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Resilience among older adults living at home: urban-rural difference in a population-based study

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Objective. We examined how individual and contextual factors affect resilience in community-dwelling older adults living in urban or rural areas in Northern Iceland.
Methods. A cross-sectional study, conducted from 2017–2018, randomly sampled community-dwelling older adults (age ≥ 65) stratified by residency (urban/rural), age, and gender.
Results. Compared with rural dwellers (n = 75), urban dwellers (n = 105) had more education ($p < 0.001$) and better access to organized physical ($p < 0.001$) and social activities ($p < 0.001$). Urban dwellers had higher resilience scores compared with rural dwellers ($p < 0.001$). A multivariate analysis showed that better health literacy and better mental health increased resilience ($p > 0.001$).
Conclusions. We found a significant association between contextual and individual factors and resilience. To enable older adults to live longer in their own homes, health care professionals should pay attention to health literacy and mental health factors that increase resilience.

Key words: older adults, community dwelling, resilience, rural health

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INTRODUCTION

An aging population leads to a higher percentage of older adults living in their own homes in the community. To live in one's home as one becomes older requires several abilities as the aging process involves various changes in biological, physiological, mental, and social functions and can affect the individual's ability to perform daily activities. Aging in the High North or in the Arctic areas requires adapting to the harsh climate and extended periods of darkness during the winter months. One feature of this essential adaption is resilience, which involves the ability to adapt well in the face of life's stressors or adversity [1]. Resilience can enhance adaption to different life situations as it involves facing challenges while maintaining one's purpose, positive outlook, and active participation [2].
Recently, research on resilience has gained increased interest, and research on resilience and older adults is increasing as well. In a concept analysis of resilient aging, Hicks and Conner [3] found antecedents for resilient ageing were some form of stressors or adversities, with the attributes being coping and hardiness and the consequences an optimal

quality of life (QoL), among older people resilience appears to moderate the effects of ill-health on QoL [2]. Psychological resilience is defined as the ability to cope, adapt, and respond positively to stress or adversity [4]. However, others have argued that a universal definition of resilience does not exist and that rather than a static characteristic of an individual, resilience is a dynamic process across different contexts and throughout the life span [5]. That is also the presumption of a recent literature review [1], which concluded that resilience changes over time and contexts and involves both environmental and individual factors. This view has been supported by other researchers who see resilience as a process of a person-environment interaction that enables individuals to adapt to hardship [6].

Individual factors of resilience include self-efficacy and positive coping strategies, and social factors include supportive peer networks and communities [2]. Social networks or a good relationship with family and friends are associated with higher resilience, and having a wide circle of family and friends increases resilience as well [7]. Such networks can serve as a protective factor for older adults when faced with stressors [8]. Resilience in older adults can moderate the effects of declining health on well-being and QoL and can be enhanced through a balance between mental and physical activity [2].

Substantial research has demonstrated that a higher level of resilience is related to better mental health outcomes [8]. In older people, resilience is even more significant as depression or low mood increases in prevalence with age [9]. A recent study on community dwelling older adults showed evidence that resilience is associated with better physical and mental health, including a lower incidence of depression [10]. These results are further supported by a meta-analysis by Aktürk et al. [11] who examined 27 studies with 13,444 participants and revealed a strong relationship between increased resilience and better mental health outcomes (r = 0.41, 95% CI [0.36, 0.44]). As energy levels tend to decrease with worsening mental health, worse mental health can decrease physical activity [12]. Physical health as a functional limitation is related to a lower level of resilience [7, 13]. An umbrella review [12] on the consequences of physical inactivity in older adults found that increased physical activity was associated with both increased resilience and QoL. Enjoying leisure activities and strengthening social networks has also been shown to increase resilience [2].

Some have argued that to be resilient includes not only individual aspects, but also the interdependence of individual, social, and community factors, resulting in what may be called social resilience [14,15]. Factors that underpin social resilience are social network, trust, and affiliation [6]. Social resilience and community resilience are terms that are often used interchangeably and are related to social relationships and the activation of social resources enabling communities to cope with unhealthy stressors [15]. Strengthening individual resilience also appears to increase the resilience of the community. A World Health Organization (WHO) report "Strengthening resilience: a priority shared by Health 2020 and the Sustainable Development Goals" [15] claimed that if communities want to increase resilience, health literacy should be increased, as better health literacy results in better access to and more beneficial use of services, resulting in more proactive health behavior.

Few studies have compared resilience in urban and rural older adults with a focus on the existence of a difference among community-dwelling older adults. In Well's [8] study, among older community-dwelling adults (n = 277) in the US, with a mean age of 75 years, there was no statistically significant difference in resilience level according to residency in the rural (n = 106), suburban (n = 95), or urban (n = 76) participants in the study.

As resilience is affected by both individual and contextual factors, the aim of this study was to analyze how resilience is associated with mental health, health literacy, QoL, and various socio-demographic factors such as age, education, cohabitation or not, adequate income, access to organized physical and social activity, and contact with family and friends. Factors analyzed were chosen in accordance with what Wild et al. [6] suggested in their model of resilience, including individual (age, education in years, scorings of Geriatric Depression (GDS), health literacy and health-related quality of life (SF-36) scales; family/social (cohabiting or not, how often meet family or friends); and community (urban/rural residency, access to organized physical activity, access to organized social activity) factors. We further examined differences among community-dwelling older adults who live in urban or rural areas.

METHODS

The study was a cross-sectional study, using a population-based design. Data were collected from September 2017 through January 2018; see previous publications for further details [16].

Participants

The study sample was a random sample from the national registry (n = 395) stratified according to residency, age, and gender. Participants were at least 65 years of age, living in their own homes in the community, able to communicate verbally, and competent to schedule time for a face-to-face interview. A total of 73 participants

could not be contacted, and 20 did not meet the inclusion criteria of the study, resulting in a total of 302 potential participants. The response rate was 57.9%, resulting in an analysis of 175 participants.

The geographical areas

Areas selected for the study were three distinct geographical areas in Northern Iceland satisfying the inclusion criteria: a) they were in parts of Iceland with understudied older populations; b) they fulfilled predetermined definitions for urban/rural residency in Iceland and c) they were geographically close to the research base. The urban town selected for the study (Akureyri) is the largest town in Iceland outside of the greater capital area of Reykjavik; it has a population of 19,000. This urban town has a university, secondary national hospital, and diverse services, and it has urban functions servicing the northern and eastern parts of Iceland, including financial institutions and cultural activities. Of the urban population, 14.6% were ≥ 65 years old. The rural participants came from one of two rural areas that are separated geographically from the urban town to the east and west by a fjord and a mountain range. The rural participants lived on farms, in other isolated houses, or in small villages (≤ 200 inhabitants). Included in the study, were three small villages in the east area and one in the west area. Those villages have fewer than 200 inhabitants, with small primary health care clinics open only a few hours a week. In both rural areas, there is one town (both excluded from the study), with a small basic hospital and a primary health care center. The population of the two rural areas was around 4,000, and about 19% were ≥ 65 years. Iceland has nationally provided primary health care (universal health care), generally provided in health care centers, where people meet a health care provider, such as a physician, a nurse, or a physiotherapist. Travel distance to health care services in the rural areas was on average over 20 km, but for the urban participants, the travel distance to health care was less than 5 km. In rural areas, the main roads are paved and regularly cleared of snow during the winter. The smaller rural roads are often unpaved and are sometimes heavily covered with snow or ice during the winter. Public transport is uncommon in rural Iceland, and Arnadottir et al. [17] found that 60% of 65-88-year-old community-dwelling individuals in Northern Iceland drove their own cars; however, this proportion was lower for women and those ≥ 75 years of age.

Data collection

Two weeks prior to the telephone interviews, the study participants received a letter with information regarding the study. In the telephone interviews, they were asked to participate in the study, and if they accepted, a face-to-face interview was scheduled. Four third-year nursing students were trained to conduct telephone calls, face-to-face interviews, and the required measurements. Rural participants met the research assistants in their own homes, but interviews in the urban town were conducted both in the participants' homes and at the research center.

Instruments

The Connor-Davidson Resilience Scale (CD-RISC) [18] measures resilience using items reflecting factors such as control and commitment and whether change is perceived as a challenge. The CD-RISC scale includes items such as having clear goals, adaptability when coping with change, social problem-solving skills, and humor in the face of stress, which is a sign of greater resilience. The CD-RISC has been found to have sound psychometric properties, good internal consistency, and test-retest reliability [18]. It has 25 items and is scored from 0-100, where a higher score represents more resilience.

The Geriatric Depression Scale (GDS) is based on 30 questions and is scored from 0 to 30 [19], where a higher score indicates more depressive symptoms [20].

The Short Form Health Survey (SF-36) is a measure of health-related quality of life (HRQoL) that is commonly used and has been extensively validated [21]. The instrument has a *physical health component* (SF-36-PHC) and a *mental health component* (SF-36-MHC). For both, higher scores reflect a better HRQoL [21].

Health literacy (HL) was measured with the European Health Literacy Questionnaire (HLS-EU-Q16) [22]. The HLS-EU-Q16 includes 16 items with four response options. The final score from each item is dichotomized into easy (1 point) or difficult (0 points), with a range from 0 (low HL) to 16 (high HL). If no more than two items are missing, missing items receive 0 points [22]. The Icelandic version has been determined to be psychometrically sound [23].

Participants also answered questions about their years of education, adequacy of income to fulfill their own needs, whether they lived alone or not, ease of access to health care, access to organized physical and social activities, frequency of eating fruits and vegetables, frequency of physical activity, and frequency of meeting children/family. Weight and height were measured and used to calculate body mass index kg/m^2 (BMI).

Statistical analysis

Participant characteristics were summarized using mean, standard deviation (*SD*), and range for continuous variables and proportions for categorical variables. To compare variables between rural and urban

Table I. Summary of background characteristics of the study participants.

	Total (*N* = 175)	Rural (*n* = 70)	Urban (*n* = 105)	*P*-value
Mean age in years, (*SD*)	74.2 (6.3)	73.9 (6.2)	74.4 (6.4)	0.55*
65-74 years (%)	104 (59.4)	43 (61.4)	61 (58.1)	0.66#
75-92 years (%)	71 (40.6)	27 (38.6)	44 (41.9)	
Gender				0.35#
Women (%)	75 (42.9)	33 (44)	42 (56)	
Males (%)	100 (57.1)	37 (37)	63 (63)	
Living alone, yes	40 (22.8)	11 (15.7)	29 (27.6)	0.062#
Education (years), Mean (*SD*)	11.1 (5.3)	9.0 (4.7)	12.5 (5.2)	**0.001***
Adequate income, yes (%)	132 (74.4)	53 (75.7)	79 (75.2)	0.94#
BMI kg/m^2, Mean (*SD*)	28.1 (5.2)	28.23 (5.5)	28.0 (5.0)	0.73*
Eat vegetables, fruits, berries every day, yes (%)	122 (69.7)	48 (68.6)	74 (70.5)	1.00#
How many days per week physical active, Mean, (*SD*)	2.44 (2.53)	2.44 (2.38)	2.44 (2.64)	0.99*
Range		0-7	0-7	
How often meet children/family (days per week), Mean (*SD*)	1.86 (0.86)	1.91 (0.95)	1.82 (0.80)	0.50*
Access to health care, Mean (*SD*) (1 = good, 5 = bad)	1.76 (1.1)	1.61 (0.86)	1.86 (1.24)	0.16*
Access to organized physical activity, Mean (*SD*) (1 = good, 5 = bad)	2.17 (1.09)	2.63 (1.13)	1.87 (0.94)	**< 0.001****
Access to organized social activity, Mean (*SD*) (1 = good, 5 = bad)	1.90 (1.00)	2.27 (1.03)	1.65 (0.91)	**< 0.001****

Note. Continuous variables are presented as mean (*SD*) and categorical variables as counts (percentages). **t*-test for difference between rural and urban; **ANOVA for difference between rural and urban, and #chi-square test for difference between rural and urban.

residencies, we used *t*-tests for continuous variables and chi-square tests for categorical variables.

To identify factors that were associated with resilience after accounting for other factors, we used a main effects linear regression to estimate the effect of individual (HL, GDS, MHC-SF-36, years of education, and age in years), family (cohabitation or not, frequency of meeting family/children), and social factors (organized physical/social activity, urban/rural residence and adequate income) on resilience (dependent variable). The factors included in the model were selected according to the Wild model [6]. Missing data were handled by using multiple imputations with chained equations using 50 imputations. The analysis was done using R version 4.1.0 and IBM SPASS version 25.

RESULTS

Of the 175 participants in the study, 70 were rural dwellers. Those who declined to participate did not differ significantly from the study sample according to residency (p = 0.55) and age (p = 0.77). However, more women declined compared with men (p = 0.01). Table I shows the background characteristics of the participants stratified by type of residency. Compared with rural people, urban dwellers had more education and better access to organized physical and social activities, and there was a trend that more urban dwellers lived alone. Urban older adults had more resilience compared with rural adults, but no statistically significant difference was found according to residency in the other measurement's (Tab. II). The younger age group (65-75 years) had higher scores on the CD-RISC scale (t = 2.58(161), p = 0.011), compared with the older age group.

There was a positive correlation between increased resilience (CD-RISC score) and years of education (0.228, p = 0.007), living in an urban area (0.350, p < 0.001), better HL (0.281, p = 0.001), and MHC-SF-36 (0.214, p = 0.006) and a negative correlation between age (-0.201, p = 0.01) and GDS (-0.426, p < 0.001). There was no statistically significant correlation between resilience and adequate income, gender, living alone or not, physical activity, and PHC-SF-36.

The linear regression analysis showed that both living in an urban area and better health literacy increased resilience, while a higher GDS score, and a lower MCH-SF-36 score had a negative impact on resilience. The model was significant (F = 7.61 df, 11(96), p > 0.001), and it explained 46.6% of the variability in resilience (see Table III).

DISCUSSION

Our study provides new knowledge in the scant literature on resilience in older community-dwelling adults in sparsely populated rural and urban areas. The main findings are that the older community-dwelling adults who lived in the urban town had higher resilience scores compared with rural dwellers, which indicates that context

Table II. Mean (SD) of Connor-Davidson resilience scale (CD-RISC), Geriatric Depression Scale (GDS), Health literacy (HL) Scale and SF-36, Physical Health Component (PHC*), and Mental Health Component (MHC*).

	Total sample	Rural	Urban	*P*-value#
CDR 0-100	75.88 (12.4)	70.4 (10.9)	79.3 (12.0)	**< 0.001**
Range	(39-100)	(39-94)	(50-100)	
GDS 0-30	4.89 (3.8)	4.88 (4.1)	4.90 (3.7)	0.98
Range	(0-20)	(0-20)	(0-18)	
HL 0-16	13.3 (2.4)	13.00 (2.40)	13.35 (2.41)	0.467
Range	(6-16)	(6-16)	(7-16)	
SF-36 PHC*	47.55 (7.37)	47.35 (5.90)	47.69 (7.66)	0.56
0-100				
Range	(24.45-61.16)	(25.84-58.69)	(24.45-61.16)	
MHC*	55.45 (6.56)	56.38 (6.96)	54.83 (6.82)	0.13
0-100				
Range	(32.56-63.95)	(37.79-63.95)		

Note. #*p*-values from a *t*-test comparing the difference between rural and urban participants.

Table III. Estimators, 95% confidence intervals, and p-values from a linear regression with CD-RISC score as the outcome.

	Estimate	Confidence interval (CI)	*P*-value
Rural/urban (urban = 1)	7.29	[3.66, 10.93]	**< 0.001**
GDS (0-30)	-1.30	[-1.77, -0.82]	**< 0.001**
HL (0-16)	0.84	[0.03, 1.65]	**0.047**
MHC-SF-36 norm based, (0-100)	-0.28	[-0.52, -0.05]	**0.019**
Age (years)	-0.12	[-0.42, 0.18]	0.43
Education (years)	0.20	[-0.18, 0.57]	0.31
Adequate income (yes = 1)	1.91	[-1.85, 5.68]	0.32
Cohabiting (no = 1)	-0.88	[-4.89, 3.13]	0.67
How often meet children/family (daily = 1)	-2.17	[-5.61, 1.26]	0.22
Participates in an organized physical activity	-2.88	[-6.20, 0.43]	0.09
Participates in an organized social activity	5.20	[-1.31, 11.71]	0.12

Note. GDS: Geriatric Depression Scale; HL: health literacy HLS-EU-Q16; MHC-SF-36: Short-Form Health Survey, mental health component. *P*-values that are statistically significant at 0.05 level of significance are shown in bold.

or urban residency affected the level of resilience in the sample. That urban participants had better access to organized physical and social activities could partly explain that they were more resilient than rural dwellers, and that is supported by a review by MacLeod et al. [13] Few participants or 16 out of 175 had a score on GDS that indicated moderate depression (≥ 11 points), and none scored so high that it indicated severe depression (≥ 20 points). Also, our participants scored on average better on the MCH-SF-36 scale than reported in a previous Icelandic study [24]. That may explain why there were no differences in GDS and MCH-SF-36 scores between urban/rural dwellers, even though the urban residents were more resilient. In addition, the findings align with finding that resilience is a creation of the interaction between the persons and the context among older adults [1,6].

It is of note that the total resilience score for CD-RISC in our sample of over 65 year-old Icelanders (*M* = 75.9; *SD* = 12.4) was almost identical to the total CD-RISC score for a large US sample (*N* = 1,395) of over 60 year-old women (*M* = 75.7; *SD* = 13.0), indicating a certain comparability between these populations [25].

In our study, resilience scores decreased as participants scored higher on the GDS and lower on the MCH-SF-36 scales. Indicating that less resilience is associated with worse mental health. Substantial evidence supports that worse mental health is negatively related to resilience. A review article [14] and further studies [8,11] report an association between worse mental health and less resilience in older community-dwelling adults. The association was stronger for the GDS than the MCH-SF-36, as each additional point in the GDS was estimated to decrease resilience by around 1.30 points, but each lower point in the MCH-SF-36 was estimated to decrease resilience by 0.28 points. It should be noted that the two instruments (GDS and MHC-SF-36) measure the diverse construct

of mental health differently and use different scales. The GDS was developed for older adults and asks about symptoms related to depression, such as how easily people get upset, if they feel helplessness, and if they lack ability to concentrate. The MHC-SF-36 is a measure of HRQoL asking questions about energy, vitality, and happiness. Therefore, a certain discrepancy in the results is to be expected.

We found an association between increased health literacy and more resilience. Health literacy is an important factor in health promotion [22], and the resilience concept includes a proactive function [23] that can be supportive for health and well-being. It is not surprising that the ability to find, understand, access, and critique health-related information, which is measured on the HL scale [22,23] was associated with the CD-RISC scale. In the WHO report on "Strengthening resilience …" [15], the role of health promotion and health literacy was noted as being prominent in strengthening resilience for individuals and communities, resulting in better utilization and access to services and enabling their more beneficial use. Health literacy, or the ability to understand and critique health-related information, increased the ability of family members of older adults to collaborate with health care worker [26]. This ability is beneficial for older adults, who often need support when they access health care in person or when accessing health-related information online.

We did not find research estimating the association between resilience and health literacy, but a study of 75-year-old Finns (N = 292) [27] found low health literacy to be related to increased depression, less physical activity, and worse cognitive function, and furthermore, those with low health literacy had more long-term health adverse health conditions. Robinson et al. [2] claim that resilience is likely to empower people with self-management of long-term conditions as it concerns positive, proactive functioning through changes. In addition, strong social support has been found to increase resilience and mediate the effects of mental illness and physical dysfunction [13]. In this study, no statistically significant association between socio-demographic factors and resilience was found, however. This differs from the results of Well's [8] US study, where higher income was associated with lower resilience levels.

That urban dwellers had better access to organized physical and social activities can at least partly explain more resilience of that group. The organized social activities are often in senior centers, organized by the local municipality, where groups of older adults come together to engage in different activities, such as playing cards, having coffee or meals, or participating in organized trips [28]. In the senior centers, there are opportunities for older adults to connect with other older adults in the municipality, which can affect their level of resilience [2]. Zheng et al. [29] claim that resilience is a product of person-context interactions among older adults. Robinson et al. [2] report that the connections older adults have with other people gave them pleasure, enabled them to feel part of their communities, and supported them through difficult times, and that enjoying leisure activities and strengthening social networks increased resilience. Other studies have supported the importance of relationships for better resilience. Chappell and Welsh [30] found relationships to be crucial to older adults' understanding of resilience, and their study participants' said that their family and friends were central to their lives and to their understanding of resilience. In this study, rural participants had less access to organized physical and social activities, which can be partly explained by the fact that they had to travel longer distances and that access to public transport is uncommon and inadequate in rural areas in Iceland. It needs to be highlighted that generally, in most municipalities, organized social activities can be found and that older adults in our study had good access to universal health care. The Health Care Institution of North Iceland, the umbrella health care center of the participants in our study, offers yearly health-promoting home visits to ≥ 80-year-old community-dwelling individuals who are not in need of at least weekly nursing or social worker visits [31]. Health-promoting visits and organized social activities in senior centers can create a supportive environment and communities, which the WHO report [15] highlighted as a way to increase resilience.

One strength of the study is that all data were collected in face-to-face interviews in a standardized manner by trained research assistants, using internationally known and validated instruments. Random selection of participants from the national registry enabled obtaining a representative sample of the target population.

The limitations of the study include that the sample was relatively small, limiting the statistical power of the hypothese tests. More men than women participated in the study, which can partly be explained by the fact that more women declined participation and that more women than men live in nursing homes in Iceland [32] (an exclusion criterion for the study). The most common reason for declining study participation was being too busy or that the individuals had participated in other research recently. That at we did not include dispositional optimism in our study can be regarded as a limitation as it has been recognized as a psychological factor contributing to resilience [24,33]. Finally, the results cannot be assumed to represent the Icelandic older adult population overall, as the participants came from an understudied part of Iceland, and the results should be interpreted within that context.

CONCLUSIONS

Our study showed that context or urban place of living increased resilience. Also, resilience was related to better mental health and better health literacy among older community-dwelling adults. In our health care systems, we should be aware that older adults are a heterogenic group, and health care providers need to focus more on older adults with poor mental health and low health literacy in an attempt to increase resilience. Low health literacy influences how older adults understand and use health-related information and can negatively affect beneficial use of the health care system. Moreover, resilience is interconnected between individual and social components influencing well-being. Today, we expect older adults to be able to live longer in their own homes; therefore, effective abilities of resilience and health literacy are abilities that health care professionals should pay attention to and try to enhance.

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Conflict of interest

The Authors declare no conflict of interest.

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Author contributions

AKS was a grant holder, developed the protocol, and wrote the manuscript; JAS analyzed the data, interpreted the data, and wrote part of the manuscript; GKK and EDG developed the protocol and co-wrote the manuscript. All Authors read, edited and approved the final manuscript.

Ethical consideration

The study was approved by the National Bioethics Committee (VSNb2016060007/03.01), which reported it to the Data Protection Authorities. All participants signed written informed consent forms prior to participation.

The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki.

Written informed consent was obtained from each participant/patient for study participation and data publication.

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