

Health risk appraisal in older people 1: are older people living alone an 'at-risk' group?

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ABSTRACT

Background

In the UK, population screening for unmet need has failed to improve the health of older people. Attention is turning to interventions targeted at 'at-risk' groups. Living alone in later life is seen as a potential health risk, and older people living alone are thought to be an at-risk group worthy of further intervention.

Aim

To explore the clinical significance of living alone and the epidemiology of lone status as an at-risk category, by investigating associations between lone status and health behaviours, health status, and service use, in non-disabled older people.

Design of study

Secondary analysis of baseline data from a randomised controlled trial of health risk appraisal in older people.

Setting

Four group practices in suburban London.

Method

Sixty per cent of 2641 community-dwelling non-disabled people aged 65 years and over registered at a practice agreed to participate in the study; 84% of these returned completed questionnaires. A third of this group, ($n = 860$, 33.1%) lived alone and two-thirds ($n = 1741$, 66.9%) lived with someone else.

Results

Those living alone were more likely to report fair or poor health, poor vision, difficulties in instrumental and basic activities of daily living, worse memory and mood, lower physical activity, poorer diet, worsening function, risk of social isolation, hazardous alcohol use, having no emergency carer, and multiple falls in the previous 12 months. After adjustment for age, sex, income, and educational attainment, living alone remained associated with multiple falls, functional impairment, poor diet, smoking status, risk of social isolation, and three self-reported chronic conditions: arthritis and/or rheumatism, glaucoma, and cataracts.

Conclusion

Clinicians working with independently-living older people living alone should anticipate higher levels of disease and disability in these patients, and higher health and social risks, much of which will be due to older age, lower educational status, and female sex. Living alone itself appears to be associated with higher risks of falling, and constellations of pathologies, including visual loss and joint disorders. Targeted population screening using lone status may be useful in identifying older individuals at high risk of falling.

Keywords

accidental falls; elderly; risk; service use.

INTRODUCTION

Government policies encourage health and social care providers to promote healthy ageing in older people by implementing the National Service Framework for Older People.¹ The failure of population screening of older age groups to demonstrate health gain, as shown by the abandonment of '75 and over checks' (1990–2004) in the new GP contract, and confirmed by the Medical Research Council trial,² has diverted the attention of the NHS towards interventions targeted at 'at-risk' groups. For example, the National Service Framework for Older People identifies older people living alone as being at risk of not having their mental health problems recognised.

Living alone in later life is seen as, at best, an undesirable state and at worst a potential health risk. In the UK, 16% of the population is aged 65 years or over³ and according to the General Household Survey,⁴ 37% of people aged 65 years and over live on their own; 24% of all men and 47% of all women. Deprivation payments to general practice were originally based on the Jarman score, which includes the proportion of older people living alone as one of its measures of deprivation.⁵ Twenty years later GPs still consider older people living alone to be an at-risk group worthy of specialist intervention.⁶ The public

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How this fits in

In the UK, population screening for unmet need, unrecognised disability, or hidden pathology has failed to improve the health of older people. Interventions are now being targeted at those deemed to be at risk. GPs may consider older people living alone to be an 'at-risk' group worthy of further intervention, although there is some evidence that those living alone are a robust group. Public perception of lone status increasing vulnerability and risk in older people is strengthened by often sensationalised media coverage of this group; loneliness, isolation, and vulnerability can become confused with solitary status. Those living alone may report worse health than those living with others, but are no different in medication use, and make less use of ambulatory health services. Non-disabled older people living alone do appear to be at higher risk of falling, and to have more visual impairment and more problems with joint disease. Clinical attention should be focused on these specific problems.

perception of lone status increasing vulnerability and risk in older people is strengthened by the often sensationalised media coverage of this group, and loneliness, isolation, and vulnerability are often confused with solitary status.⁷

Living alone may arise from social and historical causes, like the sex imbalance following the First World War; economic migration; demographic effects, for instance, the longer lifespan of women; or personality and preference. Bereavement apart, there is no reason to assume that living alone is necessarily harmful to health, and there is some evidence to suggest that those living alone a decade ago were as robust as those living with others.⁸

Nevertheless, the perception of living alone being problematic continues to drive policy and practice, and primary care practitioners may be encouraged to use lone status as a trigger for further attention and assessment. The aim of this study was to test the hypothesis that living alone in older age (aged 65 years and over) increases the risk of poor physical and mental health and results in a higher use of health services compared with living among other independent older persons. The objectives of this study were:

- to examine the clinical significance of living alone in later life; and
- to explore lone status as an epidemiological risk category.

METHOD

Four large group practices in suburban London were recruited to participate in a randomised controlled trial investigating the effect of the health risk appraisal for older people on health behaviours and status in the 'well old' population.⁹ Practices were purposively selected for their interest in primary care for older people, location in suburban (that is, relatively without

deprivation) areas of London, and routine use of electronic medical recording systems in clinical encounters.

To identify eligible patients aged 65 years and over, practice lists were checked by GPs. Eligibility criteria were: those living at home and without evidence of need for human assistance in basic activities of daily living, high dependency due to major physical or psychiatric illness, cognitive impairment, or a terminal illness. Patients also had to have a sufficient level of English to complete the questionnaires. Eligible and consenting patients were posted the Health Risk Appraisal Older people questionnaire (HRA-O) in phases and at least once. The findings reported in this paper are from the first completion of the questionnaire. The HRA-O questionnaire is a multidimensional, self-completion questionnaire that collects information on health, functional status, health behaviours, preventive care, and psychosocial factors in older people. The development of the questionnaire⁹ and the feasibility of its use in UK primary care have been reported elsewhere,¹⁰ as has a full description of the methodology.¹¹

Due to multiple morbidity often found in older people, a number of clinically salient domains from the HRA-O questionnaire were included in this analysis: functional ability (difficulty in the basic activities of daily living¹² and instrumental activities of daily living);¹³ functional change (changed and decreased functioning in the last 12 months);¹⁴ falls, (multiple falls in the last 12 months and activity limitation due to the fear of falling),¹⁵ vision;¹⁶ multiple medication use (more than three prescribed medications);¹⁷ mood (depression symptoms);¹⁸ cognitive functioning (self-reported memory loss);¹⁹ risk of social isolation;²⁰ health risk behaviours including low physical activity,²¹ poor diet (high fat consumption, low fruit and fibre consumption),²² current tobacco use²³ and alcohol consumption (hazardous alcohol use);²⁴ general health rating (poor, fair, good or excellent); and medical history of diagnosed chronic conditions. Use of health services over the previous 12 months (hospital admission and primary care or outpatient appointments) and availability of a carer in an emergency were included in the analysis. Information was collected on age, sex, education level, current income source, and living arrangements.

Data were analysed using SPSS version 12 and the following tests as appropriate: χ^2 , independent samples *t*-test, Mann-Whitney *U* and binary logistic regression. Data were analysed in two stages corresponding to the two objectives of the paper. Firstly, χ^2 tests were used to compare the proportions of those living alone with those living with others for the health behaviours, health risk factors, diagnosed

chronic conditions, and use of health services from the domains of the HRA–O questionnaire listed above. These descriptive data outline the clinical implications of older people living alone presenting to health services compared with older people living with others.

Secondly, the epidemiology of lone status was explored using binary logistic regressions to address two questions. Firstly, to examine the impact of living status on health behaviour, health risk, physical and social function, chronic conditions, and use of health services at a population level, when controlling for the known confounders of increasing age (65–74 years, 75–84 years, and 85 years and over), female sex, education level (basic education up to the age of 15 or 16 years versus more than basic education), and income (receipt of the state pension alone versus receipt of additional income from other sources); the latter two used as proxies for socioeconomic status. Both crude odds ratios and odds ratios adjusted for age, sex, education level, and income are reported.

Given the current clinical and policy significance of falls prevention in older people, the impact of living status on multiple falls over the previous 12 months and fear of falling were explored, controlling for age, sex, education level, income, functional ability and change, vision, multiple medication use, mood, cognitive functioning, social isolation, availability of emergency carer, low physical activity, poor diet, tobacco and alcohol consumption, general health rating, and health services use over the last 12 months.

RESULTS

Five thousand nine hundred and eighty-two patients aged 65 years and over were identified across the four practices. After list checking, 5467 (91%) people were invited to join the study, of whom 3299 returned a consent form (60%). Of these, a further 160 were excluded based on exclusion criteria.¹¹ Of the remainders, 209 returned incomplete information and 1959 declined to participate or did not return the questionnaire/consent form.

The remaining 3139 people were posted the HRA–O questionnaire, of which 2641 completed and returned the questionnaire, a response rate of 84%. Those most likely to respond to the questionnaire were female (54.6 versus 59.8%, $P = 0.032$).

Of the 2641 responders, 2601 (83% of those posted the HRA–O questionnaire) completed a question about their current living arrangements and this is the sample on which the rest of the paper has focused. A third of this group ($n = 860$) lived alone and two thirds, ($n = 1741$) lived with someone else. As expected, older people living alone were significantly older (mean age = 76.43 years [standard deviation {SD} = 6.66] compared with 73.62 years [SD = 5.75, $P < 0.001$, $t =$

11.104, degrees of freedom {df} = 2599]) and more likely to be female (75.6 compared to 44.0%, respectively, $P < 0.001$). Those living alone were more likely to have had only the basic level of education (67.2 versus 61.3% respectively, $P = 0.003$) but were better off financially, being in receipt of more than the state pension alone (29.2 versus 37.0% respectively, were in receipt of only the state pension, $P < 0.001$).

Those living alone fared significantly worse than their counterparts living with others in almost all of the HRA–O domains investigated (Table 1), the exceptions being that there was no difference in multiple medication use, high fat consumption, tobacco use, or use of health services (hospital admission or doctor consultation).

After controlling for increasing age, female sex, education level and income, those living alone were more likely to report fair or poor health, difficulties with instrumental activities of daily living, worsening function, and multiple falls in the previous 12 months, as well as activity limitation due to fear of falling and other associations (Table 1). However, there was no difference between the groups in vision and multiple medication use (a proxy for complex morbidity). In terms of mental health, no difference was found in mood (depressive symptoms) or self-reported memory loss, regardless of the fact that those living alone were more likely to be socially isolated.

Despite being less likely to have an emergency carer, those living alone were either significantly less likely to use services or their use of health services was comparable to those living with others. No difference was found in the number of in-patient stays and those living alone were less likely to have had multiple doctor appointments (either GP or outpatient). The health risk behaviours of these groups was mixed; in the multivariate analyses those living alone were less healthy in the sense that they ate less fruit and fibre and smoked tobacco, but they were not different in levels of physical activity, high fat consumption, and hazardous alcohol use. Those living alone had a greater number of diagnosed chronic medical conditions (mean of 2.2 versus 1.9, $P < 0.001$; and 64.1 versus 56.3% respectively, $P < 0.001$, had two or more chronic conditions). The distribution of self-reported chronic conditions by different household type shows that these appear to be concentrated to particular illness types (Table 2). Prevalence of heart and lung diseases, diabetes, and mental health problems were largely the same between groups, except in the case of coronary heart disease and/or heart attack which was more common in those living with others. Conditions more common in those living alone were: arthritis and/or rheumatism, osteoporosis, glaucoma, irreversible and/or untreatable retinal disease, and cataracts.

Odds ratios (OR) for chronic conditions, both crude and adjusted (for increasing age, female sex, education level, and income), are shown in Table 2. After controlling for confounders, two chronic conditions remained significantly more prevalent in those living alone: arthritis and/or rheumatism (OR = 1.36, 95% confidence interval [CI] = 1.13 to 1.63) and glaucoma (OR = 1.50, 95% CI = 1.03 to 2.19); and the condition cataracts remains of borderline significance (OR = 1.25, 95% CI = 1.00 to 1.55).

The association of falls and fear of falls with living status was analysed in a second multivariate model, controlling for the socioeconomic indicators as well as for health indicators and service use. In this analysis (not shown), living status was found to be significantly associated with multiple falls but not with fear of falling. The likelihood of having multiple falls over the previous 12 months was 2.26 times higher in those living alone, after controlling for the known socioeconomic confounders, health indicators, and service use outlined above (95% CI = 1.56 to 3.28, $P < 0.001$).

DISCUSSION

Summary of main findings

This paper reports on the 2601 patients who participated in the UK arm of the HRA-O trial and completed the HRA-O questionnaire and information on their living arrangements. The proportion of older people living alone was slightly lower than the national average of 37%.³

If the findings of this study are extrapolated to clinical practice, non-disabled older people living alone would present to healthcare practitioners with a greater number of health risk behaviours and worse health status, although they would not differ in their use of ambulatory health services. However, at a population level, the increased age, higher prevalence of women, lower educational level, and better financial status of those living alone, account for a number of the differences between the two groups. The domains in which older people living alone remain at higher risk than their counterparts living with others are poorer self-rated health, difficulty in instrumental activities of daily living, worsening functioning, falls, social

Table 1. Health indicators and use of health services by living status.

Domain	Alone n (%) (total n = 860)	Living with others n (%) (total n = 1741)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
Fair/poor health ^a	241/850 (28.4)	376/1725 (21.8)	1.42 (1.2 to 1.7) ^f	1.33 (1.1 to 1.6) ^g
Difficulty in one or more BADL ^b	75/848 (8.8)	73/1720 (4.2)	2.19 (1.6 to 3.1) ^f	1.39 (0.95 to 1.0)
Difficulty in one or more IADL ^c	412/815 (50.6)	552/1690 (32.7)	2.11 (1.8 to 2.5) ^f	1.33 (1.1 to 1.6) ^g
Changed functioning	517/812 (63.7)	818/1690 (48.4)	1.87 (1.6 to 2.2) ^f	1.42 (1.2 to 1.7) ^f
Decreased functioning	384/797 (48.2)	578/1656 (34.9)	1.73 (1.5 to 2.1) ^f	1.27 (1.0 to 1.5) ^g
Multiple falls in last 12 months	139/818 (17.0)	138/1688 (8.2)	2.30 (1.8 to 3.0) ^f	1.99 (1.5 to 2.6) ^f
Activity limitation due to fear of falling	307/836 (36.7)	343/1714 (20.0)	2.32 (1.9 to 2.8) ^f	1.47 (1.2 to 1.8) ^f
Less than excellent or good vision ^d	239/842 (28.4)	385/1728 (22.3)	1.38 (1.2 to 1.7) ^f	1.13 (0.9 to 1.4)
Takes more than three medicines	284/814 (34.9)	551/1694 (32.5)	1.11 (0.9 to 1.3)	1.05 (0.9 to 1.3)
Impaired memory	101/807 (12.5)	153/1702 (9.0)	1.45 (1.1 to 1.9) ^g	1.20 (0.9 to 1.6)
Depressed mood	166/854 (19.4)	257/1732 (14.8)	1.38 (1.1 to 1.7) ^f	1.18 (0.9 to 1.5)
Socially isolated	190/842 (22.6)	197/1721 (11.4)	2.25 (1.8 to 2.8) ^f	2.18 (1.7 to 2.8) ^f
No emergency carer	284/830 (34.2)	137/1733 (7.9)	6.06 (4.8 to 7.6) ^f	6.16 (4.8 to 7.9) ^f
Low physical activity	221/792 (27.9)	355/1667 (21.3)	1.43 (1.2 to 1.7) ^f	1.09 (0.9 to 1.4)
High fat consumption	689/785 (87.8)	1476/1667 (88.5)	0.93 (0.7 to 1.2)	0.89 (0.7 to 1.2)
Low fruit and fibre in diet	537/799 (67.2)	1038/1675 (62.0)	1.26 (1.1 to 1.5) ^f	1.42 (1.2 to 1.7) ^f
Smokes tobacco	99/787 (12.6)	172/1647 (10.4)	1.23 (1.0 to 1.6)	1.63 (1.2 to 2.2) ^f
Hazardous alcohol use	140/825 (17.0)	376/1704 (22.1)	0.72 (0.6 to 0.9) ^f	1.20 (0.9 to 1.5)
SERVICE USE:				
Stayed overnight in hospital more than once in last 12 months	35/860 (4.1)	66/1741 (0.0)	1.08 (0.7 to 1.6)	1.01 (0.6 to 1.6)
Visited a doctor more than six times in last 12 months	180/860 (20.9)	412/1741 (0.2)	0.85 (0.7 to 1.0)	0.78 (0.6 to 1.0) ^g

^aOut of: excellent, good, fair, poor. ^bBADL = basic activities of daily living, self-perceived difficulty or need for assistance with: feeding, moving from bed to chair, getting to the toilet, dressing, bathing). ^cIADL = instrumental activities of daily living, self-perceived difficulty or need for assistance with: using the telephone, driving or using public transport, shopping, preparing meals, housework, DIY, laundry, taking medication, managing money. ^dOut of: excellent, good, fair, poor, very poor, completely blind. ^eadjusted for increasing age, female sex, education level and income. ^f $P < 0.005$. ^g $P < 0.05$. OR = odds ratio.

isolation, lack of emergency carer, lower consumption of fruit and fibre, and tobacco use. In terms of chronic conditions, arthritis and/or rheumatism, glaucoma and cataracts remain significantly more common.

Despite having poorer self-reported health, those living alone attend outpatient and general practice less often. Poorer functional ability and a greater number of falls in those living alone may inhibit access to services, but this finding requires further exploration. The overall prevalence of impaired mental mood was comparable to levels of depression found in other urban surveys of older people.²⁵ In contrast, no difference in mental health or memory loss was found when comparing the groups by living status. This was despite the living alone group being twice as likely to be at risk of social isolation, a finding explored further in an accompanying paper (this issue).²⁶ It should also be noted that living alone may be a positive state for some older people and hence have beneficial mental health effects.

The picture of chronic disease prevalence that emerges may explain the health status, risk factors, and the pattern of health service use found.

At a population level, non-disabled older persons registered with practices in suburban London living alone do not differ from those living with others with regard to visual problems, multiple medication use, basic activities of daily living, and the major pathologies that drive service use: heart and lung

diseases and diabetes. This is reflected in their comparable or lower use of services. Their perceived poor health, worsening functioning, and difficulties with instrumental activities of daily living may be related to three chronic conditions — glaucoma, cataract and arthritis and/or rheumatism — which can have a major impact on quality of life. The chronic eye and joint disease reported more frequently by those living alone may explain the increased likelihood of multiple falls in this group. The association between multiple falls and lone status remained significant after controlling for socioeconomic factors, major health indicators and health service use, although fear of falling is no longer associated with lone status.

Limitations of the study

This is a secondary analysis of data collected for a trial of health risk appraisal, which may lead to some bias in recruitment and response. It is not possible to determine causality due to the cross-sectional nature of the data. Analyses have been based on self-reported data and not on confirmed diagnoses or utilisation data; due to the number of variables included in the analyses, seemingly significant associations may have arisen by chance because of multiple comparisons. The significant difference in response rates between men and women may be due to this, as may be the adjusted OR for glaucoma in Table 2. The sample was drawn from four general

Table 2. Self-reported chronic conditions by living status and unadjusted and adjusted odds ratios of chronic conditions among those living alone.

Chronic condition	With others		P-value	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
	Alone n (%) (total n = 860)	n (%) (total n = 1741)			
High blood pressure	419/843 (49.7)	812/1727 (47.0)	0.20	1.11 (0.9 to 1.3)	1.03 (0.9 to 1.2)
Coronary heart disease/ heart attack	71/846 (8.4)	222/1722 (12.9)	<0.001	0.62 (0.5 to 0.8) ^c	0.78 (0.6 to 1.1)
Heart failure	20/838 (2.4)	43/1716 (2.5)	0.85	0.95 (0.6 to 1.6)	1.28 (0.7 to 2.3)
Irregular heart beat	132/842 (15.7)	299/1721 (17.4)	0.28	0.88 (0.7 to 1.1)	0.91 (0.7 to 1.2)
Stroke	41/844 (4.9)	87/1724 (5.0)	0.84	0.96 (0.7 to 1.4)	1.07 (0.7 to 1.6)
Chronic bronchitis/emphysema	41/845 (4.9)	76/1721 (4.4)	0.62	1.10 (0.8 to 1.6)	1.27 (0.8 to 1.9)
Asthma	111/839 (13.2)	210/1715 (12.2)	0.48	1.09 (0.9 to 1.4)	1.02 (0.8 to 1.3)
Arthritis/rheumatism	425/838 (50.7)	652/1717 (38.0)	<0.001	1.68 (1.4 to 2.0) ^c	1.36 (1.1 to 1.6) ^c
Osteoporosis	104/842 (12.4)	129/1721 (7.5)	<0.001	1.74 (1.3 to 2.3) ^c	1.02 (0.8 to 1.4)
Diabetes	64/843 (7.6)	152/1725 (8.8)	0.30	0.85 (0.6 to 1.2)	0.95 (0.7 to 1.3)
Depression	110/843 (13.0)	184/1720 (10.7)	0.10	1.25 (1.0 to 1.6)	1.19 (0.9 to 1.6)
Emotional or mental illness (other than depression)	22/840 (2.6)	37/1721 (2.1)	0.46	1.22 (0.7 to 2.1)	1.26 (0.7 to 2.2)
Glaucoma	58/842 (6.9)	86/1722 (5.0)	0.05	1.41 (1.0 to 2.0)	1.50 (1.0 to 2.2) ^p
Irreversible/ untreatable retinal disease	34/843 (4.0)	41/1717 (2.4)	0.02	1.72 (1.1 to 2.7) ^b	1.29 (0.8 to 2.2)
Cataracts	240/846 (28.4)	328/1718 (19.1)	<0.001	1.68 (1.4 to 2.0) ^c	1.25 (1.0 to 1.6)

^aadjusted for increasing age, female sex, education level, and income. ^bP<0.05. ^cP<0.005. OR = odds ratio.

practices in suburban London and the population studied may not be typical of other areas. The prevalence of health problems identified within this sample may be lower than that in the general population of older primary care patients, as people with disabilities were excluded.

Comparison with existing literature

These findings challenge the conclusions of a community survey of older people aged 75 years and over,⁸ carried out after the introduction of the 75 years and over annual health check²⁷ which concluded that those living alone were not a high risk group to be targeted for specific assessment, despite the younger mean age of those living alone in the community survey (76 versus 81 years of age).

Implications for future research and clinical practice

In this group of non-disabled older people living in a suburban area, those living alone do appear to have worse health status and health risk behaviours than those living with others, although they do not make greater use of ambulatory medical services. Some of this excess disability burden and health risk is due to age, sex, and educational differences between those living alone and those living with others. However, living alone itself appears to be associated with specific problems, like functional impairment, social isolation, joint disorders, multiple falls, and possibly eye disease which remain significantly higher, after controlling for socioeconomic factors, major health indicators, and health service use. Those implementing the NICE guidelines on falls prevention in primary care²⁸ could evaluate the use of lone status as one of the risk indicators for targeted interventions. The fact that those living alone had a lower use of ambulatory services despite having worse health deserves further evaluation, given the possibility that some of those living alone might be under served.

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Ethics committee

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Competing interests

The authors have stated that there are none

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REFERENCES

1. Department of Health. *The National Service Framework for Older People*. London: The Stationary Office, 2001.
2. Fletcher AE, Price GM, Ng ES, et al. Population-based multidimensional

assessment of older people in UK general practice: a cluster-randomised factorial trial. *Lancet* 2004; **364**: 1667–1677.

3. Office for National Statistics. 2001 Census. <http://www.statistics.gov.uk/cci/nugget.asp?ID=949> (accessed 15 Feb 2007).
4. Walker A, O'Brien M, Traynor J, et al. *Living in Britain. Results from the 2001 General Household Survey*. London: Office for National Statistics, 2002.
5. Jarman B. Identification of underprivileged areas. *BMJ* 1983; **286**: 1705–1709.
6. Drennan V, Iliffe S, Haworth D, et al. The feasibility and acceptability of a specialist health and social care team for the promotion of health and independence in 'at risk' older adults. *Health Soc Care Community* 2005; **13**(6): 136–144.
7. Routasalo P, Pitkala K. Loneliness among older people. *Rev Clin Gerontol* 2003; **13**: 303–311.
8. Iliffe S, Tai SS, Haines A, et al. Are elderly people living alone an at risk group? *BMJ* 1992; **305**: 1001–1004.
9. Stuck AE, Elkuch P, Dapp U, et al for the Pro-Age pilot study group. Feasibility and yield of a self-administered questionnaire for health risk appraisal in older people in three European countries. *Age Ageing*, 2002; **31**: 463–437.
10. Iliffe S, Kharicha K, Harari D, et al. Health risk appraisal for older people in general practice using an expert system: a pilot study. *Health Soc Care Community* 2005; **13**(1): 21–29.
11. Stuck AE, Kharicha K, Dapp U, et al. The Pro-Age study: an international randomised controlled study of health risk appraisal for older persons based in general practice. *BMC Med Res Methodol* 2007; **7**: 2
12. Katz S, Ford AB, Moskowitz RW, et al. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. *JAMA* 1963; **185**: 914–919.
13. Lawton MP, Brody EM. Assessment of older people: self-maintaining instrumental activities of daily living. *Gerontologist* 1969; **9**: 179–186.
14. Fried LP, Bandeen-Roche K, Chaves PHM, Johnson BA. Pre-clinical mobility predicts incident mobility disability in older women. *J Gerontol Med Sci* 2000; **55A**: M43–M52.
15. Kelsey JL, Browner WS, Seeley DG, et al. Risk factors for fractures of the distal forearm and proximal humerus. *Am J Epidemiol* 1992; **135**: 477–489.
16. Mangione CM, Lee PP, Pitts J, et al. Psychometric properties of the National Eye Institute Visual Function Questionnaire (NEI-VFQ). NEI-FVQ Field Test Investigators. *Arch Ophthalmol* 1998; **116**: 496–504.
17. Wasson J, Nierenberg D, Landgraf J, et al. The effect of a patient questionnaire on drug-related symptoms in elderly outpatients. *Ann Rev Geriatr Gerontol* 1992; **12**: 109–125.
18. Stewart AL, Hays RD, Ware JE. The MOS short-form general health survey: reliability and validity in a patient population. *Med Care* 1988; **26**: 724–732.
19. Riege WH. Self-report and tests of memory aging. *Clin Gerontol* 1982; **1**: 23–36.
20. Lubben JE. Assessing social networks among elderly populations. *Fam Comm Health* 1988; **11**: 42–52.
21. Washburn RA, Smith KW, Jette AM, Janney CA. The Physical Activity Scale for the Elderly (PASE): development and evaluation. *J Clin Epidemiol* 1993; **46**: 153–162.
22. Stoy DB, Curtis RC, Dameworth KS, et al. The successful recruitment of elderly black subjects in a clinical trial: the CRISP experience. Cholesterol Reduction in Seniors Program. *J Natl Med Assoc* 1995; **87**(4): 280–287.
23. Breslow L, Beck JC, Morgenstern H, et al. Development of a Health Risk Appraisal for the Elderly (HRA-E). *Am J Health Promot* 1997; **11**(5): 337–343.
24. Babor T, de la Fuente JR, Saunders J, Grant M. AUDIT — The Alcohol Use Disorders Identification Test: guidelines for use in primary health care. Geneva: World Health Organization, 1992.
25. Prince MJ, Harwood RH, Blizard RA, et al. Social support deficits, loneliness and life events as risk factors for depression in old age. The Gospel Oak Project VI. *Psychol Med* 1997; **27**: 323–332.
26. Iliffe S, Kharicha K, Harari D, et al. Health risk appraisal in older people 2: the implications for clinicians and commissioners of social isolation risk in older people. *Br J Gen Pract* 2007; **57**: 277–282.
27. Department of Health. *A new contract for general practice*. London: The Stationary Office, 1990.
28. National Institute for Clinical Excellence. *Falls: the assessment and prevention of falls in older people*. Clinical Guideline 21. London: NICE, 2004.