



Coastal blue space and depression in older adults

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ABSTRACT

This paper tests whether higher exposure to coastal blue space is associated with lower risk of depression using data from The Irish Longitudinal Study on Ageing (TILDA), a nationally representative longitudinal study of people aged fifty and over in Ireland. We contribute to the literature on blue space and health by (i) using scores from the Center for Epidemiologic Studies Depression Scale (CES-D) to measure depression outcomes (ii) using new measures of coastal blue space visibility (iii) studying the association in an older population (iv) using data from Ireland. Our results indicate that exposure to coastal blue space is associated with beneficial mental health outcomes: TILDA respondents with the highest share of sea view visibility have lower depression (CES-D) scores, while distance from coastline is not statistically significant when views and proximity are both included in the model. This finding supports the idea that the primary channel through which coastal blue space operates to reduce depression scores is visual rather than related to physical proximity.

1. Introduction

Despite the historical development of urban areas alongside water bodies (e.g. inland waterways and coastal margins), the predominant focus of literature linking the natural environment to health outcomes, has related to the health benefits of green spaces (Gascon et al., 2017). However, against a backdrop of rapid urbanisation (UN, 2015), the health and well-being effects of *all* our environmental surroundings have become of increased relevance and importance to policy-makers. In recognition of the blue space gap in the environmental health literature the European Union's Horizon 2020 has allocated funding to the BlueHealth project in order to better understand how 'blue infrastructure' can be used to provide health and well being effects. Here blue space is defined by the BlueHealth project (Grellier et al., 2017) as "outdoor environments – either natural or manmade – that prominently feature water and are accessible to humans either proximally (being in, on or near water) or distally/virtually (being able to see, hear or otherwise sense water)". Our paper makes a unique contribution to the literature by examining the association of both proximal and visual measures of coastal blue space on the mental health outcome of depression in older people.

2. Literature

2.1. Blue spaces and depression

As identified by Völker and Kistemann (2011), Völker and Kistemann (2013) and Gascon et al. (2015) the health effects of blue spaces has been an under-explored topic in the literature. The emergent blue space literature borrows extensively from the pre-existing green space literature with relatively mixed evidence found regarding its health effects. Gascon et al. (2017) perform the first systemic review of this emergent blue space literature. Here they find evidence which suggests a positive association between blue space and outcomes relating to mental health, well-being and physical activity, but find the evidence to be more mixed when examining outcomes related to general health, obesity, and cardiovascular health. Overall Gascon et al. (2017) identify just 12 studies that examine the association between blue space and mental health and well-being. However, of these 12 studies, only 4 studies (Alcock et al., 2015; Triguero-Mas et al., 2015; White et al., 2013a, 2013b) specifically examine the mental health outcome of depression. Since the systemic review of Gascon et al. (2017), we know of only one more study (Gascon et al., 2018) that has examined the link between blue spaces and depression.

Nutsford et al. (2016) outline the three main channels through

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which blue spaces can operate to create beneficial mental health effects. First, the availability of blue space can potentially increase the likelihood of engaging in physical activity (e.g. swimming, walking on beaches) which in turn will improve mental health. Second, blue space can facilitate increased social interaction which will generate positive mental health effects through fostering a sense of belonging and social cohesion. Third, blue space can confer positive mental health effects by acting as therapeutic or salutogenic (health and well-being promotion) places (Foley and Kistemann, 2015; de Bell et al., 2017; Hartig et al., 2014; Völker and Kistemann, 2013; MacKerron and Mourato, 2013). Much of the therapeutic landscape literature relates to the *biophilia* hypothesis (Wilson, 1984), a psycho-evolutionary theory, which posits that humans have an innate tendency to seek connections with nature and other forms of life. Bell et al. (2015) in particular examines the varied types of therapeutic experiences (symbolic, achieving, immersive and social) which coastal blue space might offer using data from residents of two towns in south west England, and suggests that the types of therapeutic experiences sought might change as an individual transitions through different stages of their life.

2.2. Blue space and depression in older adults

Very few studies have examined the relationship between mental health and exposure to blue space in an ageing population. Finlay et al. (2015) examine the therapeutic impact of green and blue spaces for older adults (aged 65–86 years old) and find that blue space in particular embodies important therapeutic qualities for mental health. Similarly Coleman and Kearns (2015) examine the importance of blue space in informing experiences of place, being aged, and well-being in older adults in New Zealand. However, to the best of our knowledge this is the first paper which specifically examines the relationship between exposure to blue space and the mental health outcome of *depression* in an ageing population. We argue that this is an important outcome to examine, as although depression is less prevalent among older adults than younger adults, it can have serious negative consequences, including increased burden of physical illness, impaired functioning, and risk of suicide (Fiske et al., 2009).

The predominant approach used to measure depression in the studies outlined by the systemic review of Gascon et al. (2017) is the General Health Questionnaire-12 Items Scale, with Gascon et al. (2018) and Triguero-Mas et al. (2015) also using self-reported questionnaires on depression and related medication. As such, as far as we are aware, this paper is the first to use a different type of scale - the Center for Epidemiologic Studies Depression Scale (CES-D) scale (described in greater detail in Section 3.1.1) - in order to measure depression in our sample respondents of older people.

2.3. Irish context

Despite the extensive coastline of Ireland and the substantial availability of other types of blue space (inland, freshwater, urban blue) relatively little research has been carried out on how blue space relates to health and well-being in an Irish context. Perhaps the most well known study is that of Brereton et al. (2008), who investigate the relationship between location-specific factors and life satisfaction. Here Brereton et al. (2008) find that proximity to coast has a significant association with life satisfaction, with those living within 2 km of the coastline more likely to enjoy higher life satisfaction than those living more than 5 km away. However, Brereton et al. (2008) find no evidence of a statistically significant association between proximity to beach and life satisfaction and suggest that given Ireland's climate, this finding could be indicative that the amenity value of coastal areas is not a function of the availability of a beach within an Irish context. Other contributions to Ireland's blue space literature includes Foley (2017), Foley (2015) who investigates the relationship between well-being and swimming in blue spaces, and also Foley (2011) who explores the

therapeutic impact of a more unconventional type of blue space, that of holy wells. More recently within the broader literature Gillespie et al. (2018) have also provided evidence using data from real estate transactions that blue space is valued by the Irish housing market. We therefore contribute to this nascent Irish literature on the well-being benefits of blue spaces by using data from Ireland.

3. Data

3.1. TILDA

This paper uses data from The Irish Longitudinal Study on Ageing (TILDA), a nationally representative longitudinal study of people aged fifty and over in Ireland. Data collection for Wave 1 was carried out between October 2009 and July 2011 on 8175 individuals aged 50 and over, from the 6279 households that participated in the study. Interviews were also conducted with the younger spouses and partners of TILDA participants (even if aged less than 50), leading to a total sample size of 8504. Interviews were conducted by trained interviewers in each respondent's homes, and were carried out using Computer Assisted Personal Interviewing (CAPI). Participants were also given a self completed questionnaire (SCQ) with more potentially sensitive questions to fill out and return by mail. Lastly, TILDA respondents were invited to attend a nurse-led health assessment at specialised centres, or a modified partial assessment in their homes where travel was not practicable. The RANSAM sampling system (Whelan, 1979; Kenny et al., 2010), which uses the An Post GeoDirectory containing geocodes for all the addresses in Ireland, was used to construct the final sample of TILDA respondents. This means that the geo-code for each TILDA respondent's address is recorded, making TILDA a uniquely appropriate dataset for merging with other geo-coded spatial data on environmental factors (Dempsey et al., 2018a, 2018b) such as blue space.

3.1.1. Outcome variable: depression

Scores from The Center for Epidemiologic Studies Depression Scale (CES-D) scale are used to proxy depression in our sample of TILDA respondents. The CES-D scale is a self-reported scale designed to measure depressive symptomatology in the general population (Radloff, 1977). Its validity as a measure of depression in older adults has been well documented (Hertzog et al., 1990; Lewinsohn et al., 1997) and it has been used extensively in studies of later life depression (Beekman et al., 1997; Santini et al., 2015). Administered during the CAPI section of the TILDA questionnaire, each respondent is asked a total of 20 questions based on a four point scale to measure the prevalence of depressive symptoms during the past week, leading to a total CES-D score of 60 (O'Regan et al., 2011). A cut-off score of ≥ 16 is generally used to determine clinically significant depressive symptoms, with 9.64% of TILDA respondents in our final sample falling into this category (see Fig. 1). This is consistent with the baseline finding that 10% of the cohort suffer from clinically depressive symptoms (Regan et al., 2013). Subsequent research of the cohort at Wave 3 has also shed light on the fact that two-thirds of depressed TILDA respondents have not been prescribed antidepressant/antipsychotic therapy (Briggs et al., 2018). An advantage therefore of using this measure, is that it is a validated tool for capturing clinically significant depression and will not be affected by undiagnosed depression (as would be the case with a self-reported question on whether the individual was ever diagnosed with depression).

3.1.2. Covariates

A significant problem with the blue/green space literature is the difficulty of estimating causal relationships due to the potential occurrence of self-selection (whereby individuals with low depression scores also choose to live in areas with greater blue space exposure). If self-selection occurs, then this would mean that our blue space exposure variables are simply acting as a proxy for some unobserved factor which

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