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*Brief Report*

# An Exploration of Rural-Urban Residence on Self-Reported Health Status with UK Cancer Survivors following Treatment: A Brief Report

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**Abstract:** Objective: To explore the effect of rural-urban residence on self-reported health status with UK cancer survivors. Design: A post-positivist approach utilising a cross-sectional postal questionnaire that collected data on demographics, post-code and self-reported health status. Methods: Independent Samples *t* test was used to detect differences in health status between rural and urban respondents. Pearson's  $\chi^2$  was used to control for confounding variables and multivariate analysis was conducted using Stepwise linear regression. Setting: East Midlands of England. Participants: Adult cancer survivors who had undergone primary treatment in the last five years. Participants were excluded if they had recurrence or metastatic spread, started active oncology treatment in the last twelve months and were in receipt of palliative or end of life care. Main Outcome: Residence was measured using the UK Office for National Statistics (ONS) RUC2011 Rural-Urban Classifications and Health Status via the UK ONS self-reported health status measure. Ethics: The study was reviewed and approved (Ref: 17/WS/0054) by an NHS Research Ethics Committee and the Health Research Authority (HRA) prior to recruitment and data collection taking place. Results: 227 respondents returned a questionnaire (Response Rate 27%). Forty-five per cent (N=103) were resident in a rural area and fifty-three per cent (N=120) in an urban area. Rural ( $4.11 \pm 0.85$ ) respondents had significantly ( $p < 0.001$ ) higher self-reported health status compared to urban ( $3.65 \pm 0.93$ ) respondents (MD 0.47; 95% CI 0.23, 0.70). Conclusion: Rural respondents had significantly higher self-reported health status compared to their urban counterparts. It is hoped that the results will stimulate further work in this area and that researchers will be encouraged to collect data on rural-urban residency where appropriate.

**Keywords:** rural health; urban health; health status; cancer survivors; United Kingdom

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## What is already known on the subject?

- Much of the existing literature on cancer survivorship and geography tends to be from non-UK areas such as Australia and North America.
- It has been documented that cancer survivors in rural settings experience a number of additional challenges compared to their urban counterparts.

## What this paper adds?

- The first analysis of self-reported health status, between rural and urban UK cancer survivors, who had completed primary treatment.

## 1. Introduction

Cancer is a leading cause of death globally and accounted for nearly ten million deaths in 2020.<sup>1</sup> The burden of cancer continues to grow exerting considerable physical, emotional, and financial pressure on people living with and affected by cancer as well as on health and social care systems around the world.<sup>2</sup> The Global Burden of Disease (GBD) study has identified large heterogeneities with regard to cancer care and survival which can be attributed to exposures to risk factors, lifestyles, access to treatment and screening as well as different economic and geographic settings.<sup>3</sup> The majority of the cancer survivorship literature with a focus on geography and specifically with regard to rurality tends to be from Australia and North America.<sup>4-18</sup> Whilst these geographies are significantly larger than the UK and what constitutes 'rural' in the UK might be very different than in North America or Australia, it has been well documented that cancer survivors in rural settings experience a number of additional challenges compared to their urban counterparts.<sup>13 16 19-21</sup> Examples include having to travel long distances for treatment, access to bespoke support and emotional and physical isolation. Additionally, research has highlighted the benefits of rural living and 'green spaces' in improving physical and mental health and there are a number of benefits to rural living for cancer survivors.<sup>22 23</sup> For example, rural communities frequently value close relationships with family and friends, community members and religious institutions<sup>24 25</sup> which constitute significant sources of social support,<sup>22</sup> vital to coping with or minimising emotional distress when experiencing a traumatic life event such as a cancer diagnosis. Butow et al<sup>19</sup> maintain that this could be a potential reason for differences and that rural populations might be less inclined to ask for help and interestingly, recent research in Australia highlighted that people affected by cancer in rural areas were less likely to report higher levels of distress compared to those from urban areas.<sup>6</sup>

Our recent research has looked specifically at the role of rural-urban residency on self-management and cancer related self-efficacy with UK cancer survivors.<sup>26 27</sup> In the UK, almost a fifth (10.82 million) of the total population (56.39 million) reside in rural areas.<sup>28</sup> It is therefore important to understand the experiences and health outcomes of cancer survivors who reside in both rural and urban areas. However, we still do not understand the impact of geography on health status as it directly relates to UK populations who have completed primary treatment for cancer. This research aimed to address that gap by exploring the impact of rural-urban residence on self-reported health status with cancer survivors who were post-treatment in the East Midlands region of England.

## 2. Methods

The study utilised a post-positivist approach via a cross-sectional self-completion postal questionnaire that collected data on demographics, post-code and self-reported health status. For health status, we used the UK Office for National Statistics (ONS) measure where participants were asked the question 'How is your health in general?' and they could rate their health as 'Very Good', 'Good', 'Fair', 'Poor' or 'Very Poor'. Respondents were asked for their post-code and rural-urban residence was defined based on the UK ONS RUC2011 Rural Urban Classifications which has been recommended for statistical analyses by the Department for Environment, Food and Rural Affairs. This approach of using official statistics to define rural-urban residence has been adopted internationally in other cancer research studies in high income settings.<sup>8 9 13</sup> The ONS measure for Index of Multiple Deprivation (IMD) was also assigned utilising post code data.

### 2.1. Participant Eligibility

Participants were included if they were aged 18 years and over, had a confirmed cancer diagnosis, undergone treatment in the last five years and excluded if they had evidence of recurrence or metastatic spread, started active oncology treatment in the last twelve months and were currently being treated for palliative or end of life care.

## 2.2. Sample Size Calculation

The first author (DN) worked with an experienced statistician to calculate the sample size and a letter of support was provided to the ethics committee outlining how the sample size was calculated. The calculation was performed for an independent samples (rural and urban) *t* test in relation to the outcome measure. The final calculation allowed for a 20 per cent difference between scores, assumed a statistical significance level of 0.05 and a test with 95 per cent power giving a required sample of 417. In line with similar cancer survivorship research in the West Midlands of England that also used a self-completion postal questionnaire<sup>29 30</sup>, the sample size was doubled as it was anticipated that 50 per cent of participants would respond. Therefore, 834 participants that met the above eligibility criteria were identified and sent a questionnaire.

## 2.3. Recruitment

Access to the sample population was sought via Cancer Centre staff at two acute NHS Trusts who acted as gatekeepers to the study population. These were both based in the East Midlands of England, one which covers a sparse and rural county and another with a high proportion of urban dwellers. The managers of both Cancer Centres as well as their lead Cancer Nurse Specialists (CNSs) were briefed on the eligibility criteria and confirmed that they could identify and recruit potential participants via their patient database on behalf of the research team. An information analyst at each trust led on the identification of potential participants using their patient database. The research team did not have access to identifiable patient information. A random sample of 834 eligible participants (417 at each NHS site) were identified and sent a printed research pack in the post that included an NHS branded invitation from the lead CNS at each site, participant information sheet, questionnaire and a freepost return envelope to the lead researcher's work address. These materials were designed to tell the participant more about why they were invited, the purpose of the research and conditions of taking part. The draft study materials were piloted with five volunteers who had lived experience of cancer prior to seeking ethical approval. The research packs were sent out in June 2017 at one site and in September 2017 at the other participating NHS site.

## 2.4. Consent

It was made clear on the information sheet and questionnaire that by completing and returning the questionnaire the participant was giving their consent to take part and the conditions that were outlined in the information sheet. Participants could self-select to take part after reading the materials and it was made clear that participation was entirely voluntary.

## 2.5. Data Storage

All physical and digital data were stored safely and securely in the first author's (DN) personal office at the University of Lincoln on a password protected PC and in a locked metal filing cabinet.

## 2.6. Analysis

Descriptive statistics were used to characterise the data and Independent Samples *t* test was firstly, used to assess for significance between rural and urban respondents. Pearson's  $\chi^2$  was used to assess for confounding variables. Finally, multivariate analysis was conducted using Stepwise linear regression whilst controlling for confounders. Results were considered significant if  $p < 0.05$ . Data were analysed in SPSS software (Ver. 25).

## 2.7. Ethics

The research was approved by a School of Health and Social Care Ethics Committee (Ref: 12/02/17) as well as by an NHS Research Ethics Committee (REC) and the Health

Research Authority (HRA) (Ref: 17/WS/0054; IRAS Project ID: 204679). NHS approvals had to be in place given the use of NHS systems and staff to support the recruitment of eligible participants. Furthermore, confirmation of capacity and capability to deliver the study was authorised by both participating NHS trusts Research and Development (R&D) departments.

### 3. Results

227 respondents (response rate of 27%) returned a questionnaire, and the mean age was 66.86 years.  $\pm 11.22$  (range 26-90). Fifty-two per cent (N=119) were female and forty-eight per cent (N=108) were male. Forty-five per cent (N=103) were resident in a rural area and fifty-three per cent (N=120) in an urban area. Thirty-seven per cent (N=38) of rural respondents reported their health as very good compared to seventeen per cent (N=20) of urban respondents. Ten per cent (N=12) of urban participants self-reported their health as poor or very poor compared to 4 per cent (N=4) of rural participants. Full rural and urban participant characteristics are reported on in Table 1.

**Table 1.** Rural-Urban Comparison of Participants.

		<i>Rural</i>	<i>Urban</i>
		<i>Total N=103</i>	<i>Total N=120</i>
<i>Age</i>		<i>n</i> (%)	<i>n</i> (%)
	25-34	1 (1.0)	0 (0.0)
	35-44	2 (1.9)	4 (3.3)
	45-54	12 (11.7)	15 (12.5)
	55-64	24 (23.3)	26 (21.7)
	65-74	42 (40.8)	48 (40.0)
	Over 75	22 (21.4)	27 (22.5)
<i>Gender</i>	Female	62 (60.2)	57 (47.5)
	Male	41 (39.8)	63 (52.5)
	Other gender identity	0 (0)	0 (0)
<i>Ethnicity</i>	White British	103 (100)	114 (95.0)
	Indian	0 (0)	4 (3.3)
	African	0 (0)	1 (0.9)
	Caribbean	0 (0)	1 (0.9)
<i>Religion</i>	Christian	79 (76.7)	98 (81.7)
	No Religion	19 (18.4)	17 (14.2)
	Hindu	0 (0)	2 (1.7)
	Muslim	0 (0)	1 (0.8)
	Sikh	0 (0)	1 (0.8)
	Any other religion	1 (1.0)	0 (0)
	<i>Living arrangements</i>		
Partner/Spouse/Family/Friends	92 (89.3)	89 (74.2)	
	9 (8.7)	30 (25.0)	
<i>Marital status</i>	Nursing home/Hospital/Long-term care home	0 (0)	1 (0.8)
	Married	86 (83.5)	79 (65.8)
	Living with partner	3 (2.9)	3 (2.5)
	Widowed	8 (7.8)	15 (12.5)
	Single	1 (1.0)	9 (7.5)
	Divorced/Separated	4 (3.9)	14 (11.7)
	Employed	21 (20.4)	30 (25.0)
<i>Employment status</i>	Not Employed	3 (2.9)	9 (7.5)
	Retired	69 (67.0)	75 (62.5)
	Other	9 (8.7)	6 (5.0)

<i>Qualifications**</i>	Professional Qualification	30 (29.1)	30 (25.0)
	Degree or Higher Degree	19 (18.4)	20 (16.7)
	A levels or equivalent	24 (23.3)	26 (21.7)
	GCSE/O Levels or equivalent	35 (34.0)	43 (35.8)
	No qualifications	8 (7.8)	30 (25.0)
<i>Annual household income</i>	£0-14,999	23 (22.3)	31 (25.8)
	£15-24,999	19 (18.4)	36 (30.0)
	£25-49,999	36 (35.0)	35 (29.2)
	£50-74,999	7 (6.8)	7 (5.8)
	Over £75,000	5 (4.9)	1 (0.8)
<i>Primary Cancer Type</i>	Breast	39 (37.9)	34 (28.6)
	Urological	22 (21.4)	30 (25.2)
	Skin	8 (7.8)	10 (8.4)
	Head and Neck	7 (6.8)	6 (5.0)
	Gynaecological	6 (5.8)	4 (3.4)
<i>Health Status</i>	Lower Gastrointestinal	13 (12.6)	16 (13.4)
	Haematological	4 (3.9)	6 (5.0)
	Upper Gastrointestinal	3 (2.9)	8 (6.7)
	Lung	0 (0)	5 (4.2)
	Sarcoma	1 (1.0)	0 (0)
	Very Good	38 (36.9)	20 (16.7)
	Good	44 (42.7)	53 (44.2)
	Fair	17 (16.5)	35 (29.2)
	Poor	3 (2.9)	9 (7.5)
	Very Poor	1 (1.0)	3 (2.5)

\*Percentages may not total 100% due to missing values. \*\*Percentages add to more than 100% because participants could select more than one option.

Firstly, Independent Samples *t* test revealed that rural ( $4.11 \pm 0.85$ ) respondents had significantly ( $p < 0.001$ ) higher self-reported health status compared to urban ( $3.65 \pm 0.93$ ) respondents (MD 0.47; 95% CI 0.23, 0.70).

**Table 2.** Multiple Predictors of Health Status Using Stepwise Linear Regression.

Health Status					
	B	SE B	$\beta$	t	p
<b>Model 1</b>					
Constant	3.701 (3.541, 3.860)	.081		45.752	.000
Rural-Urban	.430 (.195, .666)	.119	.239	3.603	.000
Adjusted R <sup>2</sup>	.053				
<b>Model 2</b>					
Constant	3.427 (3.179, 3.675)	.126		27.254	.000
Rural-Urban	.356 (.119, .594)	.121	.198	2.958	.009
Marital Status	.400 (.119, .681)	.142	.188	2.810	.013
Adjusted R <sup>2</sup>	.082				
<b>Model 3</b>					
Constant	3.125 (2.766, 3.474)	.177		17.671	.000
Rural-Urban	.318 (.081, .555)	.120	.177	2.643	.009
Marital Status	.357 (.077, .637)	.142	.168	2.515	.013
Deprivation	.057 (.010, .103)	.024	.159	2.405	.017
Adjusted R <sup>2</sup>	.103				
<b>Model 4</b>					
Constant	3.271 (2.900, 3.643)	.189		17.349	.000
Rural-Urban	.329 (.094, .564)	.119	.183	2.755	.006
Marital Status	.806 (.304, 1.308)	.255	.379	3.166	.002
Deprivation	.055 (.009, .101)	.023	.155	2.369	.019
Living Arrangement	-.593 (-1.145, -.041)	.280	-.252	-2.116	.035
Adjusted R <sup>2</sup>	.117				

Notes: Figures in brackets refer to 95% Confidence Intervals. Outcome Health Status: Very Poor=1, Poor=2, Fair=3, Good=4, Very Good=5. Residence: Urban=0 and Rural=1. Marital Status: Widowed/Single/Divorced/Separated=0 Married/Civil Partnership=1. Deprivation: 1=Most Deprived through to 10=Least Deprived. Living Arrangement: 0=Live alone and 1=Partner/Spouse/Family/Friends.

Pearson's  $X^2$  test revealed that living arrangement (9.768,  $p=.002^*$ ), marital status (11.155,  $p=.001^*$ ) and qualifications (11.886,  $p=.003^*$ ) were all significantly associated with rural-urban residence and so, were entered into our stepwise linear regression model with rural-urban residence and deprivation to adjust for their effect (Table 2). Ethnic group was also significantly associated with residency, but the sample was deemed too homogenous (Table 1) to warrant a meaningful comparison and inclusion in our model(s).

Turning to the multivariate analysis in Table 2, the first model, showed that rural-urban residence was a highly significant ( $p=.000$ ) predictor of health status. In models two, three, and four, whilst adjusting for confounding variables, residence still remained a significant predictor of health status. Qualifications was not a significant predictor and as such, was excluded from the models. Model 4 that included marital status, living arrangements and deprivation as covariates was the best fit although the adjusted  $r^2$  (.117) was only slightly larger than model 3 (.103). Deprivation and living arrangement were not significant predictors in this model when controlling for confounders. Whilst the adjusted  $r^2$  for model 4 could be considered low there was a notable increase from model 1 and 2 suggesting that this model was the best fit although further research is required that considers additional covariates.

#### 4. Conclusion

The research highlighted that in this sample, rural respondents had significantly higher self-reported health status compared to their urban counterparts. This was at odds with American research where rural participants were more likely to self-report fair/poor health.<sup>9</sup> However, their sample was considerably larger and those from rural areas had lower levels of education and health insurance compared to their urban counterparts.<sup>9</sup> Model 4 that included rural-urban residence, marital status, living arrangements and deprivation was the best predictor of self-reported health status. Although the results from the multivariate analysis should be interpreted with caution given the low adjusted  $r^2$ . However, it is hoped that the results will stimulate further work in this area and that researchers will be encouraged to collect data on rural-urban residency where appropriate. This can be done by asking participants for their post code and cross-referencing with official statistics as was the case in this study. This means that the amount of personal data that is required is minimal. Additionally, the use of self-report measures also raises concerns around response bias which need to be considered when interpreting the findings. A limitation of our study was that we did not have access to the details of non-responders and so could not make any conclusions about those who decided not to take part and whether they came from a rural or urban area. A further limitation was that the required sample size of 417 was not reached, however, the sample of 227 still offered a good split in terms of rural and urban respondents to facilitate a comparative analysis.

The literature maintains that cancer survivors in rural areas tend to be more stoic with regards to their health<sup>31</sup> and are less likely to report high/very high distress<sup>6</sup> which could account for some of the differences with self-reported health status in this study. Research by McNulty and Nail<sup>10</sup> found that rural participants advocate for themselves, their diagnosis, survivorship, and for improved health care, as well as, having higher trust within their local communities<sup>6</sup> which could subsequently impact positively on health status. Our other research with UK cancer survivors also suggests that people from rural areas have greater confidence to self-manage when compared to their urban counterparts.<sup>26</sup> Further qualitative work is warranted with diverse samples from a range of rural and urban areas to understand why health status and recovery might differ between rural and urban populations who have completed treatment for cancer.

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