

## Graffiti, greenery, and obesity in adults: secondary analysis of European cross sectional survey

Anne Ellaway, Sally Macintyre, Xavier Bonnefoy

Obesity levels are high and increasing worldwide. Being overweight is linked with increased death rates and contributes to a wide range of conditions, including ischaemic heart disease, hypertension, stroke, diabetes, certain cancers, and diseases of the gall bladder.<sup>1</sup> The principal cause of obesity is an imbalance between energy intake and energy expenditure. And there is growing recognition that, independently of individual characteristics, place of residence may be associated with health outcomes, including body size<sup>2</sup> and health related behaviours, such as level of physical exercise.<sup>3</sup>

Few studies have explored which features of the local neighbourhood might be related to these outcomes or behaviours, although perceived attractiveness has been found to be related to levels of physical activity.<sup>4</sup> Levels of incivilities, such as litter and graffiti, are associated with poorer health outcomes such as general wellbeing but not, to our knowledge, levels of physical activity. Few studies use objectively measured indicators of the residential environment or similar research instruments across different settings. Based on our previous work, we hypothesised that areas which are pleasant with lots of greenery and few incivilities might encourage people to take exercise and thereby influence levels of obesity.

### Participants, methods, and results

To tackle this hypothesis systematically, we drew upon data collected in the LARES study (Large Analysis of European Housing and Health Status), which was done in 2002-3 in eight European countries, varying in their wealth, culture, and history.<sup>5</sup> This survey includes data on adults (n=6919) in Angers (France), Bonn (Germany), Bratislava (Slovakia), Budapest (Hungary), Ferreira do Alentejo (Portugal), Forlì (Italy), Geneva (Switzerland), and Vilnius (Lithuania). The same survey methods and training of the surveyors were applied in all cities. A strength of the study is that it is not generally subject to same source bias—that is, it does not rely solely on self assessed perceptions of both health and environment. Housing and health questionnaires captured self reported data on the health of occupants (including self assessed height and weight, which we then used to calculate body mass index, and level of physical activity) and the dwelling and surrounding environment via face to face interview. Trained surveyors used an inspection sheet to assess the immediate residential environment, including the amount of graffiti, litter, and dog mess, as well as the level of vegetation and greenery visible on the dwelling and streets immediately surrounding it. We recoded physical activity into two levels (never/seldom and often) and incivilities and greenery into five levels—low to high. The analysis controlled for age, sex, socioeconomic status, and city of residence, and excluded respondents who reported

having a physical handicap or constraint. Dietary intake was not measured in this survey.

For respondents whose residential environment contains high levels of greenery, the likelihood of being more physically active is more than three times as high, and the likelihood of being overweight and obese is about 40% less (table). Conversely, for respondents whose residential environment contained high levels of incivilities, the likelihood of being more physically active is about 50% less, and the likelihood of being overweight or obese is about 50% higher.

Effect of litter, graffiti, and greenery on likelihood of being overweight/obese or being frequently physically active

	No*	Adjusted odds ratio (95% CI)†	P value
<b>Overweight/obese‡</b>			
Greenery:			
1 (low)	661	1.00	—
2	1143	0.87 (0.71 to 1.07)	0.195
3	1666	0.74 (0.61 to 0.90)	0.003
4	1250	0.79 (0.64 to 0.97)	0.027
5 (high)	458	0.63 (0.49 to 0.82)	0.001
Litter and graffiti:			
1 (low)	1193	1.00	—
2	1122	0.99 (0.82 to 1.18)	0.880
3	753	1.16 (0.95 to 1.42)	0.150
4	1341	1.34 (1.12 to 1.60)	0.001
5 (high)	675	1.42 (1.15 to 1.96)	0.001
<b>Frequent physical activity</b>			
Greenery:			
1 (low)	655	1.00	—
2	1133	1.70 (1.30 to 2.23)	0.001
3	1647	1.76 (1.36 to 2.27)	0.001
4	1238	1.68 (1.29 to 2.18)	0.001
5 (high)	454	3.32 (2.46 to 4.50)	0.001
Litter and graffiti:			
1 (low)	1180	1.00	—
2	1107	0.79 (0.60 to 0.88)	0.001
3	749	0.66 (0.54 to 0.85)	0.001
4	1331	0.51 (0.44 to 0.67)	0.001
5 (high)	668	0.53 (0.43 to 0.72)	0.001

\*Number of respondents vary because of missing data on some variables.

†Adjusted for sex, age (in single years), socioeconomic status (based on variables deemed to be comparable across the eight countries—highest education qualification of any adult resident, size of dwelling in square metres, number of rooms in dwelling, number and percentage of adults working full time, number of full time equivalent jobs held by resident adults, number of people in the household, whether a single person household, number of people aged at least 60 in the household), and city of residence. Odds ratio showed a linear relation with body mass index and physical activity (P<0.001 in trend test).

‡Compares normal (body mass index 20-24.99) with overweight/obese (≥25) and excludes 208 underweight (≤19.99).

**What is known on this topic**

Area of residence is increasingly recognised as being associated with levels of obesity and physical activity

**What this study adds**

Higher levels of greenery and lower levels of graffiti and litter in residential environments are associated with being physically active and not being overweight or obese; efforts to promote activity and reduce weight should take into account environmental facilitators and barriers

**Comment**

We find that objectively assessed features of the residential environment are associated with the likelihood of being physically active and not being overweight or obese, in this study of a range of European cities. Our analysis is limited because it is cross sectional and may be subject to differences in interpretation and reporting between countries—for example, in the reporting of height and weight. In efforts to promote physical activity and reduce weight, however, attention should be paid to environmental facilitators and barriers as well as individual factors.

We thank Matthias Braubach, Nathalie Röbbel, and members of the WHO Large Analysis and Review of European Housing and Health Status study

team for the survey data and Alastair Leyland and Geoff Der for statistical advice.

Contributors: All authors contributed to the design and writing up of the study. AE did the analysis and is guarantor.

Funding: No additional funding.

Competing interests: None declared.

Ethical approval: Not needed.

- 1 Must A, Spadano J, Coakley E, Field A, Colditz G, Dietz W. The disease burden associated with overweight and obesity. *JAMA* 1999;282:1523-9.
- 2 Ellaway A, Anderson A, Macintyre S. Does area of residence affect body size and shape? *Int J Obes* 1997;21:304-8.
- 3 Sundquist J, Malmstrom M, Johansson SE. Cardiovascular risk factors and the neighbourhood environment: a multilevel analysis. *Int J Epidemiol* 1999;28:841-5.
- 4 Ball K, Bauman A, Leslie E, Owen N. Perceived environmental aesthetics and convenience and company are associated with walking for exercise among Australian adults. *Prev Med* 2001;33:434-40.
- 5 Bonnefoy XR, Braubach M, Moissonnier B, Monolbaev K, Röbbel N. Housing and health in Europe: preliminary results of a pan-European study. *Am J Public Health* 2003;93:1559-63.

(Accepted 5 July 2005)

doi 10.1136/bmj.38575.664549.F7

MRC Social and Public Health Sciences Unit, University of Glasgow, Glasgow, G12 8RZ

Anne Ellaway *senior researcher*  
Sally Macintyre *director*

WHO European Centre for Environment and Health, Görresstr 15, D-53113 Bonn, Germany

Xavier Bonnefoy *regional advisor*

Correspondence to: A Ellaway [anne@msoc.mrc.gla.ac.uk](mailto:anne@msoc.mrc.gla.ac.uk)