The impact of social support and living alone on health literacy – A national population study from Denmark

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Abstract

Background: The complexity of demands regarding health literacy in present society requires knowledge and competences within health care, disease prevention, and health promotion in order to retain and obtain good health. Health literacy is mentioned in the literature to be part of the social determinants of health, however the mechanisms behind this association are still unclear. The objective of the present study was to investigate the effect of social support and living alone on health literacy.

Methods: A cross-sectional study was conducted based on a randomly selected sample of 15,728 Danish citizens aged 25 or older. Information on health literacy, social support and living alone was gathered through a nationwide questionnaire during December 2016 and February 2017 and linked to administrative registry data. Multinomial regression was used to assess associations.

Results: Adequate health literacy was seen in 60.3% of the respondents and more men (59.5%) than women (40.5%) had inadequate health literacy. Lower social support was associated with higher inadequate health literacy levels and problematic health literacy among respondents with lower opportunity for practical help when being ill. Men, younger respondents, and respondents with lower educational attainment had higher risks of problematic and inadequate health literacy. No associations were found between living alone and health literacy.

Conclusions: The results from this study shed light on the mechanisms of social context and its relation to health literacy. But it also gives new insight to mechanisms behind the relationship between social support and health outcomes. We suggest that health literacy might be on the causal pathway between functional social support and health. We further recommend that future studies on social relationships and health should include measures of health literacy and multidimensional measures of social support.

Introduction

Insufficient health literacy, low level of social support and living alone are all life circumstances suggested in the literature as predictors of adverse health outcomes [1–3].

In present society the complexity of demands regarding health literacy requires knowledge and competences within health care, disease prevention, and health promotion in order to retain and obtain good health [4,5]. In this paper, we explore to what extent social support and living alone have an effect on the level of the multifaceted phenomena, health literacy, if at all?

A survey performed by the European Health Literacy Consortium in 2011 showed that nearly half of the European population has suboptimal health literacy [6]. Low health literacy levels are known to be associated with low socio-economic position, health behaviours leading to bad health, poor health status, increased hospitalisation and mortality, high use of health care services, lack of ability to make informed health-related decisions, poor adherence to medical instructions, and increased health care costs [4,7–12]. The important role of health literacy and its role in determining health outcomes has been widely underlined in the last 40 years simultaneously with the increased interest in the topic, and health literacy research within different health disciplines has expanded since 2005 [13–15]. Conversely, the definition of health literacy itself, has been subject to discussion making scientific comparisons difficult. Furthermore, the health literacy perspective is utilized in both a public health and an individual-level approach. This paper relates to the definition from a public health point of view formulated by Sørensen (2012) et al.:

“Health literacy is linked to literacy and entails people’s knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course” [5].

The presence of a relationship between people’s social circumstances and health is well established [16–18], but the social context of health literacy has obtained little and divergent attention[19,20]. Social support has been widely studied as one of several social determinants of health, leading to evidence suggesting that high quality and quantity of social relationships are of importance for decreased risk of mortality, a high level of mental and physical health, and further to predict health-promotion [2,21]. However, the mechanisms through which social support operates on health are only poorly understood, and researchers are requesting further studies on the relationship [22,23]. If health literacy is part of that mechanism, the still unclear relationship between social support and health literacy must be studied [19,20].

In the EU, the prevalence of people living alone has increased in the last ten years. Almost one third of EU households and almost half of the population in Denmark are living in single-persons households in 2016 [24]. Previous studies have shown that living alone increases the risk of social isolation, loneliness and cardiovascular mortality, mostly among men and the elderly [25–27]. Research covering the relationship between living alone and health literacy is scarce. Associations between living alone and low health literacy has been shown among a Danish study population having cancer [28] and among a chronically ill Dutch study population [29].

Evidence documents social support as a buffer able to moderate the exposures of harmful physical and mental health [22,23]. The same effect might appear in the association between living alone and health. One mechanism calling for further research is therefore if social support and living alone influences health literacy. This might help to improve understanding of mechanisms behind the complexity of health literacy within a social context and the, as of the yet, unclear model examining the associations between social support/living alone and health literacy. The aim of the present study is therefore to investigate the impact of social support and living alone on health literacy within a large representative survey of health literacy in the Danish adult population (25 +). To our

knowledge, this is the largest study utilizing a representative national population survey on health literacy using The European Health Literacy (HLS-EU) measure to capture health literacy.

Methods

Study population and design

Through the Danish Civil Registration System (CRS), the population for this study was derived from a random sampling aged 25 years and older among a representative Danish population. To ensure proportionality to population size and density in relation to a Danish context the participants were stratified according to age, gender, and geographical location. Everyone in Denmark, who is able to access it, has a personal e-mail account (e-Boks) driven by the state where all messages from public authorities are sent. Questionnaire data were sent to e-Boks and collected between December 2016 and February 2017, where 9,007 out of 15,728 individuals answered the questionnaire (response rate 57.3%). To increase representability and ensure consistency with former health literacy surveys, a random part of the study population (n = 1,082) were contacted and interviewed by phone.

The questionnaire data were linked to information from the official registers held at Statistics Denmark [30]. The data linkage procedures were approved by the Danish Data Protection Agency. Based on the nature of the data, a cross-sectional study was conducted.

Health Literacy

Health literacy was measured using the HLS-EU-Q16 questionnaire developed by the HLS-EU Consortium for measuring health literacy in the general population [31]. The 16 items in the questionnaire each had response categories on a 4-point Likert scale. Health literacy scores ranging from 0 to16 were calculated by dichotomising answer categories, “very easy” and “easy” was given a score of 1 and “difficult” and “very difficult” were given a score of 0. The total health literacy score was classified according to the three levels: “inadequate” (0–8), “problematic” (9–12) and “adequate” (13–16) (Cronbach’s α = 0.90). Consistent with Pelikan et al., health literacy scores were only computed for respondents who had answered at least 14 out of the 16 health literacy items, corresponding to a total of 8,455 of respondents (93.9%) [6].

Exposure and covariates

The exposures in this study were social support and living alone based on answers to three questions from the questionnaire: 1: “Do you have someone to talk to when having problems?” with the opportunity to answer “yes, often”, “yes, most of the time”, “sometimes”, or “no, never/almost never”. 2: “Do you have someone to give you practical help when you are ill?” with the opportunity to answer “yes, definitely”, “yes, maybe”, or “no”. 3: “Do you live alone?” with the opportunity to answer “yes” or “no”.

We included respondents’ age and gender retrieved from the Danish Civil Personal Registry [30]. Educational level was included as covariate, because socio-economic position could be related to health literacy. Data on educational level was described using the International Standard Classification of Education (ISCED) nomenclature, obtained from the Danish Education Registers [32], and categorised into four groups based on highest completed education level one year before questionnaire completion: “Basic school” (containing early childhood, primary, lower secondary educations), “Upper secondary/vocational”, “Short/medium length educations” (containing short and medium length tertiary and bachelor level educations), and “Master and PhD level educations”. The register data in the study was based on information from the CRS [33]. CRS is a key tool for research in Denmark containing register information for administrative use. All Danish citizens are identified with a unique personal identification number, allowing for exact individual-level record linkage of all Danish registries [34].

Statistical analyses

Differences of frequencies among respondents between health literacy levels was tested using chi-square. Multinomial logistic regression analyses were used to estimate crude and adjusted relative risk ratios (RRR) with 95% confidence intervals (CI) for analyses of health literacy level. The analyses were performed in STATA version 15.0 and R statistical software package, version 3.5.0 (R Development Core Team) [35].

Results

Table 1 presents socio-demographic characteristics of the study population divided by health literacy levels (adequate, problematic and inadequate), the characteristics are social support, living alone, and socio-demographic factors. The majority of the study population were women (54.9%), average age 52.9 years. The majority had upper secondary or vocational education as their highest educational attainment. A low level of social support was infrequently reported, and 16.6% reported living alone. With respect to health literacy, 692 (8.3%) had inadequate health literacy, 2616 (31.4%) had a problematic health literacy, and 5147 (60.3%) had an adequate health literacy. More men (59.5%) than women (40.5%) had inadequate health literacy. Health literacy levels were lower among respondents reporting lower social support, respondents living alone, respondents having basic school, upper secondary or vocational school as their highest educational attainment, and among respondents aged 25–54.

Descriptive respondent information a

Characteristics of respondents					adequate health literacy
		(N=8455)			
	N	%	M	SD	n
Gender					
Women	4642	54.9			
Men	3813	45.1			
Agegroup (years)			52.9	13.3	
25-44	2551	30.2			888
35-54	2056	24.3			783
55-64	1962	23.2			713
> 65	1886	22.3			666
Someone to talk to when having problems					
Yes, often	5034	60.7			1979
Yes, most of the time	2229	26.9			778
Sometimes	801	9.7			188
No, never/ almost never	227	2.7			36
Do you live alone?					
No	7053	83.4			2558
Yes	1402	16.6			492
Practical help when being ill					
Yes, definitely	5707	68.8			2221
Yes, maybe	2122	25.6			666
No	462	5.6			94
Income (€)			62441.0	42019.2	
< 20133	277	3.3			67
20133-50198	3184	38.0			1095
50199-93818	3956	47.3			1507
> 93953	955	11.4			357
Education					
Basic school	1361	16.5			449
High school/vocational	3552	43.2			1161
Medium	2343	28.5			1032
High	967	11.8			341

Table 1 here

The RRR's in Fig. 1 show a strong exposure-response association between the two aspects of social support and inadequate health literacy and an exposure-response association was also observed for problematic health literacy according to the opportunity for practical help when being ill. Furthermore, there was

an association between the respondents who reported having someone to talk to when having problems sometimes or most of the time and problematic health literacy. There was no association between living alone and health literacy.

Men had a significant higher risk of both problematic and inadequate health literacy compared to women in the study. The youngest respondents (25–44 years) had higher risk of both problematic and inadequate health literacy than the older. Respondents having basic school, upper secondary or vocational school as their highest educational attainment had a higher risk of problematic health literacy than respondents with a high education.

By adding income to the model none of the RRR's changed, we therefore omitted the income variable from the model.

We tested for interaction between gender and social support and living alone. No interactions were found, but a tendency was shown in differences in RRR among men and women. In the stratified model women had a higher risk of inadequate health literacy than men in the instance of not having someone to talk to when having problems; whereas men had a higher risk of problematic health literacy than women if unable to get practical help when being ill. The RRR's were statistically significant, but statistical uncertainty implies lack of conclusion regarding true differences.

Discussion

This paper examined the effect of social support and living alone on health literacy among a representative sample of the Danish population. The main findings were that lower social support was associated with higher inadequate health literacy levels and of problematic health literacy among respondents with lower opportunity for practical help when being ill. Men, younger respondents, and respondents with lower educational attainment had higher risks of problematic and inadequate health literacy. No associations were found between living alone and health literacy.

To our knowledge, this is the largest study utilizing a representative national population study on health literacy and the largest study using the internationally validated HLS-EU measure within a single country. Besides the strength of a large representative sample size, we furthermore included nationwide registry-based information on demographic measures, which ensures objective measures. Our study is limited by the cross-sectional design, which excludes any interpretations of causality. The most vulnerable population groups, including citizens with low social support, may not have participated in the study. Overestimation of the health literacy score among the study population might therefore be present. We believe that the consequences of overestimation of the health literacy score for the study's results are minor. It would most likely attenuate the associations if citizens with low social support were underrepresented. The literature shows comprehensive measurement inconsistency for both health literacy and social support, and only few studies on the relationship between social support, living alone and health literacy exist [5,36]. Nevertheless, studies suggest social support to be an important determinant of health literacy and their interrelation to be of importance for understanding the linkage between social support and health literacy. The lack of research on the underlying mechanisms behind the relationship between social support and health literacy is still dominant [36,37].

In the literature, social support is often classified as embodying two types of support: functional and structural. Functional support entails different types of transactions between individuals, such as emotional support, instrumental support and informational support or favours; and structural support relates to individuals' position in the social structure such as involvement in community organizations, keeping up social contact, and preoccupation in close social networks [38–41]. By including whether the participants had the opportunity to receive emotional support when having problems and instrumental support given as practical help when being ill, we found that functional support was of great importance for health literacy status. Evidence supporting this finding is also seen in the literature where emotional support is mentioned to promote feelings of self-esteem and self-confidence, enabling acceptance and effective coping with low health literacy, including its adverse consequences [36,42]. Instrumental support is suggested to help overcome certain limitations of low health literacy such as seeking doctoral help, accessing primary care and reducing stress when dealing with the health care system [36,43]. The tendency of gender differences in types of social support shown in our study might indicate that women are more vulnerable to deficient emotional support while men are more vulnerable when social support is deficient in an instrumental form. This mechanism is also considered in prior studies where interpersonal social support is mentioned as a coping strategy to manage stress among women [44,45].

A limitation of the study is that we did not measure the functional informational support, which is recognised in the literature to influence access to health care and comprehension of medical conditions and providing a sense of mastery over literacy problems [36,46]. Neither did we measure structural social support, which also is of importance if the full picture of the importance of social support to health literacy and the implications of the relationship with health are to be recognized [47].

Our finding of no association between living alone and health literacy in any age group is against the results of other studies. The scarce literature suggesting the existence of an association often refers to living alone as a proxy condition of low levels of social support [11,28] and the study populations often consist of patients or elderly [28,29,48]. Our finding indicates that living alone cannot be considered a proxy for low social support in a population-based study. Health literacy is not suggested as a moderator for the association between living alone and health, and the divergent results might indicate that living alone is many-faceted and might be differently experienced resulting in different health literacy levels and health. Further investigation of living alone and its implications for health literacy and relationship to health in other study populations are still required.

Conclusions

The results from this study shed light on the mechanisms of social context and its relation to health literacy. But it also gives new insight to mechanisms behind the relationship between social support and health outcomes. Even though the significant and causal role of social support and its positive relationship to health is well documented, we are still searching for the causal mechanism behind the association. We suggest that health literacy might be on

the causal pathway between functional social support and health. Whether low health literacy leads to poor health outcomes may be dependent on the amount of support and resources that individuals receive from their social networks.

To ensure better understanding of the underlying mechanisms, we recommend that future studies on social relationships and health should include measures of health literacy and multidimensional measures of social support.

Abbreviations

ISCED

International Standard Classification of Education

CRS

Danish Civil Registration System

RRR

Relative risk ratio

CI

Confidence interval

Declarations

Ethics approval and consent to participate

The study was approved by the Danish Data Protection Agency. According to Danish Law questionnaire and register-based studies require neither informed consent nor approval by ethical or scientific committees.

Consent for publication

Not applicable

Availability of data and materials

Due to restrictions related to Danish law and protecting patient privacy, the combined set of data as used in this study can only be made available through a trusted third party, Statistics Denmark. Requests for data may be sent to Professor Christian Torp-Pedersen.

Competing interests

The authors declare that they have no competing interests.

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Authors’ contributions

MJK conceived the study, carried out statistical analyses and drafted the manuscript. MTS carried out the questionnaire. All authors participated in the design of the study, helped to draft the manuscript and interpreted the results.

All authors read and approved the final manuscript.

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References

1. McNaughton CD, Cawthon C, Kripalani S, Liu D, Storrow AB, Roumie CL. Health literacy and mortality: a cohort study of patients hospitalized for acute heart failure. J Am Heart Assoc. 2015;4(5). doi:10.1161/JAHA.115.001799.
2. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. PLoS Med. 2010;7(7):e1000316. doi:10.1371/journal.pmed.1000316.
3. Klinenberg E. Social Isolation, Loneliness, and Living Alone: Identifying the Risks for Public Health. Am J Public Health. 2016;106(5):786–7. doi:10.2105/AJPH.2016.303166.
4. Kickbusch I, Pelikan JM, Apfel F, Tsouros AD. World Health Organization. Regional Office for Europe. *Health Literacy: The Solid Facts*.
5. Sørensen K, Van den Broucke S, Fullam J, et al. Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health. 2012;12(1):80. doi:10.1186/1471-2458-12-80.
6. Pelikan JM, Röthlin F, Ganahl K. Comparative Report On Health Literacy in Eight EU Member States. *Online Publ*. 2012.
7. Stormacq C, Van den Broucke S, Wosinski J. Does health literacy mediate the relationship between socioeconomic status and health disparities? Integrative review. Health Promot Int. August 2018. doi:10.1093/heapro/day062.
8. Schillinger D, Grumbach K, Piette J, Wang F. Association of health literacy with diabetes outcomes. JAMA. 2002. doi:10.1001/jama.288.4.475.
9. Friis K, Vind BD, Simmons RK, Maindal HT. The Relationship between Health Literacy and Health Behaviour in People with Diabetes: A Danish Population-Based Study. J Diabetes Res. 2016. doi:10.1155/2016/7823130.
10. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. Eur J Prev Cardiol. 2017;24(17):1880–8. doi:10.1177/2047487317729538.
11. Bo A, Friis K, Osborne RH, Maindal HT. National indicators of health literacy: Ability to understand health information and to engage actively with healthcare providers - A populationbased survey among Danish adults. BMC Public Health. 2014. doi:10.1186/1471-2458-14-1095.
12. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053–8. doi:10.1093/eurpub/ckv043.
13. Simonds S. Health education as social policy. *Heal Educ Monogr*. 1974.
14. Peerson A, Saunders M. Health literacy revisited: what do we mean and why does it matter? Health Promot Int. 2009;24(3):285–96. doi:10.1093/heapro/dap014.
15. Ishikawa H, Yano E. Patient health literacy and participation in the health-care process. Heal Expect. 2008;11(2):113–22. doi:10.1111/j.1369-7625.2008.00497.x.
16. Strategic Review of Health Inequalities in England post-2010. *Fair Society, Healthy Lives: The Marmot Review.*; 2012. doi:10.1016/j.puhe.2012.05.014.
17. Marmot M. Social determinants of health inequalities. Lancet. 2005. doi:10.1016/S0140-6736(05)74234-3.
18. Marmot M, Allen JJ. Social determinants of health equity. Am J Public Health. 2014. doi:10.2105/AJPH.2014.302200.
19. Bauer U. The Social embeddedness of health literacy. In: International Handbook of Health Literacy: Research, Practice and Policy across the Lifespan, editor Okan, O., Bauer. U., Priheiro, P., Sørensen. Great Britain: Policy Press; 2019. s.573–587.
20. Pitt R, Davis T, Manganello J, Massey D, Okan O, McFarlane E, Buchthal OV, Davis J, Arnold C, Sentell T. Health literacy in a Social Context: A meta narrative review. In: : International Handbook of Health Literacy: Research, Practice and Policy across the Lifespan, editor Okan, O., Bauer. U., Priheiro, P., Sørensen, K. Great Britain: Policy Press; 2019. pp. 665–88.
21. Stewart DW, Gabriele JM, Fisher EB. Directive support, nondirective support, and health behaviors in a community sample. J Behav Med. 2012;35(5):492–9. doi:10.1007/s10865-011-9377-x.
22. Thoits PA. Mechanisms linking social ties and support to physical and mental health. J Health Soc Behav. 2011;52(2):145–61. doi:10.1177/0022146510395592.
23. Uchino BN. *Social Support and Physical Health: Understanding the Health Consequences of Relationships*. Yale University Press; 2004. https://utah.pure.elsevier.com/en/publications/social-support-and-physical-health-understanding-the-health-conse. Accessed September 24, 2018.
24. Eurostat. *People in the EU: Who Are We and How Do We Live? 2015.*; 2015. doi:978-92-79-50328-3.
25. Routasalo PE, Savikko N, Tilvis RS, Strandberg TE, Pitkälä KH. Social contacts and their relationship to loneliness among aged people - A population-based study. Gerontology. 2006. doi:10.1159/000091828.
26. Kharicha K, Iliffe S, Harari D, Swift C, Gillmann G, Stuck AE. Health risk appraisal in older people 1: Are older people living alone an "at-risk" group? *Br J Gen Pract*. 2007.
27. Steg PG, Steg PG, Scirica BM, et al. Living Alone and Cardiovascular Risk in Outpatients at Risk of or With Atherothrombosis. Arch Intern Med. 2012;172(14):1086. doi:10.1001/archinternmed.2012.2782.
28. Friis K, Lasgaard M, Osborne RH, Maindal HT. Gaps in understanding health and engagement with healthcare providers across common long-term conditions: a population survey of health literacy in 29,473 Danish citizens. BMJ Open. 2016;6(1):e009627. doi:10.1136/bmjopen-2015-009627.
29. Heijmans M, Waverijn G, Rademakers J, van der Vaart R, Rijken M. Functional, communicative and critical health literacy of chronic disease patients and their importance for self-management. Patient Educ Couns. 2015. doi:10.1016/j.pec.2014.10.006.
30. Pedersen CB. The Danish Civil Registration System. Scand J Public Health. 2011;39(7_suppl):22–5. doi:10.1177/1403494810387965.
31. Sørensen K, Van den Broucke S, Pelikan JM, et al. Measuring health literacy in populations: illuminating the design and development process of the European Health Literacy Survey Questionnaire (HLS-EU-Q). BMC Public Health. 2013;13(1):948. doi:10.1186/1471-2458-13-948.
32. Jensen VM, Rasmussen AW. Danish education registers. Scand J Public Health. 2011;39(7_suppl):91–4. doi:10.1177/1403494810394715.

33. Schmidt M, Pedersen L, Sørensen HT. The Danish Civil Registration System as a tool in epidemiology. Eur J Epidemiol. 2014;29(8):541–9. doi:10.1007/s10654-014-9930-3.
34. Frank L. Epidemiology. When an entire country is a cohort. Science. 2000;287(5462):2398–9. doi:10.1126/science.287.5462.2398.
35. R Development Core Team. R: A Language and Environment for Statistical Computing. R Found Stat Comput Vienna Austria. 2016. doi:10.1038/sj.hdy.6800737.
36. Lee S-YD, Arozullah AM, Cho YI. Health literacy, social support, and health: a research agenda. Soc Sci Med. 2004. doi:10.1016/S0277-9536(03)00329-0.
37. Sentell T, Pitt R, Buchthal OV. Health Literacy in a Social Context: Review of Quantitative Evidence. HLRP Heal Lit Res Pract. 2017;1(2):e41–70. doi:10.3928/24748307-20170427-01.
38. Lin N, Ye X, Ensel WM. Social Support and Depressed Mood: A Structural Analysis. J Health Soc Behav. 1999. doi:10.2307/2676330.
39. Martire LM, Schulz R, Mittelmark MB, Newsom JT. Stability and change in older adults' social contact and social support: The Cardiovascular Health Study. Journals Gerontol - Ser B Psychol Sci Soc Sci. 1999. doi:10.1093/geronb/54B.5.S302.
40. Sherbourne CD, Stewart AL. The MOS social support survey. Soc Sci Med. 1991. doi:10.1016/0277-9536(91)90150-B.
41. Albrecht TL, Adelman MB, et al. Dilemmas of supportive communication. In: *Communicating Social Support*. Newbury Park, CA: Sage; 1987:240–254. http://psycnet.apa.org/record/1987-98299-000. Accessed October 26, 2018.
42. La Greca AM, Auslander WF, Greco P, Spetter D, Fisher EB, Santiago JV.. I get by with a little help from my family and friends: Adolescents' support for diabetes care. J Pediatr Psychol. 1995. doi:10.1093/jpepsy/20.4.449.
43. Kawachi I, Berkman LF. Social ties and mental health. J Urban Heal. 2001. doi:10.1093/jurban/78.3.458.
44. Greenglass ER. Work stress, coping, and social support: Implications for women's occupational wellbeing. In: Nelson DL & RJB, editor. Gender, Work Stress, and Health. Washington, DC: American Psychological Association; 2002. pp. 85–96.
45. Norcross JC, Prochaska JO, Diclemente CC. Self-change of psychological distress: Laypersons' vs. psychologists' coping strategies. *J Clin Psychol*. 1986. doi:10.1002/1097-4679(198609)42:5<834::AID-JCLP2270420527>3.0.CO;2-A
46. Antonucci TC. Social Relations: An examination of social networks, social support and sense of control. In: *Handbook of the Psychology of Aging*.; 2001. doi:10.3917/leco.049.0098.
47. Rodríguez-Artalejo F, Guallar-Castillón P, Herrera MC, et al. Social Network as a Predictor of Hospital Readmission and Mortality Among Older Patients With Heart Failure. J Card Fail. 2006. doi:10.1016/j.cardfail.2006.06.471.
48. Baker DW, Gazmararian JA, Sudano J, Patterson M. The Association Between Age and Health Literacy Among Elderly Persons. Journals Gerontol Ser B Psychol Sci Soc Sci. 2000. doi:10.1093/geronb/55.6.S368.

Figures

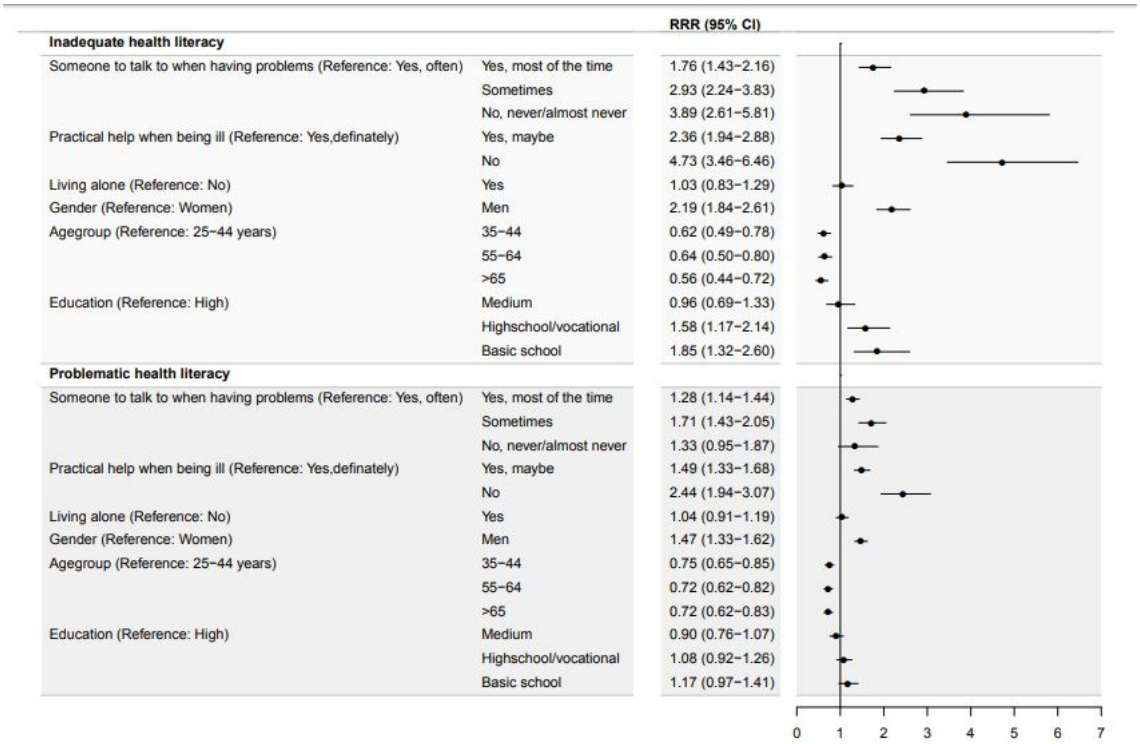

Figure 1

Associations of social support and living alone with health literacy. Forrest plot presenting multivariable multinomial logistic regression model describing relative rate ratios (RRR), with corresponding 95% confidence intervals (CI), of inadequate and problematic health literacy compared to adequate health literacy