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**Associations between the perceived environment and physical activity among adults aged 55-65 years: does urban-rural area of residence matter?**

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Running head: Environments, physical activity and urban-rural status

## Abstract

This study aimed to determine whether associations between the perceived environment and physical activity are moderated by urban-rural status among mid-older aged adults. Environmental (safety, aesthetics, physical activity environment) and physical activity (total, leisure, transport) data from 3888 adults (55-65 years) from urban and rural areas of Victoria, Australia, were analysed. Multinomial logistic regression examined interactions between urban-rural status and environments in associations with physical activity. Significant ($p<0.05$) interactions were evident and indicated positive associations only among older rural adults for both safety and aesthetics with total and transport physical activity (e.g. rural adults reporting higher safety were 91-118% more likely to have higher activity than rural adults reporting low safety). In contrast, the physical activity environment was positively associated with leisure activity among only urban adults. Findings suggest that some tailoring of physical activity promotion strategies targeting the environment may be required for urban and rural mid-older aged adults.

## Introduction

The worldwide phenomenon of an ageing population is projected to pose significant health, social and economic burden. The proportion of adults aged 65 years and over is expected to double in Australia by 2036 (Department of Health and Ageing, 2001), representing one quarter of the population, and will more than double in the United States by 2040 (United States Census Bureau, 2008), representing one fifth of the population. While disease burden substantially increases from 45 years of age, approximately 80% of health problems associated with ageing are preventable primarily through lifestyle changes made in the 55-65 year age group (Department of Health and Ageing, 2001) (henceforth referred to as 'mid-older aged adults'). In Australia, the number of adults aged >45 years has increased by 30% since 1995 (National Obesity Taskforce, 2006). This is a period where many transitions and life events occur. Many adults begin to consider or commence the transition from working life into retirement (Australian Bureau of Statistics, 2011). Other life events, such as the death, disablement or illness of a partner or spouse, and the departure of children from the family home, are common occurrences. These major transitions and life events have the potential to impact on lifestyle behaviours, such as physical activity, making it an ideal time to intervene to promote healthy behaviours.

A number of common and chronic diseases, including cardiovascular disease, type 2 diabetes and obesity, are largely preventable through regular participation in moderate-intensity physical activity for 30 minutes per day on most days of the week (Haskell et al., 2007). Despite the large body of empirical evidence and a number of public health campaigns promoting the importance of regular physical activity for good health (Australian Department of Health and Aging, 2006), a significant proportion of the adult population in Westernised countries are not regularly active (Bauman et al., 2003; Centers for Disease Control and

Prevention, 2007), and physical activity participation declines with age (Australian Bureau of Statistics, 2009; Sallis, 2000). This is of particular concern for mid-older aged adults, among whom the loss of muscle mass associated with ageing can result in reduced muscular strength (Wannamethee, Shaper, Lennon, & Whincup, 2007), which contributes significantly to increased disability prevalence (Department of Health and Ageing, 2001). Of additional relevance to mid-older aged adults, low levels of physical activity can also impact on functional fitness, quality of life, independent living, and mental health problems such as depression (Sims et al., 2006). Identifying the factors contributing to the high prevalence of physical inactivity observed among mid-older aged adults in developed nations is essential for informing the development of preventive strategies.

Social-ecological models (Bronfenbrenner, 2005; Stokols, 1996) offer a useful framework for understanding health behaviours such as physical activity. These models posit that a range of individual, social and physical environmental factors interact to influence behaviour. While historically much research has focused on the individual (e.g. demographic, cognitive, behavioural) and social (e.g. support, peers, family) constructs, more recent research over the past two decades has highlighted the importance of a supportive environment for physical activity (Bauman & Bull, 2007). As adults age, car usage, independence and mobility decrease (Yen, Michael, & Perdue, 2009), and consequently the local neighbourhood environment may play a more prominent role in influencing behaviours. However, empirical work investigating environmental correlates of physical activity among mid-older aged adults is still emerging. For instance, a recent systematic review (Van Cauwenberg et al., 2011) identified 31 articles examining environment-activity associations in adults aged ≥65 years, but observed inconsistent findings which the authors attributed to a focus on measuring total physical activity (rather than context-specific activity) (Giles-Corti,

Timperio, Bull, & Pikora, 2005), non-validated and/or non-reliable environmental measures, lack of geographic heterogeneity (the majority of studies were from North America), and a focus on urban populations.

A recommendation of that systematic review was to better understand the moderating effects of urban-rural status of environment-physical activity associations among mid-older aged adults (Van Cauwenberg, et al., 2011). Rural adults demonstrate higher rates of premature mortality, obesity, type 2 diabetes and mental health problems than do urban adults (Australian Institute of Health & Welfare, 2008; Janus et al., 2007). These poorer health outcomes may be in part attributable to the lower levels of physical activity, a key modifiable risk factor for each of these outcomes, observed in rural populations (Australian Institute of Health & Welfare, 2008; Australian Institute of Health and Welfare, 2010; Centers for Disease Control and Prevention, 1998; Dobson, McLaughlin, Vagenas, & Wong, 2010; Martin et al., 2005; Parks, Housemann, & Brownson, 2003; Patterson, Moore, Probst, & Shinogle, 2004; Reis et al., 2004; Van Dyck, Cardon, Deforche, & De Bourdeaudhuij, 2011; Wilcox, Castro, King, Housemann, & Brownson, 2000). Differences in environmental influences on physical activity according to area of residence have been observed in other population groups, (e.g. (Cleland, Ball, King, & Crawford, 2010; Van Dyck, et al., 2011)), but it is not known whether urban-rural area of residence is an important consideration for environment-physical activity associations among mid-older aged adults. It is therefore important to understand whether such differences exist in order to determine whether interventions should be tailored separately for rural and urban mid-older aged adults. This study aimed to determine whether associations between the perceived environment and physical activity are moderated by urban-rural area of residence among mid-older aged adults.

## Methods

The data presented here were collected in 2010 and form the baseline data of a longitudinal cohort study known as the Wellbeing, Eating and Exercise for a Long Life (WELL) study (follow-up data to be collected in 2013-14) (McNaughton, Crawford, Ball, & Salmon, in press). Ethical approval was granted by the Deakin University Human Research Ethics Committee (EC2009-105), and participants provided written consent.

### Sample

A two-stage sampling process was employed to first select 'areas', then to select participants within those areas. Urban areas of Victoria were classified as (a) metropolitan Melbourne; (b) postcodes completely within a 10km radius of the centroid of regional cities (regional cities defined as having a population >20,000). Rural areas were classified as those areas falling outside metropolitan Melbourne and outside a 25 km radius of the regional cities. Twenty-nine postcodes were removed from the sampling frame due to disastrous bushfires in 2009 where entire townships were destroyed. The Relative Index of Socioeconomic Disadvantage, an index of the Socioeconomic Index for Areas (SEIFA) classification developed by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2003), was used to indicate the socioeconomic status of each area as low (bottom third), medium (middle third) and high (top third).

Participants were randomly selected from the Australian Electoral Roll (voting is compulsory in Australia) within urban-rural and socioeconomic (low, medium, high) strata. Within each of the 84 'areas', 134 residents (equal numbers of men and women) were randomly selected and invited to participate in the study. In cases where an area had <134 eligible residents, everyone aged 55-65 years in that area was invited to participate. A postal

survey was sent to 11,256 adults (n=5623 urban and n=5623 rural), inviting participation, with 380 returned undeliverable, and 95 returned from individuals outside the age range. Completed surveys were returned by 4082 participants (38% participation rate), and data from 3888 were used in the final analyses (exclusions detailed below).

## Measures

### Perceived environment.

Existing measures (Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007) were used to assess perceptions of personal safety (sum of three items), neighbourhood aesthetics (sum of five items), and the neighbourhood 'physical activity environment' (sum of seven items). Each item was assessed by respondents' level of agreement with statements on a five-point Likert scale. For personal safety, participants reported agreement with the statements: 'I feel safe walking in my neighbourhood, day or night', 'Violence is not a problem in my neighbourhood', and 'My neighbourhood is safe from crime'. Where one of the three component values were missing (n=72), the sum of two items was used as there were no significant differences between mean values for those with no missing values and those with one missing value (Cronbach's alpha=0.79).

For aesthetics, participants reported agreement with the statements: 'There is a lot of rubbish on the street in my neighbourhood', 'There is a lot of noise in my neighbourhood', 'In my neighbourhood the buildings and homes are well-maintained', 'The buildings and homes in my neighbourhood are interesting', and 'My neighbourhood is attractive'. The sum of four items was used for the 29 participants with one missing item, as there was no significant difference between mean values for those with no missing values and those with one missing value (Cronbach's alpha=0.69).

For the neighbourhood physical activity environment, participants reported agreement with the statements: 'My neighbourhood offers many opportunities to be physically active', 'Local sports clubs and other facilities in my neighbourhood offer many opportunities to get exercise', 'It is pleasant to walk in my neighbourhood', 'The trees in my neighbourhood provide enough shade', 'In my neighbourhood it is easy to walk places', 'I often see other people walking in my neighbourhood', and 'I often see other people exercising (e.g. jogging, bicycling, playing sports) in my neighbourhood'. Only participants with all seven items were included in the summary score because mean values significantly differed between those with no missing values and those with one missing value (Cronbach's alpha=0.84).

Thirty-nine participants who were missing more than one of the three summary variables (personal safety, aesthetics, or physical activity environment) were excluded from analyses.

**Physical activity.**

Leisure, work, transport and domestic (household/yard) physical activity in the past week was self-reported using the long version of the International Physical Activity Questionnaire (IPAQ-L), which is suitable for use in adults aged 15-69 years. This survey has demonstrated excellent one-week test-retest reliability (pooled $r$=0.81) and acceptable validity (pooled $r$=0.33) when compared to accelerometer-measured physical activity in a 12-country, 14-site study (Craig et al., 2003). Duration was multiplied by frequency and intensity factors (metabolic equivalents, METs) to estimate total MET-hours/week (sum of leisure, work, transport and domestic activities). Because they are discretionary and are conceptually most likely to be influenced by the neighbourhood environment context, MET-hours/week of leisure activities and transport activities are also considered in this report. Participants missing any of these variables were excluded from analyses (n=155).

**Covariates.**

Covariates were selected based on evidence in previous literature of an association with physical activity (Trost, Owen, Bauman, Sallis, & Brown, 2002). Participants self-reported their age, height and weight (used to calculate body mass index [BMI] kg/m$^2$), country of birth (Australia, other), language usually spoken at home (English, other), marital status (married/living as married, separated/divorced, widowed, never married), highest level of education (low: <Year 12; medium: Year 12/trade/certificate; high: university/postgraduate), employment status (full-time work; part-time work; not working, including those unemployed/laid off, keeping house/raising children, or full time study; retired), number of children <18 years living in the household (including grandchildren), general health status (excellent, very good, good, fair/poor), comparative health status (health status compared to one year ago: better, about the same, worse), illness/injury/disability that prevents physical activity (yes, no), typicality of past week physical activity (same as usual/no, usually more active/no, usually less active), and smoking status (never, former, current). Weight status was defined as healthy weight (BMI<25 kg/m$^2$), overweight (BMI 25-29.9 kg/m$^2$) or obese (BMI ≥30 kg/m$^2$) (World Health Organization, 2000).

**Analyses**

Variable means or medians (where data were skewed) and proportions were used to describe the sociodemographic, physical activity and environmental characteristics of the sample, stratified by area of residence. Chi-squared tests, one-way analysis-of-variance (for equal variances) and Kruskal-Wallis equality-of-populations rank tests (for unequal variances) were used to examine differences in characteristics between urban and rural residents.

The physical activity variables were problematic because they were highly skewed with large numbers of zero values, and an appropriate and consistent transformation could not be identified (hence, linear regression could not be used as model assumptions would be violated). These variables were therefore classified into five categories, with the first category representing participants reporting no physical activity (0 MET-hours/week). The remaining data were classified into four categories (enabling examination of any possible dose-response effect) using quartile cut-points (total activity MET-hours/week: 0, >0-40.4, 40.5-81.9, 82.0-149.9, ≥150; leisure activity MET-hours/week: 0, >0-4.8, 4.9-10.9, 11.0-23.0, ≥23.1; transport activity MET-hours/week: 0, >0-6.5, 6.6-15.2, 15.3-29.6, ≥29.7). We selected this approach to categorisation (rather than basing the cutpoints on for, example, public health guidelines) due to the lack of existence of domain-specific physical activity guidelines, and the lack of internationally-accepted cutpoints for MET-hours/week values.

Environmental (exposure) variables were dichotomised at the median for analyses (safety: 3.7; aesthetics: 3.8, physical activity environment: 3.9) to aid interpretation and represent 'low' versus 'high' levels of the particular environmental feature (e.g. 'low' versus 'high' perceived aesthetics). Associations between each perceived environment variable (safety, aesthetics, physical activity environment) and each physical activity variable (total, leisure, transport) were examined using multinomial logistic regression, adjusting for covariates that demonstrated significant bivariable associations with both the exposure (the environmental variables) and the outcome (the physical activity variables). While a multinomial logistic regression model does not strictly model the ordinal nature of the categories, it remains a valid method for analysing these data and imposes fewer restrictions on the ordinality of the response and its association with exposure (Hosmer & Lemeshow, 2000).

Interactions between each environmental variable and urban-rural status in their association with each physical activity variable were tested by adding a product term (environment*urban-rural status) to the regression models. Relative risk ratios (RRR) and 95% confidence intervals (CI) are presented for urban and rural adults combined where no statistically significant interaction ($p>0.05$) was identified, and stratified by urban-rural status where statistically significant ($p<0.05$) interactions were evident. All analyses were conducted in Stata (Version 12, StataCorp, College Station, Texas, US), and standard errors were adjusted for clustering by neighbourhood (the unit of recruitment; n=84 clusters) using the cluster(by) command. We used the Huber-White robust variance estimator (Williams, 2000), which ensures that the standard errors are not underestimated due to the potential correlated nature of responses for persons living in the same neighbourhood.

## Results

Compared to urban adults, rural adults had significantly higher BMI values, and a significantly greater proportion of rural than urban adults were born in Australia, spoke English at home, had an injury/illness/disability that impacted on physical activity, and had children (<18 years-old) living in the household (**Table 1**). There were also significant differences between urban and rural adults in terms of weight status, marital status, education, employment status, general health status, and smoking status, with urban adults generally demonstrating more favourable characteristics.

Perceived levels of personal safety were significantly more favourable among rural than urban residents (**Table 2**), while physical activity environments were more perceived to be favourable among urban than rural adults. Rural adults reported significantly more total physical activity than did urban adults, while urban adults reported significantly more leisure-time and transport physical activity than rural adults.

Associations between the three environmental factors and three physical activity variables are presented in **Table 3**, with results stratified by urban-rural status where significant interactions were found. For all adults, the physical activity environment was significantly positively associated with increasing categories of total and transport physical activity. For example, compared to those adults who perceived their physical activity environment less favourably, those who perceived their physical activity more favourably were 80% more likely to be in the second quartile of total physical activity, 86% more likely to be in the third quartile, and 82% more likely to be in the highest quartile. Personal safety was significantly positively associated with the highest quartile of leisure physical activity (although the lower confidence intervals in all other categories approached 1.0, suggesting a

noteworthy trend), while aesthetics was significantly positively associated with the middle category of leisure-time physical activity.

Significant interactions between urban-rural status and the environment were identified in a number of associations with physical activity, described in **Table 3** and illustrated in **Figures 1a-e**. Personal safety and aesthetics were positively associated with significantly higher levels of total physical activity in rural but not urban adults (**Figures 1a** and **1b** respectively). For example, among rural adults, compared to those reporting lower levels of personal safety, those reporting higher levels of personal safety were 91% more likely to be in the first quartile of total physical activity, 93% more likely to be in the second quartile, 102% more likely to be in the third quartile, and 118% more likely to be in the highest quartile. Personal safety was positively associated with being in the highest category of transport physical activity for rural adults, but no association was seen among urban adults (**Figure 1c**). While a significant interaction was identified for urban-rural status and aesthetics in its association with transport physical activity, no significant associations were identified when stratified by urban-rural status (**Figure 1d**). Significant positive associations were identified between the physical activity environment and leisure-time physical activity among both urban and rural adults (**Figure 1e**), with associations being greater in magnitude among urban than rural adults.

## Discussion

This study aimed to determine whether associations between the perceived environment and physical activity are moderated by urban-rural area of residence among mid-older aged adults. The findings suggest that urban-rural status is an important factor to consider in understanding environment-physical activity associations among this age group, with personal safety and aesthetics seeming to play a more important role in physical activity among rural than urban adults. More favourable perceptions of personal safety and neighbourhood aesthetics were associated with participation in greater amounts of total physical activity among rural but not urban adults; personal safety was similarly associated with greater amounts of transport physical activity in rural but not urban adults. While a more favourable perception of the physical activity environment was associated with greater amounts of total, leisure and transport physical activity among all adults, the association between the physical activity environment and leisure activity was stronger in magnitude among urban compared to rural adults.

Personal safety was associated with total and transport-related physical activity among rural but not urban adults. Although the association with transport-related activity was only statistically significant in the highest category, the lower confidence intervals in all other categories approached 1.0 suggesting a noteworthy trend. A systematic review of studies of older adults (≥65 years) found no clear evidence of an association between personal safety and total physical activity or transport-related walking (Van Cauwenberg, et al., 2011), but the studies reviewed were mainly limited to urban populations, which may explain the difference in findings. It is plausible that rural adults may find it more difficult than urban adults to participate in transport-related activity because of greater distances to destinations or the need to traverse remote and/or unlit areas, which may create a sense of vulnerability. The

measures used in this study did not assess these factors, but feeling safe and having low levels of concern about violence and crime may be particularly important for physical activity among rural adults. These factors may be less important for mid-older aged adults living in urban areas, who may have more options in terms of where and how they are active.

In contrast to many studies of urban populations (Ball, Bauman, Leslie, & Owen, 2001; Humpel, Marshall, Leslie, Bauman, & Owen, 2004; Inoue et al., 2009), this study observed no association between aesthetics and physical activity among urban adults, but an association was apparent among rural adults. It is unclear why no association was observed in urban adults, but it could be that adults living in urban areas have greater access (i.e. greater availability and shorter distances to travel) to indoor physical activity options (such as recreational facilities, gyms, community health centres, or neighbourhood houses/community learning centres) and as such the attractiveness of their neighbourhood environment is less important. Conversely, rural adults may have fewer opportunities for indoor activities, and so the attractiveness of their environment becomes an important factor in determining their participation in physical activity. Much of the previous literature has focused on general adult samples with a wide age range (e.g. 18-65 years), and it may be that aesthetics plays a different role in the physical activity behaviours of adults aged 55-65y years. However, Van Cauwenberg et al's review of environment-physical activity associations among slightly older adults (≥65 years) showed no consistent relationship between aesthetics and total physical activity, total walking or cycling, recreational walking, or transportation walking (Van Cauwenberg, et al., 2011). It is also possible that in this cross-sectional study, rural adults were more aware of their environment because they were more physically active (i.e. reverse causation), or were choosing to be active in places that were aesthetically pleasing.

A more favourable perceived 'physical activity environment' was associated with leisure-time physical activity among all adults, but the strength of the association was

significantly greater among urban than rural adults. It is plausible that the constructs included in the measure of the 'physical activity environment' had more salience to urban than rural adults. For example, in urban areas there may be more opportunities and facilities for physical activity, walking in the neighbourhood may be more feasible (and hence pleasant and/or shady), and higher population density may increase the chances of seeing and being influenced by other people walking or exercising. Other studies examining similar constructs to those included in the measure of the physical activity environment have also identified stronger and more consistent associations among urban than rural adults (Cleland, et al., 2010; Parks, et al., 2003).

The limitations of this study should be considered when interpreting the findings. The cross-sectional study design limits inferences about temporality and causality. The participation rate (38%) was less than desired, but there was heterogeneity in the demographic, physical activity and environmental characteristics of participants. Classification of urban-rural status is difficult (De Marco & De Marco, 2010), and could have resulted in some misclassification. Classifications also differ within and across countries, which may limit the generalisability of our findings, but highlight the need for context-specific investigations. The limitations of self-reported measures of physical activity are well-documented (Sallis & Saelens, 2000), but a reliable, reasonably valid and internationally commonly-used survey instrument was employed (Craig, et al., 2003), which enabled us to examine context-specific domains of physical activity likely to be most conceptually related to the environment (i.e. leisure and transport activity). Different associations may have been observed had we examined domain-specific walking, which may have been more pertinent to this age group. Around 50% of leisure-time and 65% of transport physical activity consisted of walking in this sample, suggesting it may be an important source of physical activity. Self-reported measures of the environment may not be as accurate as objective measures;

however, it is unclear whether objective or perceived environments are more strongly associated with physical activity, with variation across studies evident (Ball et al., 2008; Hoehner, Brennan Ramirez, Elliott, Handy, & Brownson, 2005). While we used a reliable, published measure of the perceived environment, a number of environmental constructs that may be important for physical activity were not included in these measures (e.g. busy roads, footpaths, walking tracks, topography, distances). In addition, the relevance of some of the environmental constructs for rural adults (e.g. neighbourhood noise) is currently unknown. A further limitation is the lack of adjustment for weather, which may have impacted on outdoor activities in the past week. It is possible that a person who lives in a supportive physical activity environment who is normally very active may have experienced an unusually inactive week due to inclement weather, which may have had some impact on the results. However, data were collected from participants during February-May, which in Australia spans summer and autumn (fall), where weather is typically mild. Models were also adjusted for typicality of physical activity, which may account for some variation in physical activity due to weather.

Despite these limitations, this study had a number of important strengths. This is one of the first studies to examine the modifying effect of urban-rural status on environment and physical activity associations, which has been identified as an important area for research (Van Cauwenberg, et al., 2011). The majority of research to date has been limited to urban populations, ignoring the not-insignificant proportion of the population that live in rural areas (e.g. 30% of Australians). The large sample size enabled the inclusion of five physical activity categories (enabling examination of possible dose-response effects), the examination of statistical interactions, and adjustment for a number of important confounding factors. The outcome and exposure variables were derived from published sources with reasonable validity and excellent reliability. Adults aged 55-65 years are an under-studied population

group, but this transitional period may represent an important ‘teachable moment’ where greater consideration is given to health, and where adults may be receptive to health promotion and disease prevention messages.

In conclusion, this study found that urban-rural status modifies associations between certain aspects of the perceived environment and physical activity among adults aged 55-65 years. Specifically, it appears that personal safety and aesthetics are particularly important for physical activity among rural adults, and some tailoring of interventions to target these factors in rural adults may be required. The ‘physical activity environment’ demonstrated associations with both urban and rural adults, and hence policies and programs among adults, irrespective of where they live, should include a focus on creating environments that are ‘physical activity-friendly’. Given that the predominance of research to date has focused on those living in urban areas, further effort is required to appropriately conceptualise definitions of rural environments, and ensure that measures of rural environments incorporate relevant and appropriate constructs.

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Table 1

*Sociodemographic and Health Characteristics of Adults Aged 55-65 Years, by Area of Residence*

| | Urban (n=1845) | Rural (n=2043) | p-value[a] |
|---|---|---|---|
| Men, n (%) | 889 (48.2) | 957 (46.8) | 0.40 |
| Age (years), Mean (SD) | 60.1 (3.1) | 60.4 (3.2) | 0.02 |
| Born in Australia, n (%) | 1334 (73.1) | 1756 (86.4) | <0.001 |
| English spoken at home, n (%) | 1744 (95.0) | 2026 (99.7) | <0.001 |
| Marital status, n (%) | | | <0.001 |
| Married/living as married | 1390 (75.7) | 1625 (80.1) | |
| Separated/ Divorced | 250 (13.6) | 223 (11.0) | |
| Widowed | 79 (4.3) | 93 (4.6) | |
| Never married | 117 (4.6) | 87 (4.3) | |
| Education, n (%) | | | <0.001 |
| Low (<Yr 12) | 514 (28.3) | 901 (44.9) | |
| Medium (Yr 12/trade/certificate) | 623 (34.3) | 736 (36.7) | |
| High (university/postgraduate) | 681 (37.5) | 368 (18.4) | |
| Employment status, n (%) | | | <0.001 |
| Full-time work | 675 (37.2) | 595 (29.7) | |
| Part-time work | 434 (23.9) | 518 (25.9) | |
| Not working[b] | 163 (9.0) | 133 (6.6) | |
| Retired | 543 (29.9) | 757 (37.8) | |
| Children living in the household[c], n (%) | 564 (30.9) | 301 (14.9) | <0.001 |

| | | | |
|---|---|---|---|
| BMI (kg/m$^2$), Mean (SD) | 26.8 (5.2) | 27.8 (5.5) | <0.001 |
| Weight status, n (%) | | | <0.001 |
| Healthy (BMI <25 kg/m$^2$) | 714 (39.8) | 645 (32.6) | |
| Overweight (BMI 25-29.9 kg/m$^2$) | 710 (39.6) | 792 (40.0) | |
| Obese (BMI ≥30 kg/m$^2$) | 369 (20.6) | 542 (27.4) | |
| General health status, n (%) | | | 0.001 |
| Excellent | 217 (11.8) | 178 (8.7) | |
| Very good | 698 (38.1) | 734 (36.0) | |
| Good | 716 (39.1) | 851 (41.7) | |
| Fair/Poor | 202 (11.0) | 277 (13.6) | |
| Comparative health status, n (%) | | | 0.169 |
| Better than 1 year ago | 330 (17.9) | 348 (17.0) | |
| About the same as 1 year ago | 1298 (70.5) | 1492 (73.0) | |
| Worse than 1 year ago | 212 (11.5) | 203 (9.9) | |
| Illness/injury/disability, n (%) | 362 (19.8) | 498 (24.5) | <0.001 |
| Typical PA level in the last 7 days, n(%) | | | |
| Same as usual | 1347 (73.8%) | 1545 (76.5%) | 0.105 |
| No, usually more active | 350 (19.2%) | 360 (17.8%) | |
| No, usually less active | 129 (7.1%) | 116 (5.8%) | |
| Smoking status, n (%) | | | 0.008 |
| Never smoker | 966 (53.0) | 974 (48.1) | |
| Former smoker | 641 (35.2) | 800 (39.5) | |
| Current smoker[d] | 216 (11.9) | 252 (12.4) | |

*Note.* Number of participants within each variable does not always equal total number of participants due to a small number of missing values

[a] p-value for urban-rural comparison

[b] Includes those unemployed/laid off, keeping house/raising children, and full-time study

[c] Aged under 18 years and includes grandchildren

[d] Includes occasional and regular smokers

Table 2

*Environment (Mean and Standard Deviation) and Physical Activity (Median and Inter-Quartile Range MET-Hours/Week) Characteristics among Adults Aged 55-65 Years, by Area of Residence*

| | Urban (n=1845) | Rural (n=2043) | p-value[a] |
|---|---|---|---|
| Environment, *Mean (SD)* | | | |
| Personal safety | 3.4 (0.8) | 3.7 (0.7) | <0.001 |
| Aesthetics | 3.8 (0.6) | 3.8 (0.5) | 0.09 |
| Physical activity environment | 3.9 (0.6) | 3.8 (0.6) | <0.001 |
| Physical activity (MET-hrs/week), *Median (IQR)* | | | |
| Total | 69 (34, 127) | 91 (43, 168) | <0.001 |
| Leisure | 10 (1, 25) | 7 (0, 20) | <0.001 |
| Transport | 7 (0, 17) | 5 (0, 15) | <0.001 |

*Note.* For the environment variables, a higher score indicates a more favourable environment; IQR: inter-quartile range; SD: standard deviation

[a] p-value for urban-rural comparison

Table 3

*Association (RRR and 95% CI) between Environmental Factors and Physical Activity among Adults Aged 55-65 Years*

| | Safety | | Aesthetics | |
|---|---|---|---|---|
| | **Urban** | **Rural** | **Urban** | **Rural** |
| **Total PA** | | | | |
| None | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) |
| Quartile 1 (low) | 0.66 (0.34, 1.29) | 1.91 (1.02, 3.58)* | 0.85 (0.43, 1.70) | 1.89 (1.04, 3.45)* |
| Quartile 2 | 0.61 (0.33, 1.13) | 1.93 (1.01, 3.69)* | 0.80 (0.41, 1.57) | 2.25 (1.30, 3.87)** |
| Quartile 3 | 0.71 (0.35, 1.41) | 2.02 (1.08, 3.78)* | 0.76 (0.37, 1.54) | 2.02 (1.11, 3.71)* |
| Quartile 4 (high) | 0.64 (0.33, 1.24) | 2.18 (1.09, 4.35)* | 0.63 (0.31, 1.26) | 2.04 (1.07, 3.89)* |
| **Leisure PA** | | | | |
| None | 1.0 (ref) | | 1.0 (ref) | |
| Quartile 1 (low) | 1.07 (0.86, 1.34) | | 0.99 (0.81, 1.22) | 0 |
| Quartile 2 | 1.16 (0.96, 1.40) | | 1.26 (1.05, 1.53) * | |
| Quartile 3 | 1.17 (0.95, 1.43) | | 1.07 (0.90, 1.27) | |
| Quartile 4 (high) | 1.21 (0.99, 1.50) | | 1.10 (0.89, 1.37) | |
| **Transport PA** | | | | |
| None | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) | 1.0 (ref) |
| Quartile 1 (low) | 0.89 (0.63, 1.25) | 1.28 (0.96, 1.69) | 1.02 (0.72, 1.43) | 1.07 (0.78, 1.46) |

| | | | | |
|---|---|---|---|---|
| Quartile 2 | 1.01 (0.75, 1.36) | 1.31 (0.94, 1.82) | 0.84 (0.61, 1.16) | 1.07 (0.82, 1.39) |
| Quartile 3 | 0.88 (0.66, 1.19) | 1.28 (0.93, 1.76) | 0.83 (0.61, 1.15) | 1.38 (0.99, 1.92) |
| Quartile 4 (high) | 0.82 (0.63, 1.07) | 1.77 (1.31, 2.39)** | 0.78 (0.59, 1.05) | 1.07 (0.78, 1.46) |

*Note.* Relative risk ratios and 95% confidence intervals adjusted for sex, education, employment status, general health, comparative health status, body mass index, illness/injury/disability preventing physical activity, typicality of past week physical activity; adjusted for clustering by neighbourhood (the unit of recruitment). Where significant ($p<0.05$) interactions were found, estimates are reported separately for urban and rural adults.

* $p<0.05$

** $p<0.01$

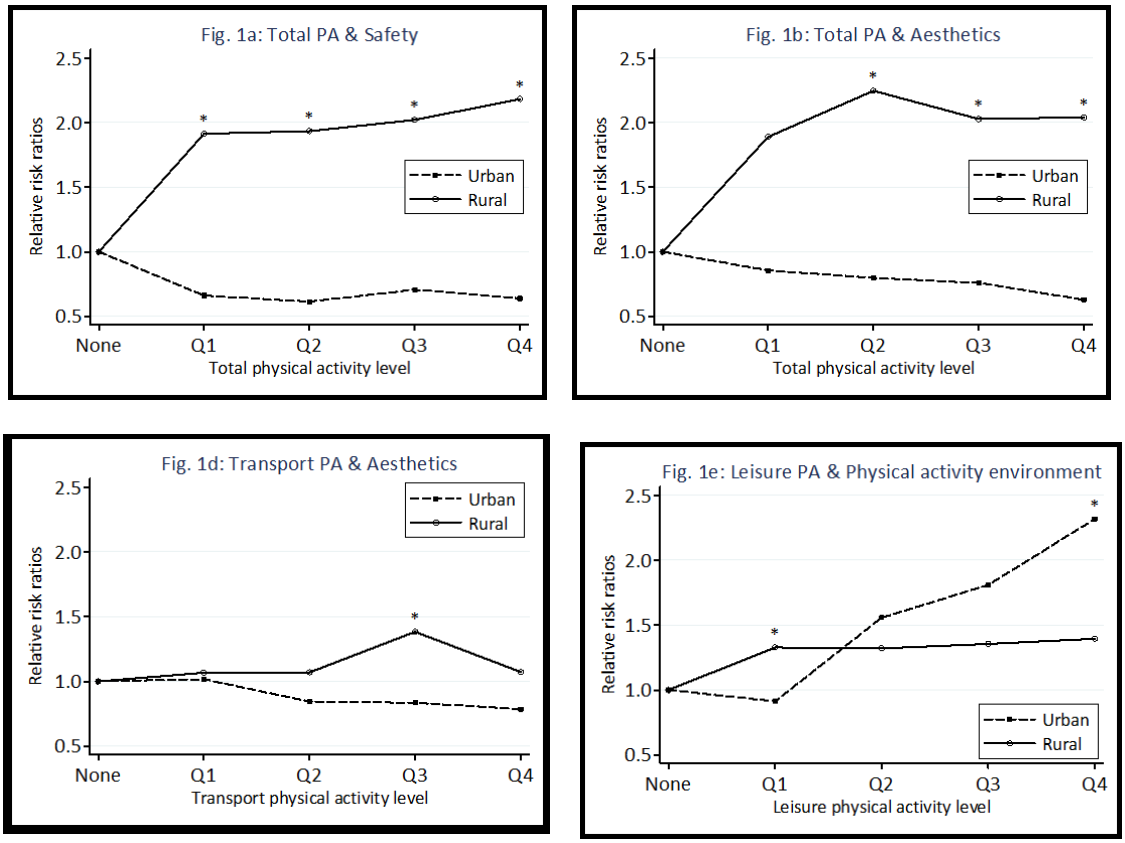


*Figure 1.* Associations (RRR) between the environment and physical activity, stratified by urban-rural status.

*Note.* Relative risk ratios adjusted for sex, education, employment status, general health, comparative health status, body mass index, illness/injury/disability preventing physical activity, typicality of past week physical activity; robust standard errors are adjusted for clustering by neighbourhood (the unit of recruitment)

* $p<0.05$ for urban/rural interaction

** $p<0.01$ for urban/rural interaction