Age and Ageing 1997; **26**: 107–114

Activities of daily living: changes in functional ability in three samples of elderly and very elderly people

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Abstract

Objectives: to investigate changes in functional ability and physical health, psychiatric morbidity, life satisfaction, service use and social support.
Design: a structured interview survey of three samples of elderly people living at home at two points in time. The three samples comprised one census of people aged 85 and over [City (of London) and Hackney], and two random samples of people aged 65–84 (City and Hackney and Braintree). The follow-up interviews took place 2.5–3 years after the baseline interviews.
Setting: City and Hackney (East London) and Braintree (Essex). Respondents were interviewed at home by one of 12 trained interviewers.
Subjects: 630 people aged 85+ at baseline (70% response rate), and 78% of survivors re-interviewed at follow-up; 464 people aged 65–84 in Hackney at baseline (67% response rate), and 83% of survivors re-interviewed; 276 people aged 65–84 in Braintree at baseline (82% response rate), and 78% of survivors re-interviewed.
Main outcome measures: scores on scales of functional ability, psychiatric morbidity, life satisfaction and social support, and items measuring number and type of health symptoms and services used.
Conclusions: decreasing levels of physical functioning were associated with poor mental health, trouble with feet and problems with muscles and joints. There were no associations with level of physical functioning and use of rehabilitative or general medical services, use of social worker or carer relief. Few respondents used preventive or rehabilitation services.

Keywords: *old age, elderly, functional disability, foot problems, frailty, psychiatric morbidity*

Introduction

Increases in the numbers and proportions of very elderly people (aged 75 and over) have been greater than expected, and are projected to increase further in the UK and in other Western countries [1, 2]. The projected future increases in the size of this age group have implications for health and social service providers [3], particularly in relation to the needs of older women who have a higher life expectancy than men and may spend a longer time physically disabled [4, 5].

Most people aged 65 and over are able to perform all tasks of daily living (activities of daily living; ADL) unaided, although sometimes with difficulty. However, the prevalence of long-standing illness is high in older age groups. In the UK 63% of men and 67% of women aged 65 or over living in private households, who were included in the 1987 General Household Survey, reported a long-standing illness, disability or infirmity [6]. The 1984/85 Office of Population Censuses and Surveys Disability Surveys in the UK showed that the prevalence of severe disability was 133 per 1,000 for people aged 80 years and over, compared with 16 per 1,000 for people in their sixties and three per 1,000 for adults aged under 50 [7]. In the US it has been estimated that over three-quarters of elderly people report at least one chronic condition and nearly half a chronic condition which limits their activity [8, 9]. The higher reported prevalence in the USA probably reflects differences in the question wording in the surveys on which the estimates are based.

Longitudinal surveys have confirmed the evidence from cross-sectional studies that functional decline is associated with sex (females are more likely to decline)

and older age (e.g. [10-13]). Results based on representative samples of people in very old age groups are sparse, as few studies include sufficient numbers of people aged 85 and over to the groups to be allow analysed separately. These studies show a big increase in functional problems with increasing age [14]. In 1988 Jagger and Clarke [13] carried out a longitudinal health survey of a sample of 1329 people aged 75 and over in Leicestershire. Of those who were independent at baseline, 34% were still independent 7 years on, with dependency at follow-up being associated with health status at baseline. In 1985 Chirikos and Nestel [12] followed-up a sample of 5000 black and white men at 15 years after baseline data collection (aged 45-59 years at baseline). While function declined with age, some functional capacities were restored. The duration of most disabilities was about 30 months, but those 'lost' were often replaced by new disabilities. The Framingham study also indicated that older people were less disabled and impaired than commonly supposed [15, 16].

Reduced functional ability is associated with less favourable perceived health status [17]. In the UK the National Disability Survey emphasized the high prevalence in old age of disabilities affecting hearing, sight and mobility. Problems with feet were a common cause of walking difficulties in older people [7]. The most common causes of long-standing illness among people aged 75+ are arthritis and rheumatism, other bone and joint problems, cataracts, hypertension, heart attack and other cardiac problems [18]. More information is needed on the factors associated with decreasing levels of functioning, in order to mobilize more effective preventive and therapeutic programmes and improve elderly people's overall quality of life. Results from a national population survey of adults in England showed that loss of independence was a central concern in relation to ageing [19].

Chronic illnesses do not necessarily result in disability, and the prevalence of disability is lower than the prevalence of chronic illness. The World Health Organisation's 1980 classification [20] distinguished between impairments and handicaps. The relationship between impairment and disability depends not just on the severity of underlying pathological processes but also on host-environment interactions, in some cases, on therapeutic, prosthetic, social and other interventions, as well as the expectations of society [21, 22].

Aim of the study

This study was initially designed to assess health and well-being, social and domestic circumstances and need for health and social services among elderly people (aged 65-84) living in East London (City of London and Hackney) and Braintree in Essex (a deprived inner city and a more affluent semi-rural area, respectively) and very old people (aged 85 and over) living in the same East London area. The follow-up study documents changes in levels of physical, psychological and social well-being, and associations with these.

The aim of the analyses reported here was to investigate changes in functional ability and associations with these changes in relation to (reported) physical health, psychiatric morbidity, life satisfaction, service use and social circumstances. In particular, we wished to examine the extent to which social networks and social support were associated with outcome.

Subjects and methods

The study design was a structured interview survey and respondents were interviewed at home by one of 12 trained interviewers. All people aged 85 and over in 1987 who could be traced from Family Practitioner Committee (now Family Health Services Authority) records, and who were listed in the electoral rolls, were eligible for inclusion in the study. The baseline responders consisted of 630 people aged 85+; for 28 of these, interviews were carried out with their carers. The response rate was 70% (630); 28% (256) refused to be interviewed and 2% (14) were untraced. All contactable survivors were followed-up in 1990 (263 people had died), and 253 people were successfully re-interviewed (of these, 18 people had proxy interviews and 11 were interviewed in institutions). This equals a response rate of 78%; 7% (22) refused to take part, 9% (30) were untraced, 2% (six) were living in institutions and not re-interviewed and 4% (15) were either ill or away at the time of the re-interviews. Respondents were interviewed over a 6 month period. The responses of those who lived in institutions were analysed separately. The improved response rate at follow-up reflects the nature of the follow-up sample — they were a sample of people who had previously responded to the study.

The two 65-84-year-old samples comprised random samples of people in these age groups, also drawn from the (then) Family Practitioner Committee records, and included in the sample if they were also on the electoral roll. The baseline response rates for the Hackney sample was 464 (67%, including two proxy interviews); 19% (130 people) refused to take part, 11% (76) were untraced and 2% (21) were away or ill at the time of the study. The response rate in Braintree was 276 (82%); 8% (22) refused to take part; 9% (30) were untraced and 1% (five) were ill or away at the time of the study. Interviews were conducted over 6 months. All contactable survivors were followed-up 2.5-3 years later (the re-interviewing process occurred over a 6 month period). The follow-up response rate for the younger Hackney sample was 83% (330

interviewed, including two proxies); 6% (22) refused, 9% (37) were untraced, 2% (six) were ill or away and 1% (four) had moved into institutions. Fifty-eight people had died. The response rate for the Braintree sample at follow-up was 78% (195 interviewed, including three proxies); 13% (33) refused, 6% (15) were untraced, 2% (four) were ill or away and 2% (four) had moved into institutions. Twenty-five people had died.

The response rates at baseline between the two Hackney samples were not significantly different. The response rate for the Braintree sample, however, was better, which matches findings from other studies (response rates are lower among urban populations). The differences between follow-up response rates between the three samples were not statistically significant. They were fairly high, as would be expected among samples of previous responders.

Measures

The measurement scales used [23-28] were chosen after consideration of their reliability and validity [27, 32-37]. The scales included a measure of functional ability (ADL, adapted Townsend ADL scale [26, 27]), psychiatric morbidity (General Health Questionnaire-28; GHQ [23]), life satisfaction (Neugarten's Life Satisfaction Index A [24] and Delighted-Terrible Faces Scale [25]), social networks and support [28] and single items measuring other main variables (including a check-list of health symptoms and use of health and social services). A standard 10 item mental confusion check-list (e.g. date, time, place, address) was used by interviewers, all 12 of whom underwent 1 week of intensive training with the authors.

Results were analysed using the Statistical Package for the Social Sciences (10th version). Univariate and bivariate statistics were carried out, including χ^2 tests, Pearson's product moment correlation, Spearman's Rank correlation and Wilcoxon tests of significance.

Total base numbers vary due to item non-response, which was problematic in relation to the longitudinal results in the case of small sample sizes. While results are presented for the three samples for changes in functional ability, only the two Hackney samples have been analysed for associations with changes in functional ability as too few of the younger Braintree sample had changed for valid analyses.

Results

Characteristics of the sample

The characteristics of the three samples at follow-up are shown in Table 1. Most were female, and most of the older Hackney sample were widowed and lived alone. Although there were more people who rented their accommodation from the local authority (council) in the inner city (Hackney) samples, there was little difference in income between the three samples.

Six per cent of respondents living in Hackney who were aged 65-74 and 6% of those aged 75-84 were rated as mentally confused by interviewers, as were 11% of those aged 85+. In Braintree 2% of those aged 65-74 and 9% of those aged 75-84 were rated as mentally confused. At follow-up the numbers were 10% of the Hackney sample aged 65-84 and 19% of the Hackney sample aged 85+, while in Braintree 9% were rated as mentally confused. These respondents were not asked to complete the GHQ or other measurement scales and, where possible, a brief proxy interview was conducted instead, but not included in the analyses presented here.

Functional ability

Table 2 shows the movement between functional ability groups in the three samples between intervals. The 85+ sample showed the most deterioration (Table 2a). Table 2b shows that the Braintree sample had slightly higher levels of (good) functioning in both years.

Testing of the ADL scale was carried out across the three samples, and results were highly statistically significant indicating that the scale has good reliability. The ADL scale items correlated moderately to well with comparable items on dressing self, trouble with steps/stairs, walking outdoors and walking indoors from the Nottingham Health Profile [29], which was used for a sub-sample (0.350-0.635, all significant at the $P<0.0001$ level) (0.635, $P<0.0001$; 0.565, $P<0.0001$; 0.350, $P<0.004$; and 0.472, $P<0.0001$, respectively). Inter-item correlations across the whole scale ranged from 0.13 to 0.74. Inter-item correlations (α) for the sub-sections were high: for the personal care sub-section they ranged from 0.70 to 0.75, for the domestic task sub-section they were 0.80-0.85, and for the mobility sub-section they were 0.81-0.89. Split half reliability was 0.78-0.91 between the three baseline samples.

ADL score at baseline and at follow-up were strongly associated (raw scores, Pearson's correlation $r=0.75$, $P<0.01$ for the sample aged 85+; $r=0.76$, $P<0.01$, sample aged 65-84 in Hackney; $r=0.87$, $P<0.01$, sample aged 65-84 in Braintree). Wilcoxon's tests also showed that the degree of change in ADL scores between interviews was also highly significant ($z=-8.1710$, $P<0.0001$ for the sample aged 85+; $z=-6.4319$, $P<0.0001$ for the sample aged 65-84 in Hackney; $z=-4.5599$, $P<0.0001$ for the sample aged 65-84 in Braintree). The changes in the sub-categories for domestic tasks, mobility and personal care tasks were all significant. In addition, taking just those who said they had severe difficulties going outdoors, could only go out with help or could not go out at all (the

Table 1. Characteristics of the samples at follow-up

	Follow-up characteristics					
	Hackney, age at baseline					
	85+		65-84		Braintree, age 65-84 at baseline	
	%	(*n*)	%	(*n*)	%	(*n*)
Age (years)						
65-74	-	(-)	38	(124)	50	(7)
75-84	-	(-)	56	(182)	46	(89)
85-94	88	(223)	6	(19)	4	(8)
95-100	9	(22)	-	(-)	-	0
>100	3	(7)	-	(-)	-	0
Gender						
Male	16	(41)	40	(134)	30	(58)
Female	84	(212)	60	(198)	70	(136)
Marital status						
Widowed	78	(197)	44	(145)	53	(102)
Single	11	(27)	12	(41)	2	(6)
Married	9	(22)	38	(124)	41	(80)
Divorced/separated	2	(5)	6	(20)	3	(5)
Household type						
Living alone	65	(165)	51	(169)	40	(78)
Living with one other	24	(60)	40	(133)	60	(116)
Living with 2+ others	11	(27)	9	(28)	-	0
Housing tenure						
Council tenant	64	(157)	66	(218)	37	(71)
Private tenant	20	(49)	19	(63)	7	(14)
Owner occupier	16	(38)	14	(46)	55	(107)
Other	-	(-)	1	(5)	1	(2)
Weekly income (£)						
<50	21	(30)	30	(76)	26	(41)
50-100	78	(114)	64	(165)	64	(101)
>100	1	(2)	6	(16)	10	(15)
GHQ score						
0-5	70	(132)	82	(214)	85	(156)
6+ (case)	30	(56)	18	(46)	15	(28)
Neugarten life satisfaction score[a]						
Poor (1-10)	39	(79)	29	(83)	23	(43)
Medium (11-14)	30	(61)	37	(109)	32	(59)
Good (15-20)	31	(63)	34	(99)	45	(84)
ADL score[b]						
Low (best)	13	(26)	65	(198)	74	(146)
Medium	33	(69)	25	(76)	15	(30)
High (worst)	54	(113)	10	(32)	11	(21)
No. of responders	188-253		257-332		157-197	

[a]Poor, 1-10; medium, 11-14; good, 15-20.
[b]Low, 0-40; medium, 41-70; high, >71.
ADL, activities of daily living; GHQ, General Health Questionnaire-28.

housebound group), few improved to being able to get out to some extent by follow-up (14% of the Hackney sample aged 85+; 3% of the Hackney sample aged 65-84—or 2% of the Hackney sample aged 65-74 and 4% of the Hackney sample aged 75-84—and 1% of the Braintree sample aged 65-84—or 1% of the Braintree sample aged 65-74 and 2% of the Braintree sample aged 75-84). There was no association between being housebound and whether respondents lived on the ground floor, or a higher level floor.

Table 2a. Activities of daily living scores: 1987 and 1990 Hackney sample aged 85+ (survivors)

	1987 score							
	Low (best)		Medium		High (worst)		Total	
1990 score	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
Low (best)	41	(22)	2	(1)	-	(-)	15	(23)
Medium	44	(24)	55	(28)	7	(4)	35	(56)
High (worst)	15	(8)	43	(22)	93	(50)	50	(80)
Total respondents	34	(54)	32	(51)	34	(54)	100	(159)

Scores: low, 0-40; medium, 41-70; high, >71.
χ^2, 91:10, 4 d.f.; $P < 0.000001$.

Table 2b. Activities of daily living scores 1989 and 1991, Hackney and Braintree samples, aged 65-84

	1989 score							
	Low (best)		Medium		High (worst)		Total	
1991 score	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
Hackney								
Low (best)	83	(183)	18	(10)	13	(3)	66	(196)
Medium	16	(34)	65	(35)	17	(4)	25	(73)
High (worst)	1	(3)	17	(9)	70	(16)	9	(28)
Total respondents	74	(220)	18	(54)	8	(23)	100	(297)
Braintree								
Low (best)	90	(131)	25	(5)	-	(-)	79	(136)
Medium	9	(13)	40	(8)	29	(2)	13	(23)
High (worst)	1	(2)	35	(7)	71	(5)	8	(14)
Total respondents	84	(146)	12	(20)	4	(7)	100	(173)

Scores: low, 0-40; medium, 41-70; high, >71.
Hackney: χ^2, 187, 4 d.f.; $P < 000001$.
Braintree: χ^2, 8993, 4 d.f.; $P < 000001$.

Associations with changes in functional ability in the older and younger Hackney samples

Table 3 shows (row percentages displayed) that the oldest group (85+) were more likely to have high (poor) or medium/high ADL scores at both baseline and follow-up, and the two younger (65+) samples were most likely to have low (good) ADL scores at both intervals.

It was not possible to carry out any further analyses for the Braintree sample due to too small numbers in each change category (see Table 3). However, the two Hackney samples are presented here and they do provide comparisons for each variable, with age group within the same district.

The single physical health symptom which was consistently significantly associated with chronic ADL scores and with deterioration in ADL in both samples, and at both baseline and follow-up interviews, was trouble with feet. For example, of the 85+ sample at baseline, 9% of the group with low (good) ADL scores, 54% of the chronic group and 16% of those who deteriorated reported trouble with their feet (only four people improved and were therefore excluded from analyses; $P < 0.001$). At follow-up interview, this association was similar, and even more pronounced for those who deteriorated: the comparable proportions were 5% (good ADL), 52% (chronic) and 38% (deteriorated) respectively ($P < 0.001$). Among the 65-84-year-old group at baseline, 20% of those with low (good) ADL scores, 63% of the chronic group, 46% of the group who deteriorated and six of the 11 who improved reported trouble with their feet ($P < 0.00001$); at follow-up, this association was similar, and again even more pronounced among those who deteriorated; the comparable proportions were 24%

Table 3. Changes in activities of daily living scores for longitudinal analyses (row%)

	ADL scores								
	Low (good)[a]		High (poor)[b]		Deteriorated[c]		Improved[d]		
Location/age	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	No. of respondents
Hackney									
85+	14%	(21)	65%	(101)	20%	(31)	1%	(2)	155
65-84	62%	(183)	22%	(64)	12%	(37)	4%	(13)	297
Braintree									
65-84	76%	(131)	13%	(22)	8%	(15)	3%	(5)	173

[a]Low at baseline and follow-up.
[b]Medium/high at baseline at follow-up.
[c]Low at baseline; medium/high at follow-up.
[d]Medium/high at baseline; low at follow-up.

(good ADL), 58% (chronic), 60% (deteriorated) and four of the 11 who improved respectively ($P < 0.00001$).

Associations between ADL and reported aches/pains/stiffness in muscles/joints were less consistent across the samples. The associations were significant at both intervals for the 85+ group, but at follow-up only for the 65-84-year-old group. For example, at baseline, of the 85+ group, 50% of those with low (good) ADL scores, 81% of the chronic group and 56% of those who deteriorated reported aches/pains/stiffness ($P < 0.001$); at follow-up the proportions were comparable at 46, 86 and 69% respectively ($P < 0.0001$). Among the 65-84 group at follow-up (but not at baseline), the association between ADL and aches/pains/stiffness was significant: 56% of those with low (good) ADL scores, 80% of the chronic group, 62% of those who deteriorated and five of the 11 who improved reported these symptoms ($P < 0.01$).

High GHQ scores, indicative of anxiety and depression, were also consistently associated with chronic ADL scores and with deterioration. For example, of the 85+ group at baseline, none of those with low (good) ADL scores had a GHQ score over the threshold, 31% of the chronic group and 27% of the group who deteriorated had high GHQ scores ($P < 0.05$). At follow-up, the comparable proportions were 0, 40 and 23% respectively ($P < 0.01$). Of the 65-84-year-old group at baseline, 5% of those with low (good) ADL scores, 34% of the chronic group, 18% of the group who deteriorated and four of the 11 who later improved, scored over the threshold with the GHQ ($P < 0.00001$); at follow-up the comparable proportions were 8, 39, 33 and 0% respectively ($P < 0.001$). Associations with current and overall life satisfaction, while statistically significant, were not consistent. There were no associations with changes in functioning and social network or support variables.

Some comment should be made about respondents whose level of functioning in relation to ADL improved between interviews. The number of respondents who had improved was small, and thus figures should be interpreted with caution. Of those aged 65-84, those who improved were less likely to report problems with their feet at follow-up interview, in comparison with their reports at baseline, suggesting improvements (see earlier).

Far fewer of this group reported problems with aches/pains/stiffness in muscles/joints at follow-up, in comparison with their reports at baseline, also suggesting improvements. These improvements contrast with the more stable reporting of these problems at both intervals among the other groups. The GHQ scores of this group at follow-up had also improved—while at baseline they were most likely to score over the threshold on the GHQ, at follow-up none of the improved group scored over the threshold, indicating that improvements in physical health and ability were associated with improvements in mental health. Only four people aged 85+ had improved, making comparisons impossible.

In relation to service use, previous analyses showed that, although those with a high ADL score in both years—the chronic group aged 65-84 and 85+—were the heaviest users of services of all types (except dentist and optician in the case of those aged 65+), few respondents (<9%) in any group used carer relief services, occupational therapy or physiotherapy (preventive and rehabilitation services) [38, 39]. There were no associations with level of physical functioning and use of social worker, carer relief, occupational therapy, physiotherapy or contact with general practitioner. In addition, associations between changes in ADL scores and social network and social support variables were either non-significant or showed inconsistent trends. Cross-tabulations of baseline, follow-up and changes in ADL scores with social class, income and housing tenure were inconsistent and mostly non-significant across the samples.

Discussion

Most British information about the functional ability of elderly people is based on cross-sectional data. However, selective survival results in older people being a sub-set of persons from a larger cohort existing at a previous time. Thus, one should be cautious about drawing conclusions from cross-sectional data sets, since people with certain characteristics may have been systematically removed. The strength of this study is its longitudinal design, and the verification of the results in three independent samples. It is limited, by the study definition, to people living in the community and to healthier elderly people who survive into very old age. It is unknown to what extent the non-responders led to any sample bias. While there were no differences in age and sex and response, the non-responders may have been different from responders in other ways. Any differences between the two groups in relation to health status (survival period and cause of death) can be examined in the future when their death certificates have all been returned.

This survey shows that the inner city Hackney sample had poorer functional ability than the semi-rural Braintree sample of the same age. Increasing and chronic frailty was clearly associated with poor mental health (psychosomatic symptoms and a high GHQ score), with physical problems relating to trouble with feet and, particularly in those aged 85+, problems with joints and muscles. Few respondents in any group used carer relief services, occupational therapy or physiotherapy (preventive and rehabilitation services). There were no associations between changes in functioning and social network or social support variables.

The lack of overall association with level of functioning and social class, income and tenure (except perhaps in Braintree with the latter) is unexpected. Although social class is a problematic variable to measure among older people, income should be a fairly good indicator of social deprivation. Although there was no evidence of this association from this study, there is evidence to support a convincing link between lower socio-economic status and poorer health (see review by Finstein [30]); the mechanisms by which this process operates are not understood [31].

The importance of maintaining and improving good levels of functioning in old age cannot be over-emphasized. Analyses of depression and life satisfaction among the baseline and follow-up respondents show that decline in health and functional ability was the strongest predictor of depression, worsening of depression over time and low life-satisfaction [32-37]. Our results suggest that services were being targeted effectively in that the respondents who were least functionally able made the greatest use of services [38, 39], but that little attention was being paid to secondary prevention or rehabilitation. As yet it is unclear whether the UK's NHS and Community Care Act [40], implemented after the study reported here, will alter this picture.

Key points

- Decreasing levels of physical functioning are associated with poor mental health, trouble with feet and problems with muscles and joints.
- There is no association between changes in level of physical functioning and social network or support.
- There is no association between the level of physical functioning and use of social worker, carer relief, occupational therapy, physiotherapy or contact with general practitioner.
- Few of the UK population studied use preventive or rehabilitation services.

Acknowledgements

The authors would like to thank the interviewers and respondents without whom this study would not have been possible, in particular Morag Farquhar for data collection and Lesley Marriott for administrative assistance. We are grateful to City and Hackney Health Authority and Social Services Department and Mid-Essex Health Authority for funding the baseline survey and the Joseph Rowntree Foundation for funding the follow-up study.

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Received in revised form 4 October 1996