalent the closer one lives to the coast. We also found that, consistent with similar analyses of greenspace accessibility, the positive effects of coastal proximity may be greater amongst more socio-economically deprived communities. We hypothesise that these effects may be due to opportunities for stress reduction and increased physical activity.

1. Introduction

Twenty-three of the world's 30 largest cities are on the coast. Whether from necessity or preference, over a third of the world's population choose to live along a "narrow fringe of coastal land" (UNEP, 2007). As well as socio-economic advantages, marine and coastal ecosystems contribute to human health and wellbeing. For example, they provide nutrient-rich seafood, novel pharmaceuticals and ecosystem services that foster outdoor leisure activities (Millennium Ecosystem Assessment, 2005). There is also a long history of the coast being used to facilitate health improvements and to aid convalescence (Fortescue Fox and Lloyd, 1938). Nonetheless, robust evidence of direct, environmentally-induced salutogenic (health promoting) effects is scarce. We know that people who live near parks, woodland and other greenspaces tend to be healthier, and live longer, than those who do not (Mitchell and Popham, 2008), and there are some suggestions of a positive effect of aquatic environments or 'blue space' (de Vries et al., 2003). Multiple mechanisms are likely to be in play, including those proposed in attention restoration (Kaplan and Kaplan, 1989) and psycho-evolutionary (Ulrich et al., 1991) theories. Activity in the outdoors can generate positive mood states (Thompson Coon et al., 2011), reducing stress and improving physiological functioning (Hartig et al., 2003; Steptoe et al., 2005). Whilst increased physical activity has also been associated with residence in proximity to the coast in Australia (Bauman et al., 1999), the relationship between spending time at the coast and consequent health and wellbeing benefits awaits thorough investigation. In order to investigate this issue at a broad, population health level, we set out to use secondary datasets (Park et al., 2011) to address the question: do rates of good health improve with proximity to the coast?

2. Methods

Using 2001 census data for England ($n=48.2$ million), we analysed the relationship between rates of self-reported "good" health and residential proximity to the coast. Data were obtained for England's 32,482 Lower-layer Super Output Areas (LSOAs, average population c. 1500), a standard statistical geography. 2001 Census data indicated the proportion of the population answering 'good' to the question "*over the last 12 months would you say your health has on the whole been: Good; Fairly good; Not good?*" This type of single item self-report general health question has been used previously to examine the effects of greenspace (Maas et al., 2006; Mitchell and Popham, 2007) and is strongly correlated with objective measures of health status such as mortality (Kyffin et al., 2004). Further, people self-reporting good health on this single item tend to have substantially higher scores on all physical, mental and social health domains of the SF-36 health survey (Mavaddat et al., 2011). To account for geographical variation in population age/sex structure, we calculated directly standardised rates of good health as the outcome measure.

To determine coastal proximity, we used a Geographic Information System to calculate the linear distance from each

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http://dx.doi.org/10.1016/j.healthplace.2012.06.015

LSOA's population-weighted centroid to its nearest coastline. The boundary between 'coast' and 'riverside' along the length of an estuary is not clearly delineated, and we were unable to identify previous work stating a definition relevant to population access to the coast. We therefore used an arbitrary cut-off where any estuary narrowed to less than approximately 1 km to define the end of the coastline.

In common with previous greenspace analyses (Maas et al., 2006; Mitchell and Popham, 2007), linear regression models were constructed separately for urban, town/fringe and rural areas as defined by the Office for National Statistics (Office for National Statistics, 2004). Predictor variables including coastal proximity, % land area classified as greenspace (Generalised Land Use Database) (Department for Communities and Local Government, 2007), and five indices of socio-economic deprivation (Noble et al., 2004): income, employment, education and skills, crime, and environmental deprivation. The environment deprivation domain only includes measures of housing condition, outdoor air quality, and road traffic collisions, and therefore does not cause problems through overlap with our primary environmental measures (coastal proximity and greenspace density). Coastal proximity was divided into bands chosen to represent comparative geographical accessibility and inferring from this potential frequency/intensity of 'exposure' to coastal environments: 0–1 km; >1–5 km; >5–20 km; >20–50 km; >50 km. Given suggestions that proximity to greenspace may provide resilience against health inequalities (Mitchell and Popham, 2008), we tested whether the association between coastal proximity and good health was modified by income deprivation. All analyses were conducted using Stata 12 (StataCorp, College Station, TX).

3. Results

We tested for modification of the association between coastal proximity and good health by urban/rural category using a likelihood ratio test. This produced a p-value=0.02, indicating evidence of an interaction, and therefore that analyses stratified by urban/rural category were appropriate. Regression coefficients for stratified, adjusted models are presented in Table 1. 'Distance to coast' coefficients represent the difference in the age/sex standardised prevalence (percentage) of people reporting good health relative to that in the category of LSOAs furthest from the coast (>50 km). For example, compared to urban communities living further than 50 km from the sea, the proportion of those reporting "good health" in urban coastal LSOAs (<1 km) was 1.13 percentage points higher (95% Confidence Interval 0.99–1.27) after adjustment for potential confounders. The effect was similar amongst urban and town/fringe areas, but appeared to be weaker across rural areas. Associations with other area characteristics were in the expected directions, with increasing greenspace and decreasing deprivation associated with higher rates of good health. Although the amount of greenspace is associated with good health, its effect as measured here appears smaller than that of coastal proximity.

A likelihood ratio test was used to test for interaction between coastal proximity and income deprivation within urban LSOAs (with adjustment for all other variables as per Table 1), and produced a p-value<0.001, again indicating strong statistical evidence of an interaction. Therefore, we repeated the main regression analysis for urban areas stratified by income deprivation quintile. The association between good health rates and coastal proximity in urban areas, in total and by income deprivation quintile is depicted in Fig. 1. The 'All urban areas' graph illustrates the overall results for urban areas as given in Table 1. The five sub-graphs depict results of regression models stratified by deprivation quintile. These indicate that the association between good health and coastal proximity is strongest in the most deprived areas (Q1), with the strength of association diminishing with decreasing deprivation. For Q5 (the least deprived 20% of LSOAs), there is no clear association between coastal proximity and good health rates, although there is still some indication of a small positive effect for coastal areas (<1 km) relative to those inland.

Table 1
Multivariate linear regression models predicting age/sex standardised rate of good general health, stratified by urban/rural status.

	Urban (n=26455)			Town/fringe (n=3081)			Rural (n=2946)		
	B	**95% CI**	***n***	***B***	**95% CI**	***n***	***B***	**95% CI**	***n***
Distance to coast									
>50 km[a]	0	–	10098	0	–	1023	0	–	870
>20–50 km	0.54	(0.46,0.62)	8096	0.04	(−0.20,0.28)	898	0.22	(0.01,0.42)	990
>5–20 km	0.63	(0.53,0.73)	3571	0.43	(0.16,0.71)	620	0.41	(0.17,0.64)	705
>1–5 km	0.96	(0.85,1.06)	3133	0.89	(0.54,1.25)	303	0.73	(0.41,1.05)	317
<1 km	1.13	(0.99,1.27)	1557	1.19	(0.79,1.59)	237	−0.09	(−0.69,0.51)	64
% Greenspace by area									
Quintile 1[a]	0	–	5291	0	–	617	0	–	590
Quintile 2	−0.02	(−0.13,0.08)	5291	0.13	(−0.17,0.43)	616	0.14	(−0.12,0.40)	589
Quintile 3	−0.01	(−0.11,0.10)	5291	0.15	(−0.14,0.45)	616	0.31	(0.04,0.57)	589
Quintile 4	0.23	(0.13,0.33)	5291	0.49	(0.19,0.79)	616	0.25	(−0.03,0.52)	589
Quintile 5	0.36	(0.26,0.47)	5291	0.69	(0.39,0.99)	616	0.59	(0.30,0.88)	589
Deprivation indices (B coefficient per quintile)[b]									
Income	1.61	(1.56,1.66)	26455	0.84	(0.71,0.96)	3081	0.42	(0.33,0.52)	2946
Employment	1.23	(1.19,1.28)	26455	1.19	(1.08,1.30)	3081	0.86	(0.77,0.95)	2946
Education	1.58	(1.54,1.61)	26455	1.52	(1.42,1.62)	3081	1.21	(1.13,1.29)	2946
Crime	0.07	(0.04,0.10)	26455	0.25	(0.17,0.32)	3081	0.07	(0.01,0.13)	2946
Environment	0.13	(0.10,0.16)	26455	−0.17	(−0.25,−0.10)	3081	−0.05	(−0.12,0.01)	2946
Constant	53.49	(53.38,53.61)		59.58	(59.20,59.96)		66.11	(65.71,66.50)	
R^2	0.84			0.75			0.66		

B: adjusted non-standardised regression coefficient, n: number of Lower-layer Super Output Areas (LSOAs) within urban/rural stratum.

[a] Reference category.

[b] Lowest quintile: most deprived 20% of LSOAs within stratum.