Social network assessment in community-dwelling older persons: results from a study of three European populations

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ABSTRACT. ***Background and aims:*** *In clinical practice, the status of living alone is often used as the only measure describing an older person's social network. We evaluated whether additional use of a brief social network measure provides relevant additional information in relation to social support and engagement.* ***Methods:*** *Cross-sectional survey of 6982 community-dwelling adults 65 years or older living in London, UK; Hamburg, Germany; and Solothurn, Switzerland. Data were collected using the self-administered multidimensional Health Risk Appraisal Questionnaire. Multivariate models were used to analyse adjusted correlations between the two measures of social network (living alone status, risk for social isolation with marginal family and friend network subscales) and potential consequences of inadequate social network (marginal emotional or instrumental support, lack of social engagement).* ***Results:*** *Living alone status was more strongly associated with marginal instrumental support [OR=7.6 (95% CI 6.3, 9.1)] than with marginal emotional support [OR=4.2 (95% CI 3.4, 5.1)], and showed no statistically significant association with lack of social engagement [OR=0.9 (95% CI 0.8, 1.0)]. Risk of social isolation was more strongly related to marginal emotional support [OR=6.6 (95% CI 5.4, 8.0)] than to marginal instrumental support [OR=3.3 (95% CI 2.8, 4.0)], and was moderately related to lack of social engagement [OR=2.9 (95% CI 2.5, 3.4]. Marginal family and friend network subscales showed consistent and unique associations with social support and social engagement.* ***Conclusion:*** *Findings suggest that living alone status and a brief measure of social network identifies distinctive at-risk groups and potential pathways for intervention. Geriatric assessment programs including both social network measures may provide useful information about potentially modifiable social network risks in older persons.*

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INTRODUCTION

The social network provides many benefits that have been associated with the overall health and well-being of older adults (1). An individual's social network provides a reservoir for social engagement, and buffers the impact of major life events by providing emotional and instrumental social support in times of crisis. Although the causal relationship between social network and health is not completely understood, it is hypothesized to function through multiple pathways that include social support and social engagement (2, 3). Thus, an adequate social network, closely related to social-structural characteristics that vary from culture to culture, is conceptualized to precede the existence of social support and engagement, intermediaries of health and well-being (2, 4). The reported health benefits associated with a social network are: less risk of early death, better physical and mental health, less risk of

Key words: Geriatric assessment, older adults, social engagement, social isolation, social network, social network assessment, social support.

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disability or decline in activities of daily living, and better chance of recovering ability to perform activities of daily living (5-8). For those reasons, lack of a social network or risk of social isolation is a potentially modifiable risk factor for functional status decline and other adverse health outcomes in older adults (1, 9-13).

Despite this, multidimensional geriatric health-risk assessment usually only includes single-item proxy measures, such as living alone status (13, 14). An important reason for limited assessment of the social network is the lack of brief social network screening instruments that can be easily incorporated into multidimensional geriatric health-risk assessment. This limitation has been recently addressed by the development of the six-item Lubben Social Network Scale (LSNS-6) which has shown good validity and reliability in community-dwelling older adults (4, 15, 16).

In the context of a multidimensional geriatric health-risk assessment program, we investigated a social network assessment that included two social network measures (living alone status and risk of social isolation using the LSNS-6 with family and friend subscales) in relation to social support and engagement across three populations of European community-dwelling older adults. Because the social network is based on social-structural and personal characteristics, which may differ considerably, our populations also served as opportunities to evaluate the sensitivity of the brief social network measure. Our analyses were based on the conceptual framework proposed by Berkman et al. (Fig. 1) (2, 4). Our *a priori* hypothesis was that differences in associations would exist between the two measures of social network, suggesting that a differentiated social network assessment with more than a single-item measure adds relevant and unique information to multidimensional geriatric health-risk assessment.

METHODS

Study population

This is a secondary analysis of baseline data from the PRO-AGE trial (PRevention in Older People - Assessment in GEneralists' practices), a multicenter study of a health-risk appraisal system among community-dwelling older adults living in London, UK; Hamburg, Germany; and Solothurn, Switzerland, conducted between 2001 and 2003. In London, the study sample included populations living mainly in the outer urban areas. In Hamburg, persons were recruited from both urban and suburban neighborhoods. Solothurn is mainly rural, and most individuals live in small villages or towns. The study was approved by local research ethics committees. A detailed description of the PRO-AGE study design is reported elsewhere (17, 18).

For recruitment of participants, 80 primary care practices in the selected project areas generated lists of all registered patients aged 65 years and older. Out of 21,391 persons on these lists, 11,750 persons were excluded, based on physician practice records according to *a priori* criteria (dependent in basic activities of daily living [ADL], cognitive impairment, terminal disease, did not speak regional language). Of the remaining 9641 persons who were enrolled in the study and received the Health Risk Appraisal for Older Persons (HRA-O) questionnaire, 1560 did

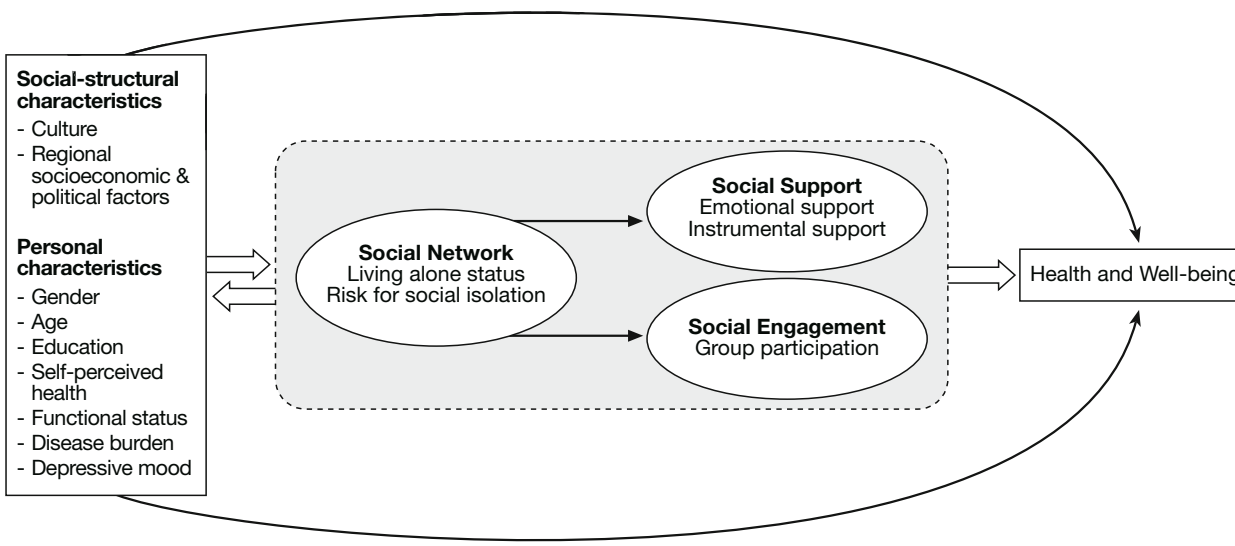

Fig. 1 - *Conceptual framework of associations between social network and other factors in older adults.*

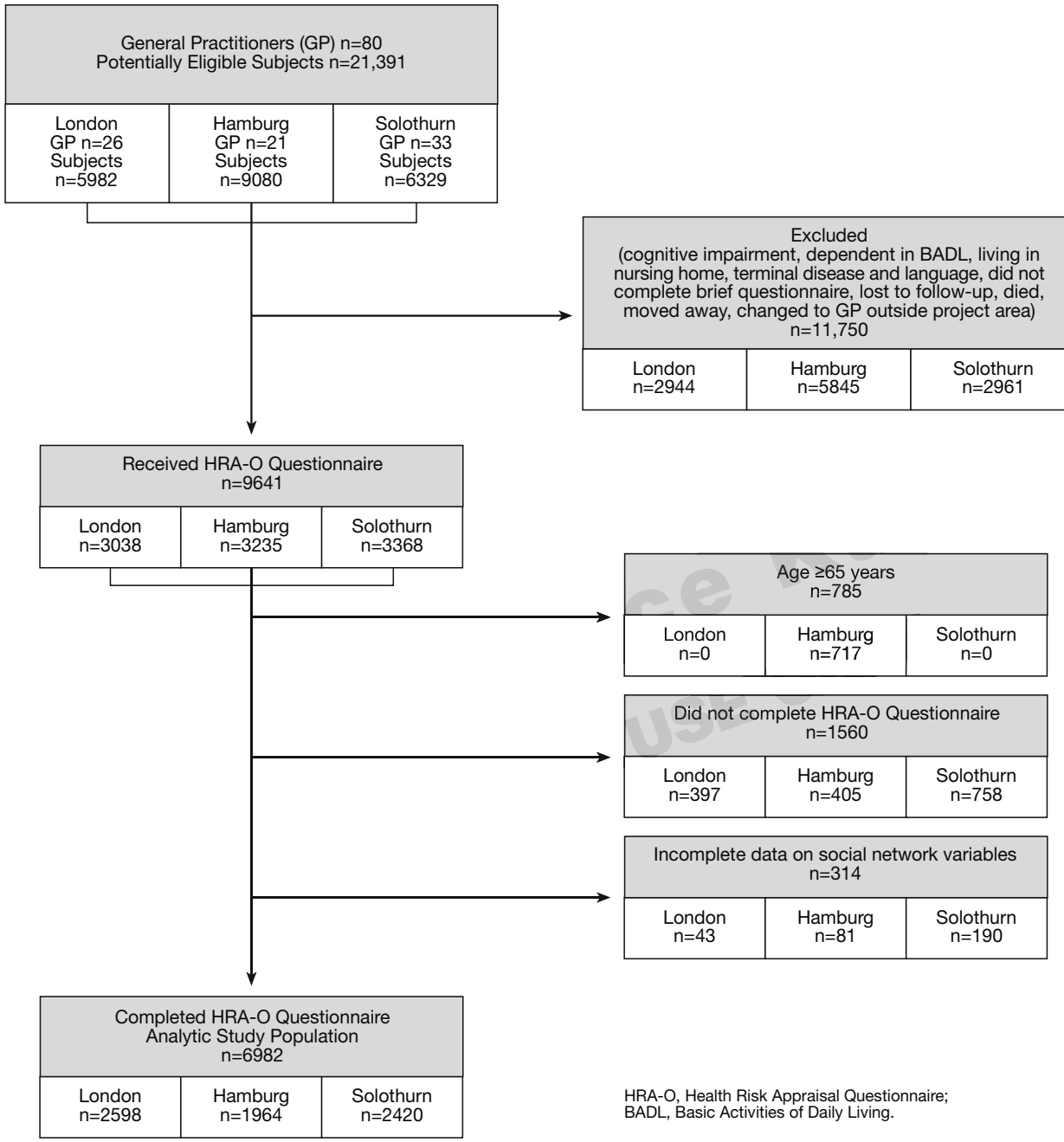

Fig. 2 - *Study population flowchart.*

not complete it, 314 had incomplete data on the social network variables, and 6982 (72%) completed all sections (London=2589, Hamburg=1964, Solothurn=2420) and were included in the present analysis. Figure 2 shows the study population flowchart.

Instruments for data collection

Physician practice records and the HRA-O were used for data collection. Information on the development, reliability, and validity of the questionnaire has been previously published (19).

Measures of social network

The HRA-O questionnaire contained two measures of social network. Living alone status was assessed by a single question: whether or not the respondent was currently living alone. Risk of social isolation was measured with the LSNS-6 score, calculated as an equally weighted sum of six items with scores ranging from zero to 30 (higher scores indicating better social network) (1, 15). The individual items of the LSNS-6 are listed in the *Appendix*. A person was defined, based on previous psychometric validation, as at risk of social isolation if the LSNS score was <12 (15, 20). The scale can also be split into family and friend subscales (15). The family subscale is constructed from three items that ask about relatives similarly, the friends subscale was three items that ask about friends.

Demographic and health-related characteristics

Age and gender were obtained from physician practice records. We considered participants as having a low level of education if they reported no additional education after completion of the compulsory nine years of school.

Health-related characteristics were based on self-reported items from the HRA-O questionnaire and measured in four ways. Self-perceived health status was assessed using a single-item measure "All in all, would you say that your health is generally excellent, good, fair or poor?" Limitation in instrumental activities of daily living (IADL) was defined as difficulty and/or need for assistance in handling finances, taking medications, engaging in "handyman" work, doing housework, doing laundry, preparing meals, shopping, using the telephone and/or using transportation (21). Comorbidity was measured by the number of self-reported chronic medical conditions out of a list of 15 (22). Depressive mood was defined as a score >66 on the five-item Mental Health Inventory Screening Test (23, 24).

Social support measures

Emotional social support was measured using a three-item version of the RAND Medical Outcome Study Social Support Survey (MOS-SSS) (25). The items included: "How often do you have someone who shows you love and affection if you need it?", "How often do you have someone to share your most private worries and fears with if you need it?" and "How often do you have someone to love and make you feel wanted?". Each item was scored on a scale ranging from zero to five, resulting in emotional social support scale values ranging from zero to 15 (15 indicating the highest level). Marginal emotional social support was defined as an emotional social support scale score <6 (1). Instrumental social support was assessed with a single-item yes/no question that asked whether or not the older adult had someone who would provide care for a few days if necessary (26).

Measure of social engagement

Social engagement was assessed dichotomously as group participation, by a single-item inquiring about monthly participation in groups such as hobby or recreational groups, community organizations including political or charity groups, and church or religious organizations (27, 28).

Statistical analyses

Summary statistics (univariate, proportion, and frequency) were used to describe the demographic and health-related characteristics of the study population. We examined bivariate relations using chi-square tests and Spearman correlations; first between the measures of social network, and then between social network measures and demographic and health-related characteristics, as well as measures of social support and social engagement. Multivariate logistic regression models were used to evaluate associations between social network measures and measures of social support and social engagement, adjusting for demographic and health-related characteristics. All variables were selected for inclusion in adjusted models based on their association with measures of social support and social engagement (29, 30). Last, we conducted analyses of non-response by comparing characteristics of respondents (n=6982) with non-respondents (n=1874) by means of Student's *t*-tests. All analyses were performed with STATA version 8.2 (STATA Corporation, College Station, TX, USA, 2003) and all *p*-values were two-sided.

RESULTS

Table 1 reports sample characteristics for the three sites. Except for emotional support, significant differences were noted among the sites. Approximately two-thirds of the individuals in the Hamburg sample were women, whereas older women constituted slightly more than half the sample in the other two sites. Sixty-three percent of participants from London, 25% from Hamburg and 40% from Solothurn had a low level of education, reflecting socio-economic differences in the selected project sites. Hamburg respondents were less likely to be living with a partner and also more apt to report deficiencies in various aspects of their social support networks than their counterparts in Solothurn and London. Because of a strong tradition of group activities in Switzerland, most of the participants from Solothurn reported participating in social groups, whereas this was less frequent in Hamburg and London. In sum, the three sites reflect important intergroup differences in social-structural and personal characteristics.

Each social network measure (individually analyzed) consistently demonstrated unique associations with social support and engagement measures across the three pop-

Table 1 - *Subject characteristics of three European populations of community-dwelling older adults (total sample, n=6982).*

	London* n (%) (n=2598)	Hamburg* n (%) (n=1964)	Solothurn* n (%) (n=2420)	Between group differences#
Social network				
Living alone	842 (33)	785 (41)	705 (30)	L < H, L > S, H > S
Risk for social isolation (LSNS-6 score <12)	397 (15)	393 (20)	255 (11)	L < H, L > S, H > S
Marginal family network (LSNS-6 family subscale score <6)	379 (15)	350 (18)	176 (7)	L < H, L > S, H > S
Marginal friend network (LSNS-6 friend subscale score <6)	495 (19)	449 (23)	434 (18)	L < H, H > S
Demographic and Health-related characteristics				
Female gender	1415 (54)	1233 (63)	1356 (56)	L < H, H > S
Mean age (±SD)	74.5±6.2	74.0±6.4	73.9±5.9	L > H, L > S
Age ≥75 years	1105 (43)	792 (40)	939 (39)	L > S
Low level of education (≤ basic school)	1618 (63)	456 (25)	986 (43)	L > H, L > S, H < S
Fair/poor self-perceived health	625 (24)	633 (33)	457 (19)	L < H, L > S, H > S
Functional status				
Limitation in ≥2 IADL	452 (18)	539 (28)	514 (22)	L < H, L < S, H > S
Disease burden				
Mean number of chronic conditions (±SD)	2.0±1.5	3.0±1.8	2.3±1.6	L < H, L < S, H > S
≥3 chronic medical conditions	851 (34)	1078 (59)	932 (41)	L < H, L < S, H > S
Depressive mood (MHI5 score<66)	422 (16)	474 (24)	407 (17)	L < H, H > S
Social support				
Marginal emotional support (MOS-SSS score <6)	251 (10)	197 (10)	205 (8)	
Marginal instrumental support	424 (16)	370 (19)	230 (10)	L > S, H > S
Social engagement				
No group participation	849 (33)	756 (39)	500 (21)	L < H, L > S, H > S

SD, Standard Deviation; IADL, Instrumental Activities of Daily Living; MHI5, 5-item Mental Health Inventory; LSNS-6, 6-item Lubben Social Network Scale; MOS-SSS, Medical Outcome Study Social Support Survey; *Due to missing values for individual items on the Health Risk Appraisal (HRA-O) questionnaire, n varies between 6646 and 6982 for total sample, between 2526 and 2598 for London, between 1822 and 1964 for Hamburg, and between 2268 and 2420 for Solothurn; #*p*-values for continuous variables based on ANOVA, for dichotomous variables based on Fisher's Exact Test comparing the three sites. Significant differences ($p<0.05$) between pair of means / proportions (L=London, H=Hamburg, S=Solothurn), adjusted for multiple comparisons (Bonferroni) (35).

ulations (Table 2). Living alone status was in most cases more strongly associated with instrumental support [OR_{London}=6.3 (95% CI 4.8, 8.1), $OR_{Hamburg}$=16.9 (95% CI 11.1, 25.7), $OR_{Solothurn}$=4.7 (95% CI 3.3, 6.7)], whereas risk for social isolation was more strongly related to marginal emotional support [OR_{London}=7.7 (95% CI 5.7, 10.5), $OR_{Hamburg}$=6.7 (95% CI 4.7, 9.7), $OR_{Solothurn}$=5.9 (95% CI 4.0, 8.6)]. Living alone status showed no association with lack of social engagement, whereas risk of social isolation was moderately related to lack of social engagement [OR_{London}=2.2 (95% CI 1.7, 2.8), $OR_{Hamburg}$=2.6 (95% CI 2.0, 3.4), $OR_{Solothurn}$=4.6 (95% CI 3.4, 6.3)]. The results of the regression analyses of models including both social network measures (data not shown) were nearly identical to the individual models, indicating that LSNS-6 measures also significantly predict differences in social support and engagement, independent of the single-item living alone measure.

The adjusted associations for marginal family and friend network (Table 2) show a consistent pattern of stronger associations, dependent on the type of social network deficit with type of social support or social engagement. For example, subjects with a marginal social network were at least six times more likely across sites to have marginal emotional support with the deficit much more strongly related to having a marginal family network as opposed to having a marginal friend network. Marginal instrumental support was more closely related to the marginal family network and only moderately associated with the friend network. In contrast, subjects in all three sites with marginal friend network were over three times more likely to report no group participation.

Non-responder analysis

The non-respondent group (n=1874) had slightly more women in all sites (London 61% *vs* 54%, Hamburg 73% *vs* 63%, Solothurn 59% *vs* 56%; $p<0.05$), were slightly older in Hamburg 76.7±7.1 SD *vs* 74.0±6.4 SD and Solothurn 75.3±6.1 SD *vs* 73.9±5.9 SD, $p<0.05$), had a worse perception of their health in London (32% fair/poor *vs* 24% and Solothurn 27% fair/poor *vs* 19%, $p<0.05$), but had no difference in hospital admissions during the preceding 12 months in comparison with responders (n=6982).

DISCUSSION

Results from these analyses, fully adjusted for differences in measured characteristics, show that living alone

Table 2 - *Adjusted associations of social network measures with marginal emotional and instrumental support and social engagement in three European populations of community-dwelling older adults (total sample, n=6982).*

	Marginal emotional support OR* (95% CI)	Marginal instrumental support OR* (95% CI)	Lack of social engagement No group participation OR* (95% CI)
London (n=2598)			
Living alone	6.8 (4.9, 9.5)	6.3 (4.8, 8.1)	0.8 (0.6, 1.0)
Risk for social isolation	7.7 (5.7, 10.5)	3.3 (2.6, 4.3)	2.2 (1.7, 2.8)
Marginal family network	7.2 (5.3, 9.8)	3.9 (3.0, 5.0)	1.3 (1.0, 1.7)
Marginal friend network	4.1 (3.0, 5.5)	1.9 (1.5, 2.4)	3.0 (2.4, 3.7)
Hamburg (n=1964)			
Living alone	4.3 (2.8, 6.5)	16.9 (11.1, 25.7)	0.8 (0.6, 1.0)
Risk for social isolation	6.7 (4.7, 9.7)	3.1 (2.3, 4.2)	2.6 (2.0, 3.4)
Marginal family network	7.8 (5.4, 11.2)	3.6 (2.6, 4.9)	1.3 (1.0, 1.7)
Marginal friend network	3.6 (2.5, 5.2)	1.7 (1.2, 2.3)	3.6 (2.8, 4.6)
Solothurn (n=2420)			
Living alone	2.1 (1.4, 3.1)	4.7 (3.3, 6.7)	1.2 (0.9, 1.6)
Risk for social isolation	5.9 (4.0, 8.6)	3.4 (2.3, 5.1)	4.6 (3.4, 6.3)
Marginal family network	6.3 (4.2, 9.6)	4.2 (2.7, 6.4)	3.7 (2.6, 5.3)
Marginal friends network	4.4 (3.1, 6.3)	2.3 (1.6, 3.2)	4.4 (3.4, 5.6)

OR, Odds Ratio; CI, Confidence Interval; LSNS-6, 6-item Lubben Social Network Scale; Risk for social isolation, LSNS-6 score <12; Marginal family network, LSNS-6 family subscale score <6; Marginal friend network, LSNS-6 friend subscale score <6.
*Adjusted OR based on multivariate logistic regression analyses including adjusting variables: age, gender, education, self-perceived health, limitation in Instrumental Activities of Daily Living, chronic conditions, depressive mood, and either living alone or measures of risk for social isolation.

status and a brief measure of risk for social isolation perform differently across three European populations of community-dwelling older adults. The two measures demonstrated unique associations with measures of social support and social engagement, suggesting that each measure identifies a distinct group. The strong similar patterns of association across sites of the measure of risk of social isolation with social support and engagement demonstrate sensitivity to differences in social-structural and personal characteristics. This is essential to a better understanding of the proposed link between social network, social support, social engagement and health in older adults. Overall, these results emphasize the importance of expanding multidimensional geriatric assessment to include differentiated social network assessment.

Several limitations of this study should be considered. These findings are not generalizable to the general populations of community-dwelling older adults in each country. Due to the eligibility criteria of the PRO-AGE trial, older adults with dementia, terminal disease, or need for human assistance in the basic activities of daily living were excluded. In addition, social factors are closely related to cultural and regional factors, and therefore association patterns may be specific to the study population living in a defined geographical area within each site (31). Selection bias is also a potential threat to the validity of these study results, due to the high non-responder rate. However, the differences between responder and non-responder groups were small, supporting our conclusion that selection bias is unlikely to have influenced the validity of our findings. Another limitation is related to unmeasured factors such as income, another potentially important determinant of social factors and health in older people (1, 12, 27). For example, the European Union 2003 estimated at-risk-of-poverty rate in the UK and Germany was 24% and 15% respectively (32). This limitation is unlikely to have affected the results in Solothurn, due to the extremely low poverty rate among older persons in Switzerland (2006 poverty rate among Swiss older adults <4%) (33, 34). Lastly, as the study was based on cross-sectional data and temporality is unknown, the results only suggest mechanisms by which social network, demographic factors, health-related characteristics, social support, and social engagement are associated in populations of European older adults.

The present findings have research implications relevant for developing improved geriatric interventions targeted at improving the health and well-being of older adults. Given the diversity of social isolates, many types of intervention will be needed to address and strengthen social networks, and only by complete assessment of social network can interventions focused on mechanisms to bolster social ties be developed and tested. In general, future research is needed, involving a broad range of programs; ones designed to work with older adults, caregivers, family and friends to strengthen existing and create new social contacts, as well as interventions aimed at improving availability and/or access to counseling, social services and social programs. Future research into multidimensional geriatric assessment should also include differentiated measures of the social network, such as those used in this study. Such efforts will further our understanding of the nature of social networks and pathways

to health, and guide future strategies for the prevention of social isolation and decline in older adults.

This study has clinical and public health implications. Multidimensional geriatric assessment, including living alone status, risk of social isolation, and lack of family and friendship ties can properly identify the population at risk of social deficits. The measures used in this research identify a relatively small proportion of community-dwelling older adults at risk of social isolation, and, with nominal added respondent burden, specifically inform about existing family and friendship resources. The specificity of social network assessment may be expected to add to the efficiency and efficacy of geriatric interventions by tailoring interventions to specific deficiencies in the social situations of individuals or groups of older adults.

CONCLUSION

Findings suggest that living alone status and a brief measure of social network identify distinct at-risk groups and potential pathways for intervention. Multidimensional geriatric assessment programs that are inclusive of a differentiated social network assessment may offer important knowledge regarding the centrality of social networks to the health and wellbeing of older adults. Such knowledge will enhance future geriatric research and clinical care, as well as public health initiatives for older adults.

APPENDIX

Individual items of a brief measure of risk for social isolation

1. How many relatives or family members do you see or hear from at least once a month?
2. How many relatives or family members do you feel close to that you can call on them for help?
3. How many relatives or family members do you feel at ease with that you can talk about private matters?
4. How many friends/neighbors do you see or hear from at least once a month?
5. How many friends/neighbors do you feel close to that you can call on them for help?
6. How many friends/neighbors do you feel at ease with that you can talk about private matters?

Note: Measure based on the Lubben Social Network Scale (LSNS-6) (15)

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