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Research paper

Micro-scale environment and mental health in later life: Results from the Cognitive Function and Ageing Study II (CFAS II)

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ABSTRACT

Background: Poor micro-scale environmental features, such as graffiti and broken windows, have been associated with crime and signs of social disorder with a potential impact on mental health. The aim of this study is to investigate the association between micro-scale environment and mental health problems in later life, including cognitive (cognitive impairment and dementia) and common mental disorders (depressive and anxiety symptoms).

Methods: The method of visual image audits was used to collect micro-scale environmental data for 3590 participants in the Cognitive Function and Ageing Study II, a population-based multicentre cohort of people aged 65 or above in England. Multilevel logistic regression was used to examine the associations between the quality of micro-scale environment and mental health problems taking into account urban/rural difference.

Results: Poor quality of micro-scale environment was associated with nearly 20% increased odds of depressive (OR: 1.19; 95% CI: 0.99, 1.44) and anxiety symptoms (OR: 1.17; 95% CI: 0.99, 1.38) while the direction of association for cognitive disorders differed across urban and rural settings. Although higher odds of cognitive disorders were found in rural settings, living in a poor quality environment was associated with nearly twice higher odds of cognitive impairment (OR: 1.88; 95% CI: 1.18, 2.97) in urban conurbations but 20% lower odds in rural areas (OR: 0.80; 95% CI: 0.57, 1.11).

Limitations: The causal direction could not be fully determined due to the cross-sectional nature of the data. The visual nature of the environmental assessment tool means it likely does not fully capture features related to the availability of local support services, or opportunities for social participation and interaction.

Conclusions: The quality of micro-scale environment appears to be important to mental health in older people. Interventions may incorporate the environmental aspect to reduce cognitive and common mental disorders.

1. Introduction

There has been a growing interest in identifying environmental factors related to mental disorders (Mair et al., 2008). Physical characteristics at the micro-scale level, such as poor pavement condition, graffiti, vandalism and litter, have been reported to be related to social disorder and lack of informal control in local areas (Kelling and Wilson, 1982; Blair et al., 2014) and might have a potential impact on stress and insecurity as well as increasing the risk of mental illnesses (Blair et al., 2014; Julien et al., 2012). Although these detailed features are advocated as providing additional information on the living environment, they cannot be captured from the existing collection of small area statistics. To collect these micro-scale features, traditional physical audit has involved assessors visiting local areas and rating the environment and micro-scale features at particular times. This approach can be time-consuming and subject to several unpredictable

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factors, such as inclement weather or poor transport links, which may influence the rate of progress and safety of assessors (Charreire et al., 2014). A small number of existing studies have investigated the associations between mental disorders and some micro-scale features but these studies have been small with limited statistical power to measure substantial effect sizes (Weich et al., 2002; Thomas et al., 2007; Araya et al., 2007; Galea et al., 2005).

In addition to common mental disorders, recent studies have also identified environmental factors that may be related to cognitive disorders in later life. Evidence from epidemiological research supports the presence of urban/rural differences in dementia prevalence and cognitive function (Cassarino et al., 2016; Nunes et al., 2010; Russ et al., 2012). Area deprivation and some physical and social environmental factors such as features of land use, access to local services and resources, have also been related to cognitive function in older people (Clarke et al., 2012; Lang et al., 2008; Watts et al., 2015; Wu et al., 2015a, 2015b). However, these studies have mainly focused on small area or neighbourhood level characteristics and few have investigated the potential impact of micro-scale features. This is limiting as poor quality micro-scale environments might be related to stress or an overload of sensory stimulation, with a negative impact on cognitive function (Cassarino and Setti, 2015; Marchant and Howard, 2015).

In the recent five years, some studies have used visual streetscape images, including Google Street View, Bing Maps or omnidirectional imagery, to observe these micro-scale features and show good inter-method reliability between visual image audits and physical audits (Charreire et al., 2014). In order to assess micro-scale level features in a large population, in an earlier study (Wu et al., 2014) we have previously developed and validated the method of visual image audits based on the Residential Environmental Assessment Tool (REAT) (Dunstan et al., 2005), a UK-based instrument designed for assessing specific micro-scale features within a postcode unit. This method has been applied to collect environmental data for a sub-sample of the Cognitive Function and Ageing Study II (CFAS II), a population-based cohort of people aged 65 or over across rural and urban areas in England. The aim of this study is to examine the relationship between the quality of micro-scale environment (the REAT scores) and cognitive and common mental disorders, two important aspects of mental health in later life, taking rural and urban contexts into account.

2. Methods

2.1. Study population

This study was based on the Cognitive Function and Ageing Study II (CFAS II), a longitudinal population-based cohort of people aged 65 or above across three areas in England (Cambridgeshire, Newcastle and Nottingham). Details of CFAS II have been described elsewhere (Matthews et al., 2013). In brief, the study population was sampled from primary care registrations. Each study area included 2500 individuals with equal sample sizes of those aged 65–74 years and ≥75 years. Eligible participants were sent an introductory letter by their General Practitioner and this was followed by a visit from a study interviewer. Informed written consent was obtained from those who agreed to take part. Interviewers were trained to deliver standardised computerised questionnaires in participants' residences and collected information on socio-demographics, lifestyle, health status, cognitive function and psychiatric symptoms. Among the 14,242 people approached, the baseline interview included 7796 people living in community settings and institutions between 2008 and 2011.

The analysis here was based on a sub-sample of 3590 (47.8%) community-based CFAS II participants. A random sample of postcodes in Cambridgeshire and Nottingham was selected to collect environmental data, which was linked to the baseline interview data. The choice of these two centres was based on urban/rural difference and geographical variation in health status and social disadvantage (Matthews et al., 2013). CFAS II was approved by relevant local research ethics committees and obtained informed consent from participants. This secondary data analysis does not require new ethical approval.

2.2. Individual level factors and mental health problems

Socio-demographic factors were obtained from the CFAS II baseline interview, including age, gender and education (less than 9 years, 10–11 years, 12 years and above). Self-reported information on co-morbidity was used to measure the number of chronic conditions (hypertension, diabetes, stroke, heart attack, angina, low blood pressure/dizzy on standing, hearing and vision impairment) and divided into three levels (none, one, two or more).

Cognitive and common mental disorders were assessed using a structured interview of psychiatric symptoms and standardised cognitive tests. Cognitive impairment was defined here by Mini-Mental State Examination (MMSE) score 25 or below (Folstein et al., 1975). Dementia, depressive and anxiety symptoms were identified by Geriatric Mental Status (GMS) and the algorithm of the Automatic Geriatric Examination for Computer Assisting Taxonomy (GMS-AGECAT) (Copeland et al., 1986). People with organicity level three or above were considered to be dementia cases. Depressive and anxiety symptoms were defined as an AGECAT depression level of one or above including all subthreshold and clinical cases.

2.3. Residential Environmental Assessment Tool (REAT)

Environmental features at the micro-scale level were measured using the Residential Environmental Assessment Tool (REAT), a validated and observational instrument designed for measuring the quality of living environment within a given UK postcode, which includes approximately 18 households on average (Dunstan et al., 2005; Office for National Statistics, 2013a). The REAT contains property and street level assessments by examining 28 items in four domains: physical incivilities (features of social disorder, such as graffiti, broken windows, litter on the street); territorial functioning (maintenance and management of private areas, such as decorative features in gardens); defensible space (designs encouraging the control of local areas, such as walls and fences separating public and private areas) and natural elements (aesthetic and outlook of streets, such as trees and green space). A higher REAT score indicates a worse quality of living environment in the postcode.

In this study, the REAT assessment was conducted through visual image audits, which used Google Street View to virtually 'walk through' streets and assess the quality of living environment in local areas. The reliability of physical and visual image audits has been validated in our earlier study (Wu et al., 2014). Visual image audits show acceptable reliability in the total REAT score but nevertheless individual items and domain scores need to be treated with caution, particularly multiple comparisons. Thus, the analysis here only focused on total REAT score. The total REAT score was divided into two groups (high and low) based on the median score (high REAT score group: 2.0–14.0; low REAT score group: 14.5–41.0).

2.4. Urban and rural classification

Postcodes of CFAS II participants were mapped onto Lower Super Output Areas (LSOA), small geographical units in the UK with an average of 1500 people per area, and linked to corresponding rural/urban categories in the 2011 Rural/Urban Classification for Small Areas Geographies (UK Government, Department for Environment, Food and Rural Affairs, 2013a). The classification is based on the characteristics of physical settlement and population sparsity (UK Government, Department for Environment, Food and Rural Affairs, 2013a). There were three urban categories: Major Conurbation (mean population