



Research Paper

What accounts for ‘England’s green and pleasant land’? A panel data analysis of mental health and land cover types in rural England



I. Alcock^{a,*}, M.P. White^a, R. Lovell^a, S.L. Higgins^a, N.J. Osborne^{a,b}, K. Husk^{a,c},
B.W. Wheeler^a

^a European Centre for Environment and Human Health, University of Exeter Medical School, Knowledge Spa, Royal Cornwall Hospital, Truro, Cornwall TR1 3HD, United Kingdom

^b Department of Pharmacology, School of Medical Sciences, Sydney Medical School, University of Sydney, Sydney 2006, Australia

^c Plymouth University Peninsula Schools of Medicine and Dentistry, Drake Circus, Plymouth, Devon PL4 8AA, United Kingdom

HIGHLIGHTS

- Rural land cover associations with mental health estimated from hybrid models.
- Intra-rural change to more natural space associated with mental health change.
- Land cover types differentially associated with mental health within individuals.
- Farmland, uplands and coastal associated with good mental health within individuals.
- Broadleaf, grassland, coastal associated with reduced odds of psychiatric caseness.

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ABSTRACT

Exposure to green space is associated with a variety of positive health states. Research to date has focused primarily on ‘generic’ green space in urban areas, where green space is relatively scarce and where it is dominated by playing fields and parks. The current research adds to our understanding with an examination of relationships between different types of green space and mental health in rural areas in England (approximate rural population = 4 million). The aggregate land cover classes of Land Cover Map 2007 were linked to rural residential areas (Lower-level Super Output Areas) and then linked to rural participants ($n = 2020$) in the 18-year longitudinal British Household Panel Survey. Random effects regression of mental health (as measured by GHQ12 scores) against land cover enabled effects to be simultaneously estimated from both mean between-individual differences and from within-individual differences over time. The nine natural land cover classes (Broadleaved woodland; Coniferous woodland; Arable; Improved grassland; Semi-natural grassland; Mountain, heath and bog; Saltwater; Freshwater; Coastal) were not significantly associated with differences in mental health between individuals. However, significant relationships were observed between some types of land cover and within-individual change in mental health amongst individuals who relocated during the 18 annual waves of the panel. These findings indicate the presence of important health related ecosystem services from different land cover types that have not previously been investigated and which help more effective spatial planning and land use management.

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* Corresponding author. Tel.: +44 01872 258151.

E-mail addresses: i.alcock@exeter.ac.uk (I. Alcock), Mathew.White@exeter.ac.uk (M.P. White), R.Lovell@exeter.ac.uk (R. Lovell), S.Higgins@exeter.ac.uk (S.L. Higgins), N.J.Osborne@exeter.ac.uk (N.J. Osborne), kerryn.husk@plymouth.ac.uk (K. Husk), B.W.Wheeler@exeter.ac.uk (B.W. Wheeler).

1. Introduction

1.1. Overview

William Blake's phrase “England’s green and pleasant land” (Blake, 1804) has become a byword for those aspects of the English countryside which are idealised in the national psyche. Although the rural landscape of today is very different from the

“pleasant pastures” and “mountains green” which Blake explicitly linked to spiritual well-being at the dawn of the industrial age, the idea that physical landscape is intimately involved in well-being persists, and is increasingly the subject of multi-disciplinary empirical research (Hartig, Mitchell, de Vries, & Frumkin, 2014).

Exposure to the natural environment has been associated with better self-reported general health (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006; Mitchell & Popham, 2007), lower prevalence of diagnosed morbidities (Maas et al., 2009), increased longevity (Takano, Nakamura, & Watanabe, 2002), less premature mortality (Mitchell & Popham, 2008) more rapid recovery from illness (Ulrich, 1984), higher levels of psychological well-being (Kaplan & Kaplan, 1989; White, Alcock, Wheeler, & Depledge, 2013a), and lower levels of anxiety and depression (Beyer et al., 2014; de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Maas et al., 2009; van den Berg, Maas, Verheij, & Groenewegen, 2010). Moreover, the research is starting to inform the development of tangible health promotion strategies and practices (St Leger, 2003). However, to date, much of the evidence of a relationship between natural environments and mental health and well-being has focused on urban rather than rural communities (Alcock, White, Wheeler, Fleming, & Depledge, 2014; Astell-Burt, Mitchell, & Hartig, 2014). The aim of the current research was to begin to redress this balance.

The issue of rural mental health is important because a significant minority of people live in rural residential areas. In England, around 4.2 million people live in areas classified as rural (8% of the population). Despite a long-term trend towards urbanisation, data compiled by the UN Department of Economic and Social Affairs suggests there are currently close to 200 million people living in rural areas in Europe. Whilst there are suggestions that the prevalence of common mental disorders such as anxiety and depression are lower in rural than urban areas (Weich, Twigg, & Lewis, 2006), there are substantial differences in their prevalence across English villages which are not accounted for by variation between individuals or by area levels of socio-economic deprivation (Riva, Curtis, Gauvin, & Fagg, 2009). This suggests that other aspects of rural areas, potentially including the nature of the physical environment, may be related to mental health. Furthermore, the treatment of poor mental health in rural communities may be more challenging due to geographical barriers, social isolation and to rural cultural beliefs on help-seeking for mental illness. These factors may partially explain why suicide rates also tend to be higher in some rural areas (Gunnell et al., 2012). Against this backdrop, a better understanding of factors which may support more positive mental health in rural areas is clearly desirable.

As to why previous research into the relationships between natural environments and mental health has been neglected in rural areas, it is likely to be, in part, because the focus has been on the *quantity* of ‘available green space’, which is arguably more important for built-up urban areas where green spaces may be scarce, than in rural areas where it is abundant. Previous epidemiological research, for instance, has generally dichotomised land cover as green/not green (Jorgensen & Gobster, 2010) and there is awareness that this dichotomy is particularly limited for rural areas because there is “too little variation in the quantity of green space” (Ord, Mitchell, & Pearce, 2013) between rural areas for this comparison to often be meaningful (see also Astell-Burt et al., 2014). However, although green spaces in towns and cities are generally dominated by parks, what constitutes green space in rural areas tends to be more mixed (e.g. farmland, moorland) and as yet we know relatively little about the importance of this variation in green space in rural settings. In other words, type and quality, rather than just quantity, may be particularly relevant for mental health in rural settings.

1.2. Current Research

It is suggested that results from landscape preference studies, where work with photographs gives evidence of preferences for more natural landscapes over more urban landscapes, may be related to the potential for natural environments to reduce stress and improve well-being (Hartig & Evans, 1993; van den Berg, Koole, & van der Wulp, 2003). Drawing on insights from the landscape preferences literature on differential preferences for different land cover types, we hypothesised that the presence of certain types of natural space environment in rural areas, such as woodlands and aquatic environments, may be linked to more positive mental health outcomes. These hypotheses were tested using data from a sample of residents of rural England who took part in a longitudinal panel survey between 1991 and 2008. Using data of this kind allowed us to do two things. First, similar to the cross-sectional approach used in most previous work looking at green space and mental health in urban areas, we were able to compare the individual average mental-health of people who lived in one type of rural area (e.g. with high proportions of woodland, or of arable) with that of those living in a different type of rural area (e.g. with low proportions of woodland, or of arable). Second, due to the longitudinal nature of the data we were able to track people’s well-being over many years, including among those who moved from one rural area to another rural area. Controlling for other changes in their lives, therefore, we were able to estimate the effect of different rural land cover on the same individuals over time. This second type of analysis enables us to account for factors such as personality and early life experiences. Specifically, cross-sectional correlations may merely reflect the fact that different sorts of people, with better mental health, have greater exposure to natural environments, rather than point to a causal relationship. In contrast, associations based on within-individual differences eliminate confounding from individual level heterogeneity (Antonakis, Bendahan, Jacquart, & Lalive, 2010).

By examining the relationships between mental health and a variety of land cover types in different rural residential areas, our work has parallels to pioneering research conducted in Sweden using the Scania Green Score (SGS). The SGS identified a set of characteristics which Swedish people regarded as important in green space and operationalised these using criteria measurable from land cover, land use and topography datasets (Skärbäck et al., 2012). SGS was found to be related to neighbourhood satisfaction, physical activity, Body Mass Index, vitality in women and self-rated health (Björk et al., 2008; de Jong, Albin, Skärbäck, Grahn, & Björk, 2012). A further study showed that interaction between some of the SGS component green space characteristics and being physically active was associated with reduced risk of poor mental health in women (Annerstedt et al., 2012). However, although the work from Sweden used land cover in the operationalisation of the SGS, the associations observed between desirable green space characteristics and health are difficult to interpret in simple land cover terms since single land parcels may contribute varying weight to the summative SGS ordinal measure (for further details see Skärbäck et al., 2012). Furthermore, the SGS takes account only of the presence/absence of land parcels with desirable characteristics, and not how much or little of a residential area these comprise. The current study builds upon this approach by accounting for the amount as well as the presence of different types of green space environment (although limited to land cover measures only).

The theme of our research was thus whether mental health is better in rural areas with greater amounts of certain types of land cover, and we had three specific research questions. First, we explored whether the positive association found between mental health (General Health Questionnaire) and the quantity of green space (compared to built-up areas) in urban areas would extend to

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