

# Original Article
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# Does a rural residence predict the development of depressive symptoms in older adults?

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**Objective:** We sought to determine whether adults aged 65 years or older living in rural areas who are without depressive symptoms have a lower risk of developing depressive symptoms over 5 years than their urban counterparts, and to determine the factors that predict the development of depressive symptoms in older adults in rural and urban areas.

**Methods:** We conducted a secondary analysis of an existing data set, the Manitoba Study of Health and Aging (MSHA.) We studied a population-based random sample of 807 people without depressive symptoms or cognitive impairment who were residing in Manitoba communities in 1991/92 and 5 years later in 1996/97. We defined "rural" as a census subdivision with a population of less than 20 000, and "urban" as a population of 20 000 or greater. The MSHA investigators measured depressive symptoms using the Center for Epidemiologic Studies Depression scale, using the standard cut-point of 16 or more. Participants reported their age, sex, education, self-rated health, and functional status at the time of their first interview.

**Results:** Of adults aged 65 years or older living in urban areas, 13.3% developed depressive symptoms, versus 8.9% of those living in rural regions ($p = 0.047$). In multivariate analyses, a rural residence was not associated with the development of depressive symptoms. In rural areas, factors predicting depressive symptoms were female sex and poor self-rated health at the time of the first interview.

**Conclusion:** A rural residence is only weakly protective for the development of depressive symptoms over 5 years, and this association was not seen after we accounted for potential confounding variables. As well, these results underscore the strong association between poor health and depressive symptoms.

**Objectif :** Nous avons cherché à déterminer si des adultes de 65 ans ou plus vivant en milieu rural et n'ayant pas de symptômes dépressifs risquent moins d'avoir des symptômes dépressifs en cinq ans que leurs homologues urbains et à déterminer les facteurs prédicteurs de l'apparition de symptômes dépressifs chez les adultes âgés en régions rurale et urbaine.

**Méthodes :** Nous avons procédé à une analyse secondaire d'un ensemble de données existantes tirées de l'étude sur la santé et le vieillissement au Manitoba (ESVM). Nous avons étudié un échantillon aléatoire représentatif de 807 personnes qui ne présentaient aucun symptôme dépressif ni déficit de la cognition et qui habitaient des communautés du Manitoba en 1991–1992 et cinq ans plus tard en 1996–1997. Nous avons défini «rural» comme une subdivision de recensement comptant moins de 20 000 habitants et «urbain» comme une subdivision en comptant 20 000 ou plus. Les chercheurs de l'ESVM ont mesuré les symptômes dépressifs au moyen de l'échelle de la dépression du Centre d'études épidémiologiques et utilisé le point de démarcation habituel de 16 ou plus. Les participants ont indiqué leur âge, sexe, scolarisation, état de santé autoévalué et état fonctionnel au moment de leur première entrevue.

**Résultats :** Parmi les adultes de 65 ans ou plus vivant en milieu urbain, 13,3 % ont eu des symptômes dépressifs par rapport à 8,9 % de ceux qui vivaient en région rurale



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($p$ = 0,047). Des analyses à variables multiples ont révélé qu'il n'y avait pas de lien entre la résidence en milieu rural et l'apparition de symptômes dépressifs. En milieu rural, les facteurs prédicteurs des symptômes dépressifs étaient le sexe féminin et un état de santé autoévalué médiocre au moment de la première entrevue.

**Conclusion :** Le fait d'habiter en milieu rural protège faiblement contre l'apparition de symptômes dépressifs en cinq ans et on n'a pas constaté ce lien après avoir tenu compte de variables confusionnelles possibles. En outre, ces résultats soulignent le lien solide qui existe entre le mauvais état de santé et les symptômes dépressifs.

## INTRODUCTION

Depressive symptoms are a concern for older adults, and have been shown to predict death,[1] admission to a nursing home[2] and functional decline.[3] Since the urbanization of society, a rural lifestyle has been purported to lower the risk of depression. Features of urban life, such as overcrowding, poor working conditions and a disconnection from traditional supports, were thought to predispose urban residents to mental health problems. At present, there is little research into these factors.

A rural residence could have both positive and negative effects on the risks of depression. Contextual factors that could lessen the risk for depression in rural areas include the presumed idyllic physical environment, residential stability, close social ties and stable social networks. As well, individual characteristics of rural residents such as resilience, independence and self-sufficiency may reduce the risk of depression. However, other factors of rurality may increase the risk of depression. Notably, economic decline, long travel distances, limited services and amenities, and stark physical environments may lead to depression. Furthermore, individual characteristics such as low educational attainment or low income may predispose people in rural areas to depression.

Previous studies have revealed positive, negative and no effect of rurality on depression in later life. In our own cross-sectional analysis, we found no differences in the percentage of older adults with depressive symptoms in Manitoba among those who lived in small towns, cities and predominantly rural areas.[4] These results are similar to the findings of the PAQUID [*Personnes Agées Quid*] study in France,[5] and Kim and coauthors[6] in South Korea. However, US researchers have found a lower risk of depressive symptoms in rural adults of all ages.[7,8] These conflicting findings reflect, in part, varying methodologies, settings, and measures of depression and depressive symptoms. As well, rural regions and urban regions are not heterogenous, and certain aspects of rural environments and rural residence may predict depression in some societies, but not in others.

Much of the existing literature draws on cross-sectional studies, with only a small number of prospective studies. Even when prospective studies have been conducted, the data have often been analyzed in a cross-sectional manner. One exception is a recent study by Weich and colleagues[9] who analyzed prospective multilevel data from the United Kingdom. In this 1-year cohort study of about 7600 adults aged 16 to 74, the effects of geographical location on depressive symptoms of the participants were small but statistically significant. Specifically, those living in rural areas had slightly lower rates of depressive symptoms. This study was limited to the United Kingdom, where rural areas are quite different from those in Canada. As well, the results, based on younger adults, may not be applicable to older adults who have had varied life experiences over a longer period. Other prospective studies of depression in rural regions have been conducted, but do not have an urban comparator group. These studies generally confirm that previously reported predictors of depression (poor health, poor functional status, low education and low social position) hold true in rural areas.[4–8]

Previous research has not investigated extensively the association between a rural residence and the development of depressive symptoms in a prospective manner. We therefore have conducted a secondary analysis of an existing data set, the Manitoba Study of Health and Aging (MSHA), to determine if there were differences in the development of depressive symptoms over 5 years in rural and urban older adults who were without depressive symptoms at the start of the study.

Our objectives were as follows:

- to determine whether adults aged 65 years or older living in rural areas who are without depressive symptoms are less likely to develop depressive symptoms over 5 years than their urban counterparts;
- to determine the factors that predict the development of depressive symptoms in older adults in rural and urban areas.

## METHODS

We conducted a secondary analysis of the MSHA. This is a population-based cohort study conducted in the province of Manitoba, in conjunction with the Canadian Study of Health and Aging (CSHA).[10] Unlike the CSHA, the MSHA sampled most areas of the province, including rural areas. As well, the MSHA investigators added supplementary questions and instruments, notably the Center for Epidemiologic Studies Depression (CES-D) scale.[11]

The MSHA investigators drew a random sample of adults aged 65 years or older from the Manitoba Health Registry, one of the most comprehensive sampling frames available. The investigators stratified the sample into region, age and sex, with an oversampling of the "oldest old." The study investigators drew samples from all health regions of the province. However, in the 2 remote northern health regions, they sampled only older adults living in the major population centres. Trained interviewers used standardized instruments to interview the study participants in their own homes. These initial interviews were conducted in 1991/92. In 1996/97, the interviewers contacted the participants again and conducted repeat interviews.

We included participants if they had completed both interviews, were cognitively intact at the time of the first interview, did not have depressive symptoms at the time of the first interview and did not live in the remote northern health regions.

### Measures

*Outcome variable*

The MSHA investigators measured depressive symptoms using the CES-D scale.[11] This scale is a valid, reliable instrument for measuring depressive symptoms in older populations and consists of 20 items each scored from 0 to 3, yielding a total score of 60. We considered the standard cut-point of 16 or greater as indicative of depressive symptoms. Of note, the CES-D does not provide a clinical diagnosis of major depression but rather an indication of the presence of depressive symptoms.

*Predictor variables*

We defined rural and urban residence based on Beale codes modified for Canada.[12,13] We classified census subdivisions according to the populations of the subdivisions reported in the 1991 Census of Canada[14] as follows: urban areas (population > 19 999); small-town zones (population 2500–19 999); and predominantly rural regions (population < 2500). We then assigned respondents into 1 of these 3 groups based on their place of residence. Since there were small numbers in some cells in logistic regression models, we further categorized these into rural (population < 19 999) and urban (population > 20 000) for most analyses.

*Socio-demographic variables*

Socio-demographic variables included age, sex, education, living arrangements, number of individuals providing companionship and perceived adequacy of income. The MSHA investigators measured companionship using the question, "How many people in total would you say visit you or provide companionship?" Those who reported more than 20 persons were recoded to 20, giving a range from 0 to 20. The investigators assessed perceived adequacy of income by asking participants to answer, "How satisfied are you that your income adequately meets your needs?" on a 5-point scale. For the current analysis, we dichotomized responses into very well/adequately (0) versus some difficulty/not very well/totally inadequate (1). We used the Older Americans' Resource Survey Multidimensional Functional Assessment Questionnaire[15] to assess activities of daily living and instrumental activities of daily living. We used a dichotomy of excellent/good functioning (0) versus mild/moderate/severe/total impairment (1). The MSHA investigators assessed self-rated health using the question, "For your age, would you say in general your health is excellent, good, fair, poor or bad?" We dichotomized responses as excellent/good (0) versus fair/poor/bad (1). We used the Modified Mini-Mental State Examination (3MS)[16] as the cognitive measure. This is a modification of the original Mini-Mental State Examination[17] with expanded scoring and extra items. It is scored on a scale of 0 to 100, with a score of 78 or greater considered normal.

### Analysis

We compared categorical variables using $\chi^2$ tests and we compared continuous variables using *t* tests (assuming unequal variance) or one-way analysis of variance. We constructed logistic regression models, with the outcome variable of presence or absence of depressive symptoms. We constructed 3 separate models (total sample, rural only, urban only). Regression diagnostics revealed that living arrangement was highly colinear with sex, and the 3MS

score was colinear with education. We therefore excluded living arrangement and 3MS score from the regression models. We conducted a sensitivity analysis with living arrangement and the 3MS included in the models, and these models were similar to the models we present in terms of rural–urban differences. As well, since self-rated health was an extremely strong predictor, we constructed logistic regression models that did not include self-rated health. These models were also similar to the models we present. We analyzed all data using SPSS Version 11.5 (SPSS Inc.) software for windows.

Our study received approval from the Research Ethics Committee of the Faculty of Medicine of the University of Manitoba, and was in compliance with the Declaration of Helsinki.

## RESULTS

Baseline characteristics of the sample participants are shown in Table 1. Of the 807 respondents, 59.5% resided in urban areas, 17.2% resided in small-town zones and 23.3% resided in predominantly rural areas. The proportion of people with depressive symptoms at the time of the second interview was lower in small-town zones and predominantly rural areas than in urban areas (Table 2, $p = 0.047$). However, this difference was not large and was of borderline statistical significance. In bivariate analyses for the total sample, sex, perceived income adequacy, self-rated health, and functional impairment at baseline were associated with the presence of depressive symptoms 5 years later. In the rural sample, sex, self-rated health, and functional impairment were significant, and in the urban sample, only self-rated health emerged as significant (Table 2).

The effect of a rural residence was not apparent in logistic regression models after we accounted for potential confounding factors (Table 3). Female sex and poor self-rated health at baseline predicted depressive symptoms at the time of the second interview. Both of these effects were statistically significant. These predictors were also the only significant predictors when considering the rural sample only. Among the urban respondents, self-rated health was the only statistically significant predictor, although sex approached significance.

## DISCUSSION

### Strengths and limitations

Our study has several strengths. First, our study covers a large population of older adults from a geographically large and heterogeneous rural area. Second, the MSHA investigators used reliable valid measures and trained interviewers gathered the data. Third, the prospective nature of our study allows better examination of the temporal nature of the effect of rurality on depressive symptoms.

Our study also has several limitations. First, the measure of depressive symptoms was the CES-D scale. Although this is a reliable, valid measure of depressive symptoms, it is not a measure of major depression, which requires a clinical examination. Second, our definition of rurality was somewhat crude, being based on the population of a census subdivision. Rurality is a complex and multidimensional construct, which is hard to categorize distinctly. It is possible that different definitions of rurality would give different results. Also, our definition does not consider intra-rural or intra-urban differences. Rural areas are heterogeneous, and different rural areas may have different rates of depressive symptoms. However, the definition of rurality we used is commonly used, consistent with other studies and reports, and easy for others to replicate. A third limitation is the difficulty accounting for different rural factors (population density, distance to services, economic base, etc.), which may affect depressive symptoms. Some of these

**Table 1. Characteristics of the 807 sample participants at the time of the first interview**

| Characteristic | % of participants* | | |
|---|---|---|---|
| | Urban,† $n = 480$ | Small town,‡ $n = 139$ | Rural,§ $n = 188$ |
| Male sex | 38.5 | 39.6 | 43.6 |
| Mean age, yr | 73.9 | 73.7 | 74.5 |
| Mean years of education | 10.9 | 9.3 | 8.9 |
| Living alone | 38.8 | 38.1 | 36.2 |
| Mean no. of companions | 3.9 | 6.0 | 6.9 |
| Perceived adequacy of income | | | |
| Very well/adequately | 90.2 | 88.5 | 88.8 |
| Some difficulty/not very well | 9.8 | 11.5 | 11.3 |
| Self-rated health | | | |
| Excellent/good | 80.5 | 81.3 | 75.0 |
| Fair/poor/bad | 19.5 | 18.7 | 25.0 |
| Functional impairment | | | |
| Excellent/good functioning | 77.9 | 80.6 | 75.5 |
| Mild/moderate/severe/total impairment | 22.1 | 19.4 | 24.5 |
| Mean 3MS score | 91.2 | 90.3 | 89.5 |

3MS = Modified Mini-Mental State Examination.
*Unless otherwise indicated.
†Population > 19 999.
‡Population 2500–19 999.
§Population < 2500.

factors may be protective, and others may be detrimental. It is methodologically difficult to disentangle the effect of these different factors since they are difficult to measure and are often correlated. Another limitation is the 5-year interval between the survey waves. Depressive symptoms may vary over time, as can the risk factors for depression. Some of these factors, such as changes in agriculturally based economies may differentially affect rural or urban older adults, and thereby confound any rural–urban analysis. As well, attrition through mortality and admission to nursing homes may occur during this time interval. However, the rates of death and admission to nursing homes did not differ significantly between rural and urban areas. To overcome many of these difficulties, long-term longitudinal studies with frequent interviews would be needed that included large groups of urban and rural seniors, and were linked to community-level contextual data from many varied communities. Understandably, such studies are rare. Finally, the data for these analyses were gathered some years ago, and it is possible that the effect of rurality on mood has changed during the intervening years.

**Table 2. Bivariate associations between participant characteristics at the time of the first interview and depressive symptoms at the time of the second interview. The percent of participants with depressive symptoms is shown in the entire sample, and in those in rural and in urban areas**

| | % of participants* | | |
|---|---|---|---|
| Characteristic at the time of the first interview | Total sample, $n = 807$ | Rural, $n = 327$ | Urban, $n = 480$ |
| Geographic residence | | | |
| Rural | 8.9† | N/A | N/A |
| Urban | 13.3† | N/A | N/A |
| Sex | | | |
| Male | 7.8‡ | 5.1† | 9.7 |
| Female | 14.0‡ | 11.6† | 15.6 |
| Age, yr | | | |
| 65–74 | 10.0 | 8.2 | 11.2 |
| 75–84 | 13.3 | 8.3 | 16.7 |
| ≥ 85 | 12.5 | 16.0 | 9.7 |
| Education | | | |
| ≤ grade 9 | 11.6 | 10.6 | 12.8 |
| > grade 9 | 11.3 | 6.6 | 13.3 |
| Living arrangement | | | |
| Lives with others | 12.2 | 8.7 | 14.6 |
| Lives alone | 10.4 | 9.1 | 11.3 |
| No. providing companionship | | | |
| 0–3 | 12.8 | 9.0 | 14.4 |
| 4–20 | 9.1 | 7.8 | 10.7 |
| Perceived income adequacy | | | |
| Very well/adequately | 10.7† | 8.0 | 12.5 |
| Some difficulty/not very well | 17.9† | 16.2 | 19.1 |
| Self-rated health | | | |
| Excellent/good | 8.5§ | 5.9§ | 10.2§ |
| Fair/poor/bad | 23.6§ | 19.2§ | 27.2§ |
| Functional impairment | | | |
| Excellent/good functioning | 9.9‡ | 7.1† | 11.8 |
| Mild/moderate/severe/total impairment | 17.3‡ | 15.1† | 18.9 |
| 3MS score | | | |
| Below median (78–91) | 13.9† | 10.6 | 16.4 |
| Above median (92–100) | 9.2† | 6.8 | 10.6 |

3MS = Modified Mini-Mental State Examination; N/A = not applicable.
*Unless otherwise indicated.
†$p < 0.05$.
‡$p < 0.01$.
§$p < 0.001$.

## Interpretation

We have found that older adults living in predominantly rural areas are less likely to develop depressive symptoms than older adults residing in urban communities. However, this effect is small, and of borderline statistical significance. Furthermore, the effect is not seen in models adjusting for potential confounding factors. This observation is consistent with our previous findings in cross-sectional analyses of no association between a rural residence and the presence of depressive symptoms.[4] It is possible that our study lacks the power to detect a difference between rural and urban areas. However, even if this were the case, the effect of a rural residence is likely small.

We noted a strong association between self-rated health and depressive symptoms. Indeed, this association was so strong that it may have obscured the effects of other factors. Since the effect was so strong, we also constructed models without self-rated health. In these models, a rural residence was also not associated with depressive symptoms.

Our results are consistent with some of the previous research on rurality and depression. The PAQUID study in France also found a weak association between rurality and depressive symptoms, which was of marginal statistical significance and was not seen after other factors were accounted for.[5] As well, other cross-sectional analyses have reported no association between rurality and depressive symptoms.[18] However, some have reported an association. In younger adults in North Carolina, there was a lower prevalence of depressive symptoms in rural areas compared with urban areas.[7,8] In Britain, a multilevel modelling study demonstrated that areas with a low population density have a lower rate of depression.[9] However, rural and urban regions in the United Kingdom and southern United States are

very different from rural and urban regions in Canada in terms of social, economic and cultural factors. As well, the population studied in both cases was younger than ours. In younger adults, different factors may predict depressive symptoms than in older adults.

Our findings are important for clinicians and for policy-makers. Clinicians working in rural areas should be aware that their patients have a similar risk of developing depressive symptoms as patients in urban centres. As well, our findings underscore the important and complex association between self-assessed poor health and depressive symptoms. Patients who report poor health are at a much higher risk of developing depressive symptoms, and should be assessed for the presence of major depression. For policy-makers, the finding of a similar risk of depressive symptoms in rural areas is also important. Older adults in rural areas face a similar risk of depressive symptoms. However, there are considerable barriers in the delivery of care to older adults with depression in rural areas. Access to primary and secondary care, as well as access to social and psychological services may be limited by travel distance, a lack of service providers, and cultural factors. Models of care for older adults with depressive symptoms require further research with special attention to rural areas.

Further epidemiologic research into the association between rurality and depressive symptoms is also needed. Specifically, there is a need for life course studies of rural residence over time and the risk of depressive symptoms. Kim and colleagues[19] have shown that a prior history of a rural residence is not as important in predicting depression as a current history of rural residence. However, there are few other studies in this regard, so it is not clear whether this is true in other societies with different rural and urban characteristics. Also, studies are required which incorporate community and regional level variables. Rurality is multidimensional, and rural regions are very heterogenous economically, culturally and socially. Research into the factors of rurality that influence depression is needed.

## CONCLUSION

Future studies into the association between rurality and depressive symptoms will need to measure both individual and community factors, and be carried out over a long time frame. Many previous epidemiologic studies of aging have been conducted in urban centres. The inclusion of older adults in rural areas is important.

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**Competing interests:** None declared.

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**Table 3. Results of logistic regression model. A rural or urban residence was not associated with the development of depressive symptoms over 5 years. Women and those with poor self-rated health were more likely to develop depressive symptoms**

| | OR (95% CI) | | |
|---|---|---|---|
| Characteristic at the time of the first interview | Total sample | Rural | Urban |
| Urban/rural [urban]* | 0.62 (0.37–1.05) | N/A | N/A |
| Sex [female]* | 2.07 (1.21–3.55) | 2.90 (1.04–8.07) | 1.80 (0.95–3.41) |
| Age, per year | 1.03 (0.99–1.08) | 1.05 (0.98–1.12) | 1.03 (0.98–1.08) |
| Education, per year | 0.98 (0.90–1.07) | 0.96 (0.82–1.13) | 0.98 (0.89–1.09) |
| Income adequacy [inadequate]* | 1.20 (0.60–2.39) | 1.32 (0.43–4.07) | 1.11 (0.46–2.68) |
| Self-rated health [poor]* | 3.24 (1.92–5.46) | 3.52 (1.39–8.88) | 3.20 (1.68–6.08) |
| Functional impairment [impaired]* | 0.95 (0.54–1.67) | 0.94 (0.35–2.57) | 0.94 (0.47–1.87) |
| Number providing companionship, continuous | 0.96 (0.91–1.01) | 0.97 (0.89–1.05) | 0.96 (0.89–1.03) |

CI = confidence interval; N/A = not applicable; OR = odds ratio.
*Brackets indicate group at increased risk.

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