Quality of Life in Rural and Urban Adults 65 Years and Older: Findings From the National Health and Nutrition Examination Survey

Marianne Baernholdt, PhD, MPH, RN[1,2], **Guofen Yan, PhD**[2], **Ivora Hinton, PhD**[1], **Karen Rose, PhD, RN**[1], and **Meghan Mattos, MSN, CNL, RN**[1]

[1]School of Nursing, University of Virginia, Charlottesville, Virginia

[2]Department of Public Health Sciences, University of Virginia, Charlottesville, Virginia

Abstract

Purpose—The proportion of people over 65 years of age is higher in rural areas than in urban areas, and their numbers are expected to increase in the next decade. This study used Andersen's behavioral model to examine quality of life (QOL) in a nationally representative sample of community-dwelling adults 65 years and older according to geographic location. Specifically, associations between 3 dimensions of QOL (health-related QOL [HQOL], social functioning, and emotional well-being) and needs and health behaviors were examined.

Methods—The 2005–2006 National Health and Nutrition Examination survey was linked with the 2007 Area Resources File via the National Center for Health Statistics' remote access system. Frequencies and distribution patterns were assessed according to rural, adjacent, and urban locations.

Findings—Older adults reported high levels of QOL; however, rural older adults had lower social functioning than their urban counterparts. Older blacks and Hispanics had lower scores than whites on 2 dimensions of QOL. Associations between QOL and needs and health behaviors varied. Although activities of daily living were associated with all 3 dimensions, others were associated with 1 or 2 dimensions.

Conclusions—The lower scores on social functioning in rural areas suggest that rural older adults may be socially isolated. Older rural adults may need interventions to maintain physical and mental health, strengthen social relationships and support, and increase their participation in the community to promote QOL. In addition, older blacks and Hispanics seem more vulnerable than whites and may need more assistance.

Keywords

NHANES; older adults; quality of life; rural; urban

The percentage of older adults is higher in rural areas than in the rest of the United States.[1] Although a sharp increase in adults 65 years and older is expected in the US population as a whole, rural areas are going to see the greatest surge in this age group.[2] Many rural counties are becoming naturally occurring retirement communities (NORCs), or geographically

defined communities with a large proportion of older persons.[3] Unlike planned housing communities for the elderly such as retirement communities and assisted living, NORCs are not designed specifically for older residents. Rather, they have evolved over time due to "aging-in-place" and migration patterns in which older people have moved in and younger residents have moved out.[4] Although Americans in their 20s are more apt to move than people close to or at retirement age, older Americans are more likely to choose rural and small-town destinations when they do move.[2] If the aging baby boomers (those born from 1946 to 1964) follow past migration patterns, the rural and small-town population of 55- to 75-year olds will increase from 8.6 million in 2000 to 14.2 million in 2020.

Many older adults move to rural areas or stay there because of quality of life (QOL) considerations. The scenic landscape and feeling of connectedness to the land, as well as the sharing and helping that are common among people in rural areas, are among the reasons why older people feel their QOL may be better in rural areas.[1,2] Whether older people in rural areas actually report better QOL, however, needs further exploration.

The World Health Organization has defined QOL as a concept with several domains, including physical and mental health, social functioning, and emotional well-being.[5] Previous studies have found that physical health is worse in the rural population than in the urban population, and worse in the elderly.[6–8] Findings on mental health have been mixed: some studies report poorer mental health in rural areas, whereas others report no difference from urban residents.[6,8] Social functioning has also been found to be poorer in rural elderly.[6] Finally, emotional well-being has been shown to be worse in rural elderly than in their urban counterparts.[9] No study, however, has compared older people in rural and urban areas on the separate dimensions of QOL. It is important to determine whether the various dimensions of QOL differ between elderly in rural and urban communities to predict health and social needs for older adults in these communities and design appropriate interventions to maintain or improve QOL in the older population.

Methods

Conceptual Model

In the study reported here, Andersen's behavioral model[10] was adapted to assess factors associated with QOL in rural and urban community-dwelling adults 65 years and older. The model depicts how contextual characteristics, individual characteristics, and health behaviors influence QOL. Contextual and individual characteristics are categorized as predisposing factors, enabling factors, and needs factors. Predisposing factors are demographic variables (gender, age, and race/ethnicity). Enabling factors are social resources (number of people in family and marital status), human resources (education), and material resources (poverty index). Needs factors are number of chronic illnesses, activities of daily living (ADL) function, and mental status (memory problems and depression). Health behaviors include physical activity and health care utilization.

Previous studies have found associations between all the concepts in the model and the 3 dimensions of QOL: health-related QOL (HQOL), social functioning, and emotional well-being. For example, QOL has been associated with predisposing and enabling factors, including age, gender, ethnicity, education, income, marital status, and family size.[11–17] Further, HQOL has been shown to be affected by needs such as severity and number of chronic diseases, though social functioning was less affected by those needs.[18,19] Moreover, needs factors such as lower ADL function, depression, andmemory problems have been linked to poorer QOL.[17,20–22] Finally, health behaviors such as physical activity and health care utilization have been associated with QOL.[23–27] However, it is not clear whether the 3 dimensions of QOL and various contextual and individual characteristics and health

behaviors differ in rural and urban elderly adults. Therefore, this study assessed the different dimensions of QOL and factors associated with QOL in rural and urban community-dwelling adults 65 years and older.

Data Sources

The 2005–2006 National Health and Nutrition Examination survey (NHANES) and the 2007 Area Resource File (ARF) were used. The NHANES is used by the National Center for Health and Human Services to assess the health and nutritional status of adults and children in the United States.[28] A nationally representative sample of approximately 5,000 individuals from the civilian, noninstitutionalized US population is surveyed each year. The sample is chosen in 4 stages, beginning with identification of strata based on geographic location and then random sampling of 15 US counties within the strata. Stratified sampling is used to ensure representation of all ages of the US population. However, there is no stratification by rural and urban location. To produce reliable statistics, NHANES oversamples persons 60 years and older, African Americans and Hispanics. The data are released for public use in 2-year increment. Some variables are restricted because they are possible indirect identifiers, such as geography, genetic data, details on race/ethnicity, and specific dates. Together, these indirect identifiers could compromise the confidentiality of survey respondents. Therefore, any researcher wishing to access restricted variables or restricted data linkage products must submit a proposal to the National Center for Health Statistics (NCHS) Research Data Center requesting direct or remote access to files that contain this sensitive information.[29]

Study Design

To compare rural and urban older adults, we merged variables from the nonpublic NHANES state and county files with the ARF database's variable on geographic designation to produce designations for rural and urban location. ARF is a publicly available collection of county level data from more than 50 sources with information about health care delivery and resources in the United States.[30] A proposal requesting remote access was submitted to the NCHS research data center.[29] After approval and payment of user fees, we provided NCHS, the 2 datasets containing variables extracted and created from the public user files of both NHANES and ARF, the restricted NHANES variable names, and the codes needed to merge the datasets. The NCHS then set up remote access using e-mail contact to 1 team member. The team member submitted codes for the planned analyses according to the rules for usages; for example, only 1 set of analyses could be run at a time and no analysis could take more than 1 hour.[31]

Eligibility Criteria

All community-dwelling adults 65 years and older with data in NHANES on the 18 variables described below were included in the study.

Location—Location was broken down into rural, adjacent, and urban location using the rural-urban continuum codes from the United States Department of Agriculture.[32] Rural counties were defined as counties with no adjacent metro areas (continuum codes 5, 7, and 9). Adjacent counties were those adjacent to metro counties (continuum codes 4, 6, and 8) and urban counties were metro counties (continuum codes 1, 2, and 3).

Dependent Variables

HQOL: HQOL was a composite score of the total number of physically and mentally unhealthy days in the past month. Over half (56.6%) of the sample reported no physically or mentally unhealthy days (HQOL = 0), but 12% reported 30 unhealthy days (HQOL = 30).

We therefore revised the HQOL variable to create 6 levels, with 0 = no unhealthy days, 1 = 1–5 unhealthy days, 2 = 6–10 unhealthy days, 3 = 11–15 unhealthy days, 4 = 16–29 unhealthy days, and 5 = 30 unhealthy days.

Social functioning: Social functioning was measured as a 2-item index. Previous studies have used an index with 4 items and this has shown a high level of predictability of the social functioning dimension of QOL.[33] However, only 2 items were available in NHANES 2005–2006: number of close friends and frequency with which a person attended church or other religious services. After examining distributions, we assigned a value of 0 for no close friends, 1 for 1 close friend, 2 for 2 close friends, 3 for 3 close friends, and 4 for 4 or more close friends. For yearly church attendance/other religious services, we assigned a value of 0 to never, 1 to once, 2 to twice, and a value of 3 for 3 or more times. Thus, scores for social functioning ranged from 0 to 7, with higher scores representing better social functioning.

Emotional well-being: Emotional well-being was also scored using an index with 2 items. The 2 items were chosen because they reflected whether individuals felt they had support and therefore experienced a sense of emotional well-being,[34] and because the items did not overlap with other measures of QOL. The first item asked whether there was anyone to help with emotional support and was assigned a value of 1 if a person answered yes and 0 if a person answered no. The second item asked whether more emotional support was needed in the last year and was assigned a value of 1 if the person answered no and a value of 0 if the person answered yes. The index had a possible score range of 0–2, with higher scores indicating better emotional well-being.

Independent Variables—Following Andersen's behavioral model, we selected or created the following 17 variables.

Predisposing factors: Predisposing factors were demographic variables such as age, gender, and race/ethnicity. Age was a continuous variable starting at age 65 and ending at 85 or above. Race/ethnicity was classified as Hispanic, non-Hispanic white, non-Hispanic black, or other.

Enabling factors: Enabling factors were social, human, and material resources. Social resources were operationalized as the number of people in the family and marital status. The number of related people included the respondent. This item was scored from 1 to 6 people or 7 for 7 or more people. Marital status was categorized as married or not (widowed, divorced, separated, or never married). Human resources were operationalized as education, then dichotomized as high school education or more and less than a high school degree. Material resources were based on the ratio of the family income to the poverty threshold. A lower number represented fewer resources.

Need factors: Need factors were the number of chronic illnesses, ADL function, and mental status. The number of chronic conditions was created using 13 pulmonary, cardiovascular, cancer, stroke, kidney, diabetes, liver, and arthritis conditions for a score range of 0–13. ADL function was the sum of 16 items on the ADL scale, which measures constructs associated with locomotion and transfers, household productivity, social integration, and manipulation of surroundings. Items are scored from 1 to 4, where 1 = no difficulty and 4 = unable to do. Previously, Cronbach's alpha coefficient was 0.94.[35] In our study, the coefficient was 0.73. Mental status was measured using memory problems and depression. Memory problems were dichotomized according to whether they were present or not. Depression was measured using the 9-item depression module (PHQ-9) from the Patient Health Questionnaire, a self-administered version of the Primary Care Evaluation of Mental

Disorders (PRIME-MD) diagnostic instrument for common mental disorders. Respondents indicate whether they have been bothered by feeling down, depressed or hopeless in the last 2 weeks, using ratings from 0 = not at all to 3 = nearly every day, for a total score of 0–27. In previous studies, alpha coefficients ranged from 0.79 to 0.89.[36,37] In our study the coefficient was 0.82.

Health behaviors: Health behaviors were measured using physical activity and health care utilization. Physical activity was the level of physical activity performed on average each day. Scores on this 4-level NHANES item ranged from 1 = sits during the day and does not walk about very much, to 2 = stands or walks about a lot during the day but does not have to carry or lift things very often, to 3 = lifts loads or has to climb stairs or hills often, to 4 = does heavy work or carries heavy loads. Health care utilization was coded in NHANES as the number of times a respondent had received any type of health care in the last year. The range was 0–5: no health care utilization was assigned a 0; 1 visit to a doctor or other health care professional at a doctor's office, clinic, hospital emergency room, at home or some other place (not including hospitalizations overnight) was assigned a 1; 2–3 visits a 2; 4–9 visits a 3; 10–12 visits a 4; and 13 or more visits a 5.

Statistical Analysis

For descriptive summaries, we used means and standard errors for continuous data, taking into account NHANES sampling weights. For categorical data, using sample weights was not possible, because cross-tabulation according to urban/adjacent/rural areas produced a number of cells with counts too small to be released under the current NCHS confidentiality policy. Similarly, for race/ethnicity subgroups the cell counts were too small using urban/adjacent/rural areas. Therefore, race/ethnicity is reported as white and all other race/ethnicities in our summary descriptions (Table 1). The associations between dependent and independent variables were examined using a design-based regression technique which took into account sampling weights.[38] In regression models, estimates for all 4 race/ethnicity subgroups are included (Table 2). SAS 9.2 (SAS Institute Inc., Cary, North Carolina) was used for all analyses.

Results

The merged dataset contained 911 adults 65 years and older with data on all variables listed in Table 1. There were more females in urban areas than in rural and adjacent areas (49% versus 42.3% and 46%, respectively), and the adults in urban areas were slightly older (73.83 vs 72.57 and 73.60 years, respectively); also, fewer adults in urban areas were white (57.5% vs 80.8% and 86.5%, respectively). In urban areas, the mean family size was 1.9, and 52.1% of respondents were married. In rural areas, family size was 1.96 and 60% were married, and in adjacent areas, family size was 1.82 and 64.9% were married. More people in rural areas had a high school education or more (65.4%) than in adjacent (54.7%) and urban areas (64.3%). However, more people were below the poverty threshold in rural (poverty index of 2.48) and adjacent areas (poverty index of 2.45) than in urban areas (poverty index of 2.79). People in rural areas also had more chronic conditions (2.94) than people in adjacent (2.35) and urban areas (2.38), and ADL function was lower in people living in rural areas (21.63) than in those in adjacent (20.65) and urban areas (21.36). People in rural areas reported having more memory problems (16.2%) and feeling more depressed (2.32) than people in adjacent (12.2% and 2.21) and urban areas (16% and 2.20). The average level of physical activity was higher in rural (2.00) and adjacent (2.13) areas than in urban areas (1.90). On average, people in rural areas received more health care (2.78) than people in adjacent (2.62) and urban areas (2.76). However, in all 3 areas, people received health care 4–12 times a year.

People in rural areas had lower HQOL (1.31) than people in adjacent (1.25) and urban (1.18) areas. On average, people in all 3 areas had experienced more than 5 but less than 10 unhealthy days in the last 30 days. People in rural areas also had significantly lower social functioning (4.75) than people in adjacent areas (5.65, $P < .001$) and urban areas (5.40, $P = .002$), indicating that fewer people in rural areas had at least 2 close friends and had attended church or other religious services more than once in the last year. The emotional well-being score was 1.74 in rural areas (of a possible 2), 1.71 in adjacent areas, and 1.76 in urban areas, indicating that most people had someone to help with emotional support and they had received all the emotional support they needed in the past year. The 3 QOL variables showed little association to each other with correlations ranging from −0.12 to 0.18.

Multivariate Analysis

Multiple regression (Table 2) showed that poorer HQOL was associated with being Hispanic, having a high school education or more, having lower ADL function, and being more depressed. Social functioning was lower in people living in rural areas, but it was higher among people who were female, black, had a high school education or more, had better ADL function, had no memory problems, and who had greater health care utilization. Emotional well-being was lower in people who were Hispanic or black, had lower ADL function, and were more depressed.

Discussion

Older people living in rural areas rated the social functioning dimension of QOL differently from their counterparts in urban and adjacent areas. However, when all the independent variables were added together only rural-urban differences remained. This is similar to previous findings that people in rural communities often experience isolation.[6,39,40] Older adults unable to drive may be forced to stay at home isolated from others when there are limited publicly funded transportation services and few housing opportunities tailored to the elderly.[41]

Our finding that there were no differences between rural, adjacent and urban older adults in HQOL is similar to Borders and associates' findings in urban, rural, and frontier (fewer than 7 people per square mile) areas.[12] Other studies, however, have found differences based on rural/urban location. For example, multiple sclerosis patients residing in rural areas have reported worse physical HQOL than those in urban areas.[42] Also, veterans residing in rural areas have reported worse physical HQOL than their urban counterparts, though reports on mental HQOL are mixed.[43,44] These results suggest that HQOL may be too broad a measure. For example, possible differences in mental and physical health in inverse directions cannot be detected in a combined score. Future studies with further subdivisions of QOL and HQOL are warranted.

In all 3 QOL dimensions, we found differences based on race. Other studies that examined overall QOL have also found that Hispanics and African Americans reported worse overall QOL.[11,16] In our study, being Hispanic was associated with poorer HQOL, and being Hispanic or black was associated with lower emotional well-being. However, being black was associated with higher social functioning. These findings suggest that race/ethnicity linkages to QOL may vary depending on the dimension of QOL examined. Similarly, gender was associated with social functioning in our study. Women reported higher social functioning, though previously, women have reported lower overall QOL than men.[13,14] In addition, we found that higher education was associated with better social functioning but poorer HQOL. Previously, higher education has been associated with better HQOL.[12,16] Further work is needed on the connections between being black, female, or better educated and higher social functioning.

None of the needs variables differed in rural, adjacent, and urban areas, but people in rural areas reported higher needs in all 4 areas examined (number of chronic conditions, ADL function, memory problems, and depression). In the full regression models, only ADL function was associated with all 3 dimensions of QOL. In other studies, ADL or physical function has been associated with social functioning in older women,[45] and the link between ADL and social functioning was also found in a longitudinal study of urban community-dwelling older adults: those who stayed socially active had better ADL functioning over 12 years.[46] Although the mechanism behind this linkage is unknown, health care providers can use this knowledge to advise older adults to stay socially active. Because rural residents reported both worse social functioning and lower ADL functioning, it is especially important to offer meaningful social programs and volunteering opportunities for older adults in rural communities.[46,47]

Our finding that being depressed was associated with poorer HQOL and lower emotional well-being is consistent with other findings on HQOL in the general population and in rural areas.[8,21,22] In our study, memory problems were linked only to lower social functioning, raising a question about whether memory problems affect all the dimensions of QOL. Surprisingly, we found no relationship between the number of chronic conditions and any of the dimensions of QOL, although other studies of both older adults in general and those with chronic conditions have found that a greater number of diseases was associated with poorer HQOL.[14,22,48] Because both depression and memory problems were associated with at least 1 QOL dimension, interventions aimed at identifying and treating depressive symptoms and memory problems in older adults should be a priority for health care providers. This is especially important in rural areas where older adults reported more depression and memory problems.

We found only 1 relationship between health care behaviors and QOL: greater health care utilization was associated with higher social functioning. Because we did not measure the types of health care services used and we examined only community-dwelling older adults, this positive relationship may reflect the use of preventive health care services. Our finding that health care utilization did not differ in rural, adjacent, and urban groups is in contrast to studies which reported that rural older adults had more emergency department visits than their urban counterparts, and rural Medicare beneficiaries had more surgical procedures than urban beneficiaries.[49,50] However, both of those studies measured specific areas of health care utilization, whereas our study used a broad measure, simply asking participants about use of any health care in the past year. More studies are clearly needed to examine utilization patterns in different geographical areas and for different health care services, as well as factors influencing health-care utilization.

There were several limitations to our study. First, there are different ways of measuring rurality. The often-used dichotomization of rural and urban geographic location produces different results from our 3 categories, yet many of the studies we refer to use this geographic dichotomization. This may explain some of the differences in findings. In addition, our findings are based on respondents for which we had complete data on all variables, and the findings may be biased if data were not missing at random.

Also, our measures were adapted from a population-based survey. We chose variables that best represented our conceptual model and the general population of older adults, but some variables were computed with less than ideal measures. For all 3 QOL variables, we used short indexes instead of validated scales. For social functioning, it would have been preferable to use all 4 domains of the Berkman-Syme Social Network Index[51] instead of the 2-item social index we computed. In fact, even more items may be needed to adequately measure social functioning. A recent study of community-dwelling older adults found robust

estimates in both cross-sectional and longitudinal analyses using an 11-item index.[52] Emotional well-being was also a 2-item index in this study and it has not been validated against much longer measurements used in other studies.[53] However, the 2-item HQOL has been validated against longer HQOL measures,[54,55] though our transformations into 6 categories have not been validated.

There were several limitations to our explanatory variables. The ADL scale had a lower Cronbach's alpha than previous studies,[35] suggesting that the underlying construct may not be well represented in the scale's items or that our sample was more heterogeneous than those in previous studies.[56] In the NHANES survey, memory problems were measured by self-report with a yes or no answer. It is possible that older adults underreported or were unaware of their memory problems, which may have led to measurement error. Finally, the NHANES database also limited the response choices for categorization of age. The final category was 85 years and older, so it is possible that the oldest-old (persons over the age of 85 years) were not adequately represented in our findings. Nevertheless, we have concluded that the NHANES had a sufficient sample of older adults in rural, adjacent, and urban locations to examine factors that influence QOL based on geographic location.

Our findings represent older people's perceptions of different dimensions of their QOL, not a health care provider's or other caregiver's observations. If QOL is a measure of successful aging as suggested by Cleary and Howell,[6] then the high scores on all 3 QOL dimensions in this sample of community-dwelling older adults are encouraging. The 3 dimension of QOL were not correlated, and they were associated with different factors, underscoring the need to measure QOL as a multidimensional construct.[57]

We found differences in self-reported QOL in rural and urban locations and with different contextual and individual characteristics and health behaviors. Although more exploration is needed to determine why older rural residents have lower social functioning, infrastructures should be planned so that rural older adults are not isolated.[4] Rural communities need to be better suited to older people's needs, with road maintenance and public transportation to remote areas.[4] Offering home visits and transportation to special events geared to older adults, and teaching older adults to use online forums are other ways rural communities can increase older adults' social functioning. For rural health care providers, it is especially important to perform routine medical and cognitive assessments for depression, memory problems, and ADL function in the elderly. Finally, blacks and Hispanics are vulnerable older adults who need special attention. They had worse HQOL and/or emotional well-being than whites. Health care providers and policy makers should therefore consider race when addressing QOL in older adults.

Acknowledgments

References

1. Institute of Medicine (IOM). Rebuilding the Unity of Health and the Environment in Rural America. Washington, DC: The National Academies Press; 2006.

2. Cromartie, J.; Nelson, P. Baby Boom Migration and Its Impact on Rural America. United States Department of Agriculture. Economic Research Service; Economic Research Report 79. Available at: http://www.ers.usda.gov/Publications/ERR79/ERR79.pdf. Updated 2009.

3. Hunt M, Gunter-Hunt G. Naturally occurring retirement communities. J Hous Elderly. 1985; 3(3/4): 3–21.

4. Colello, KJ. [Accessed February 10, 2010] Supportive Services Programs to Naturally Occurring Retirement Communities. Available at: http://aging.senate.gov/crs/aging15.pdf. Updated 2007.

5. World Health Organization (WHO). Measuring quality of life: the World Health Organization Quality of Life Instruments (WHOQOL). 1997

6. Cleary KK, Howell DM. Using the SF-36 to determine perceived health-related quality of life in rural Idaho seniors. J Allied Health. 2006; 35(3):156–161. [PubMed: 17036671]

7. Laditka JN, Laditka SB, Olatosi B, Elder KT. The health trade-off of rural residence for impaired older adults: longer life, more impairment. J Rural Health. 2007; 23(2):124–132. [PubMed: 17397368]

8. Oguzurk O. Differences in quality of life in rural and urban populations. Clin Invest Med. 2008; 31(6):E346–E350. [PubMed: 19032904]

9. Kirk AB, Alessi HD. Rural senior service centers: a study of the impact of life issues. Activities, Adaptation & Aging. 2002; 26(3):51–64.

10. Andersen RM. National Health Surveys and the Behavioral Model of Health Services Use. Med Care Res Rev. 2008; 46(7):647–653.

11. Bandiera FC, Pereira DB, Arif AA, Dodge B, Asal N. Race/ethnicity, income, chronic asthma, and mental health: a cross-sectional study using the behavioral risk factor surveillance system. Psychosom Med. 2008; 70(1):77–84. [PubMed: 18158369]

12. Borders TF, Aday LA, Xu KT. Factors associated with health related quality of life among and older population in a largely rural Western region. J Rural Health. 2004; 20(1):67–75. [PubMed: 14964929]

13. Fryback DG, Dunham NC, Palta M, et al. US norms for six generic health-related quality-of-life indexes from the National Health Measurement study. Med Care. 2007; 45:1162–1170. [PubMed: 18007166]

14. Hopman WM, Harrison MB, Coo H, Friedberg E, Buchanan M, VanDenKerjhof EG. Associations between chronic disease, age and physical and mental health status. Chronic Dis Can. 2009; 29(2): 108–116. [PubMed: 19527569]

15. Skarupski KA, Mendes de Leon CF, Bienias JL, et al. Black-white differences in health related quality of life among older adults. Qual Life Res. 2007; 16:287–296. [PubMed: 17033898]

16. Zahran HS, Kobau R, Moriarty DG, Zack MM, Holt J, Donehoo R. Health-related quality of life surveillance–United States, 1993–2002. MMWR Surveill Summ. 2005; 54(4):1–35. [PubMed: 16251867]

17. Zaninotto P, Falaschetti E, Sacker A. Age trajectories of quality of life among older adults: results from the English Longitudinal Study of Aging. Qual Life Res. 2009; 18(10):1301–1309. [PubMed: 19806468]

18. Fortin M, Bravo G, Lapointe L, Almirall J, Dubois MF, Vanesse A. Relationship between multimorbidity and health-related quality of life of patients in primary care. Qual Life Res. 2006; 15(1):83–91. [PubMed: 16411033]

19. Fortin M, Lapointe L, Hudon C, Vanasse A, Ntetu AL, Maltais D. Relationship between multimorbidity and quality of life in primary care: a systematic review. Health Qual Life Outcomes. 2004; 2(51) Available at: http://www.hqlo.com/content/2/1/51.

20. Davis JC, Marra CA, Najafzadeh M, Liu-Ambrose T. The independent contribution of executive functions to health related quality of life in older women. BMC Geriatr. 2010; 10:16. [PubMed: 20359355]

21. Larson CO, Belue R, Schlundt DG, McClellan L. Relationship between symptoms of depression, functional health status, and chronic disease among a residential sample of African Americans. J Ambul Care Manage. 2006; 29(2):133–140. [PubMed: 16552322]

22. Lima MG, Barros MBA, Cesar CLG, Goldbaum M, Carandina L, Ciconelli RM. Impact of chronic disease on quality of life among the elderly in the state of sao Paulo, Brazil: a population-based study. Rev Panam Salud Publica. 2009; 25(4):314–321. [PubMed: 19531319]

23. Federal Interagency Forum on Aging-Related Statistics. Older Americans 2008: Key Indicators of Well-Being. Washington, DC: US: Government Printing Office; 2008.

24. Gallegos-Carrillo K, Garcia-Pena C, Duran-Munoz C, Mudgal J, Duran-Arenas L, Salmeron-Castro J. Health care utilization and health-related quality of life perception in older adults: A study of the Mexican social security institute. Salud Publica Mex. 2008; 50(3):207–217. [PubMed: 18516368]

25. Rust G, Fryer GE, Phillips RL, Daniels E, Strothers H, Satcher D. Modifiable determinants of healthcare utilization within the African-American population. J Natl Med Assoc. 2004; 96(9): 1169–1177. [PubMed: 15481745]

26. Simmons LA, Anderson EA, Braun B. Health needs and health care utilization among rural, low-income women. Women Health. 2008; 47(4):53–69. [PubMed: 18843940]

27. Williams SA, Wagner S, Kannan H, Bolge SC. The association between asthma control and health care utilization, work productivity loss and health-related quality of life. J Occup Environ Med. 2009; 51(7):780–785. [PubMed: 19528828]

28. Center for Disease Control and Prevention (CDC). [Accessed September 22, 2009] National Health and Nutrition Examination Survey. Available at: http://www.cdc.gov/nchs/nhanes/about nhanes.htm.

29. National Center for Health Statistics (NCHS). [Accessed March 2, 2010] Data Access. Available at: http://www.cdc.gov/nchs/data_access/ftp_data.htm.

30. Area research File (ARF). [Accessed March 2, 2010] Available at: http://arf.hrsa.gov./

31. National Center for Health Statistics (NCHS). [Accessed March 2, 2010] Research Data Center. Rule for Usage. Available at: http://www.cdc.gov/rdc/B2AccessMod/Acs231.htm.

32. United States Department of Agriculture (USDA). [Accessed March 4, 2010] Measuring Rural-Urban Continuum Codes. Available at: http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/.

33. Ford ES, Merritt RK, Heath GW, et al. Physical activity behaviors in lower and higher socioeconomic status populations. Am J Epidemiol. 1991; 133(12):1246–1256. [PubMed: 2063832]

34. Abbey A, Abramis DJ, Caplan RD. Effects of different sources of social support and social conflict on emotional well-being. Basic Appl Soc Psych. 1985; 6(2):111–129.

35. Cook CE, Richardson JK, Pietrobon R, Braga L, Silva HM, Turner D. Validation of the NHANES ADL scale in a sample of patients with report of cervical pain: Factor analysis, item response theory analysis, and line item validity. Disabil Rehabil. 2006; 28(15):929–935. [PubMed: 16861200]

36. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16(9):606–613. [PubMed: 11556941]

37. Huang FY, Chung H, Kroenke K, Delucchi KL, Spitzer RL. Using the Patient Health Questionnaire-9 to measure depression among racially and ethnically diverse primary care patients. J Gen Intern Med. 2006; 21(6):547–552. [PubMed: 16808734]

38. Lohr, SL. Sampling: Design and Analysis. 2nd ed.. Pacific Grove, California: Duxbury Press; 2009.

39. Findholt, N. The culture of rural communities: an examination of rural nursing concepts at the community level. In: Winters, CA.; Lee, HJ., editors. Rural Nursing. Concepts, Theory, and Practice. 3rd ed.. New York, NY: Springer Publishing Company; 2010. p. 373-383.

40. Winters, CA.; Sullivan, T. The chronic illness experience of isolated rural women: use of an online support group intervention. In: Winters, CA.; Lee, HJ., editors. Rural Nursing. Concepts, Theory, and Practice. 3rd ed.. New York, NY: Springer Publishing Company; 2010. p. 179-192.

41. MacKenzie P. Aging people in aging places: addressing the needs of older adults in rural Saskatchewan. Rural Social Work, Special Australian/Canadian Issue. 2001; 6(3):74–83.

42. Buchanan RJ, Zhu L, Schiffer R, Radin D, James W. Rural-urban analyses of health-related quality of life among people with multiple sclerosis. J Rural Health. 2008; 24(3):244–252. [PubMed: 18643801]

43. Wallace AE, Lee R, MacKenzie TA, et al. A longitudinal analysis of rural and urban veterans' health-related quality of life. J Rural Health. 2010; 26:156–163. [PubMed: 20447002]

44. Weeks WB, Wallace AE, Wang S, Lee AL, Kazis LE. Rural-urban disparities in health-related quality of life within disease categories of veterans. J Rural Health. 2006; 22(3):204–211. [PubMed: 16824163]

45. Michael YL, Colditz GA, Coakley E, Kawachi I. Health behaviors, social networks, and healthy aging: Cross-sectional evidence from the nurses' health study. Qual Life Res. 1999; 8(8):711–722. [PubMed: 10855345]

46. James BD, Boyle PA, Buchman AS, Bennett DA. Relation of late-life social activity with incident disability among community-dwelling older adults. J Gerontol. 2011; 66(4):467–473. [Epub 2011 Feb 7].

47. Morrow-Howell N, Hinterlong J, Rozario PA, Tang F. Effects of volunteering on the well-being of older adults. J Gerontol. 2003; 58(3):S137–S145.

48. Nobrega TCM, Jaluul O, Machado AN, Paschoal SM, Jacob Filho W. Quality of life and multimorbidity of elderly outpatients. Clinics(Sao Paulo, Brazil). 2009; 64(1):45–50.

49. Fan L, Shah MM, Veazie PJ, Friedman B. Factors associated with emergency department use among the rural elderly. J Rural Health. 2011; 27(1):39–49. [PubMed: 21204971]

50. Francis ML, Scaife SL, Zahnd WE. Rural-urban difference in surgical procedures for medical beneficiaries. Arch Surg. 2011; 146(5):579–583. [PubMed: 21242423]

51. Berkman LF, Syme SL. Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda county residents. Am J Epidemiol. 1979; 109(2):186–204. [PubMed: 425958]

52. Glass TA, De Leon CF, Bassuk SS, Berkman LF. Social engagement and depressive symptoms in late life: longitudinal findings. J Aging Health. 2006; 18(4):604–628. [PubMed: 16835392]

53. Costa PT, McCrae RR, Zonderman AB. Environmental and disposition influences on well-being: longitudinal follow-up of an American national sample. Brit J Psychol. 1987; 78:299–306. [PubMed: 3620790]

54. Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's healthy days measures—population tracking of perceived physical and mental health over time. Health Qual Life Outcomes. 2003; 1(37):1–8. [PubMed: 12605709]

55. Toet J, Raat H, van Ameijden EJ. Validation of the Dutch version of the CDC core healthy days measures in a community sample. Qual Life Res. 2006; 15(1):179–184. [PubMed: 16411043]

56. Fain, JA. Reading, Understanding, and Applying Nursing Research. 2nd ed.. Philadelphia, Pennsylvania: F.A. Davis Company; 2004. p. 123-141.

57. Hambleton P, Keeling S. The jungle of quality of life: mapping measures and meanings for elders. Australas J Ageing. 2008; 28(1):3–6. [PubMed: 19243368]

Table 1

Characteristics of Adults in the US Population 65 Years or Older in Rural, Adjacent, and Urban Areas. NHANES 2005–2006

	All (N = 911)	Rural (n = 130)	Adjacent (n = 1,480)	Urban (n = 633)	Range
Contextual and individual characteristics					
Predisposing					
Demographics					
Gender (female)	47.5%	42.3%	46.0%	49.0%	-
Age (years)	73.58(0.24)	72.57 (0.74)	73.60(0.24)	73.83(0.29)	(65–85)
Race (white)	65.5%	80.8%	86.5%	57.5%	-
Enabling					
Social resources					
Number of people in family	1.90(0.04)	1.96 (.06)[a]	1.82(0.05)	1.90(0.05)	(1–7)
Marital status (yes)	55.3%	60.0%	64.9%	52.1%	-
Human resources					
Education (high school)	62.9%	65.4%	54.7%	64.3%	-
Material resources					
Poverty index	2.67(0.10)	2.48 (0.09)	2.45(0.14)	2.79(0.12)	(0.05–5)
Need					
Number of chronic illnesses	2.46(0.09)	2.94 (0.39)	2.35(0.14)	2.38(0.09)	(0–13)
Activities of daily living (ADLs)	21.27(0.25)	21.63 (1.61)	20.65(1.02)	21.36(0.34)	(16–54)
Mental status					
Memory problems (yes)	15.4%	16.2%	12.2%	16.0%	-
Depression	2.22(0.14)	2.32 (0.30)	2.21(0.17)	2.20(0.15)	(0–17)
Health behaviors					
Physical activity	1.96(0.06)	2.00 (0.08)	2.13(0.13)	1.90(0.06)	(1–4)
Health care utilization	2.74(0.05)	2.78 (0.05)	2.62(0.15)	2.76(0.08)	(0–5)
Quality of life					
Health-related quality of life	1.22(0.07)	1.31 (0.12)	1.25(0.08)	1.18(0.08)	(0–5)
Social functioning	5.34(0.12)	4.75 (.13)[a,b]	5.65(0.09)	5.40(0.12)	(0–7)
Emotional well-being	1.74(0.03)	1.74 (0.04)	1.71(0.03)	1.76(0.04)	(0–2)

Continuous data are presented as means (SE), accounting for sampling weights; categorical variables are raw percentages.
Numbers in bold significant at $P < .05$.

[a] Result significantly different from adjacent.

[b] Result significantly different from urban.

Table 2

Multivariate Regression Results for Health-Related Quality of Life, Social Functioning, and Emotional Well-Being, in Rural, Adjacent, and Urban US Adults 65 Years and Older (n = 911)

Variable	Health-Related Quality of Life			Social Functioning			Emotional Well-Being		
	Estimate	SE	P value	Estimate	SE	P value	Estimate	SE	P value
Rural (vs urban)	0.130	0.09	.189	**-.538**	**.23**	**.035**	-0.022	0.06	.702
Adjacent (vs urban)	0.201	0.14	.180	0.236	0.16	.152	-0.061	0.05	.258
Age	-0.012	0.01	.087	0.271	0.01	.056	0.004	0.00	.246
Female	0.192	0.13	.166	**.489**	**.11**	**<.001**	0.071	0.04	.110
Hispanic (vs white)	**.309**	**.13**	**.028**	-0.135	0.30	.663	**-.193**	**.06**	**.009**
Black (vs white)	0.112	0.11	.313	**.460**	**.16**	**.013**	**-.141**	**.04**	**.005**
Other (vs white)	0.404	0.51	.436	-1.06	0.63	.129	-0.062	0.17	.714
Family size	0.041	0.04	.330	0.076	0.07	.323	0.031	0.18	.107
Marital status (married)	-0.035	0.11	.740	0.434	0.21	.054	0.065	0.04	.142
Education (high school)	**.269**	**.10**	**.014**	**.547**	**.21**	**.019**	-0.056	0.05	.303
Poverty index	-0.004	0.03	.900	0.065	0.04	.161	0.027	0.01	.078
Number of chronic illnesses	-0.004	0.03	.868	-0.064	0.04	.136	0.019	0.02	.261
Activities of daily living (ADL)	**.034**	**.01**	**<.001**	**-.024**	**.01**	**.010**	**-.009**	**.01**	**.003**
Memory problems (yes)	0.175	0.29	.552	-0.835	0.18	<.001	-0.060	0.04	.173
Depression	**.263**	**.02**	**<.001**	-0.041	0.02	.077	**-.048**	**.00**	**<.001**
Health care utilization	0.045	0.05	.364	**.120**	**.050**	**.041**	0.018	0.02	.299
Physical activity	-0.040	0.08	.623	0.103	0.12	.418	-0.047	0.03	.151

SE, Standard error.

Results in bold significant at *P* < .05.