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Occupational class differences in later life hospital use by women who survived to age 80: the Renfrew & Paisley prospective cohort study

Abstract

Background

Population ageing challenges the sustainability of healthcare provision.

Objective

To investigate occupational class differences in hospital use in women aged 80+ years

Methods

8353 female residents, aged 45-64, took part in the Renfrew and Paisley prospective cohort study in 1972-76. Information on general and mental health hospital discharges was provided from computerised linkage with the Scottish Morbidity Records data to 31/12/2012. Numbers of admissions and bed-days after the 80th birthday were calculated for all and specific causes. Rate ratios by occupational class were calculated using negative binomial regression analysis, adjusting for age and a range of risk factors.

Results

4,407 (56%) women survived to age 80 and had 17,563 general admissions thereafter, with a mean stay of 19.4 days. There were no apparent relationships with occupational class for all general admissions, but lower occupational class was associated with higher rate ratios for coronary heart disease and stroke and lower rate

ratios for cancer. Adjustment for risk factors could not fully explain the raised rate ratios. Bed-day use was higher in lower occupational classes, especially for stroke. There were strong associations with mental health admissions, especially dementia. Compared with the highest occupational class, admission rate ratios for dementia were higher for the lowest occupational class (adjusted rate ratio =2.60, 95% confidence interval 1.79 to 3.77).

Conclusion

In this population, there were no socioeconomic gradients seen in hospital utilisation for general admissions in old age. However, occupational class was associated with mental health admissions, coronary heart disease, stroke and cancer.

Introduction

Success in reducing premature mortality from firstly infectious diseases and more recently cardiovascular diseases (CVD) and cancer, has led to an ageing population in many countries and increasing demands on health services[1]. Nearly a quarter of men and women aged 85 in a study in Newcastle (UK) had an overnight hospital admission in the previous year and nearly a third had an outpatient attendance in the previous 3 months[2]. In the Scottish Health Surveys of 2008-10, over a fifth of men and women aged 80 and over had consulted a GP in the previous 2 weeks[3]. The rise in the proportion of elderly is set to continue, with serious implications for health service use[3].

Poorer socioeconomic position is related to higher health service use, which can at least partly be accounted for by variation in health status[4,5]. It is not clear whether this is still the case in older age groups. This study investigated whether there were any occupational class differences in hospital use by women aged 80 and over, and if they could be explained by baseline characteristics, using data from a prospective cohort study from Scotland.

Methods

The Renfrew and Paisley study was conducted between 1972 and 1976 on adults aged 45-64 years living in the two towns in the west of Scotland[6]. Almost 80% took part, a total of 15,402 participants (7049 men and 8353 women). Details are given in Appendix 1 in supplementary data on the journal website.

Follow-up for deaths and embarkations (leaving the UK) was provided by flagging with the NHS Central Register, from the date of screening examination to the end of 2012. A computerised linkage was made with the Scottish Morbidity Records system[7]. Hospital discharges from general and mental health hospitals occurring in the follow-up period in Scotland were used, in women who had reached the age of 80. Further details are given in Appendix 2 in supplementary data on the journal website. Excluded from this study were 13 women who were lost to follow-up, 74 known to have left the UK, one who died on her 80th birthday and 349 with missing occupational class. The analysis was performed on 4407 women who survived to age 80.

Statistical analysis

Numbers of admissions were added for each participant, with transfer admissions included as part of the initial admission. Bed-days were calculated by subtracting the date of admission from the date of discharge and adding 1 to ensure day cases were includedexcept for transfer admissions. Person years were calculated from the 80th birthday to date of death or the end of 2012 as appropriate. Negative binomial regression analysis was used to calculate the rate ratio for admissions (and bed-days) by occupational class, using Stata version 11. Occupational class I & II combined was taken as the baseline category. Analyses were first adjusted for age, and then further adjusted for risk factors measured at baseline: systolic blood pressure, cholesterol, body mass index, height, FEV1, angina, ischaemic ECG, bronchitis and smoking.

Age adjusted trends by occupational class of variables at screening used the six occupational classes as a continuous variable, with regression analysis for continuous variables and logistic regression analysis for proportions.

Declaration of Sources of Funding

This work was supported by NHS Health Scotland [to CH]. NHS Health Scotland played no role in the design, execution, analysis and interpretation of data.

Results

Of the 4407 women who survived to the age of 80, 3098 (70.3%) died between their 80th birthday and the end of follow-up.

Variables measured at screening were socially patterned (table 1). There were increasing trends by occupational class for age, systolic blood pressure, bronchitis and current smoking. BMI and the percentages overweight and obese were higher in the manual compared to the non-manual occupational classes. There were decreasing trends across occupational class for cholesterol, height, percent predicted FEV1 and the percentage who were never smokers.

The women had a total of 17,563 general admissions after their 80th birthday, with average length of stay 19.4 days. Average length of stay was 15.2, 19.4, 19.9 and 21.7 days for occupational classes I&II, III non manual, III manual, and IV&V respectively. The number of general admissions after age 80 was not related to occupational class, but the number of bed-days was higher in the lowest occupational classes (table 2). Adjustment for risk factors explained this increase. Admissions and

bed-days for CVD were higher in occupational classes IV&V compared with occupational classes I&II, and were explained after adjusting for risk factors. Admissions for CHD were higher in manual classes, compared to classes I&II. Rate ratios were attenuated when adjusting for other risk factors, but the higher relationships remained. There was no clear pattern with bed-days for CHD, except a suggestion of higher bed-days in women from the lowest occupational class. Both admissions and bed-days for stroke were higher in manual classes, remaining significantly higher for classes IV&V after adjustment. Admissions for respiratory disease increased with lower occupational class, but the relationship did not remain after adjustment. Bed-days for respiratory disease were less clear. Cancer admissions and bed-days were higher in occupational classes I&II compared to the other occupational classes, both before and after adjustment for risk factors. Bed-days were particularly low in occupational classes IV&V.

Mental health admissions increased with lower occupational class and were more than double in classes IV&V as in classes I&II. Adjustment for other risk factors had little effect. Mental health bed-days followed a similar pattern. A large proportion of the mental health admissions were for dementia, and had a steeper gradient with class.

Discussion

In this cohort, there were no apparent relationships with occupational class for general admissions after age 80, but this masked positive associations with lower occupational class for CHD and stroke, and negative associations for cancer. There were marked

socioeconomic gradients in hospital utilisation with dementia. Higher use of bed-days in lower occupational classes, especially for stroke, was apparent.

A study of men and women in Rome aged 75+ found lower socioeconomic status was related to more admissions and longer length of stay[8]. Associations were similar for diabetes, heart failure, stroke and chronic obstructive pulmonary disease . A study of community-dwelling men and women with home care found that those with economic hardship were more frequently hospitalised than those without [9].

An American study found that higher education was related to lower bed-days, and fewer chronic conditions [10]. A study in Finland showed bed days in women aged 70+ with basic compared to higher education[11].

In the current study, marked social patterning of hospital admissions among women aged over 80 was most apparent for dementia. This could be due to a number of factors, including higher rates of dementia among women in lower social positions or higher rates of admission because of less support at home or lack of alternative care arrangements. A number of studies have shown that higher rates of dementia are associated with lower socio-economic status. A small Swedish study found that the risk of developing Alzheimer's disease was more strongly associated with educational attainment than occupational status[12]. Poorer socioeconomic factors are thought to be related to development of Alzheimer's disease and dementia[12-14] and there may be interactions between genetic and environmental factors[14,15]. A rapid growth in dementia-associated hospitalisations among the 85 years and over age group has been predicted in the United States (US)[16].

Strengthswere the cohort included almost 80% of all the 45-64 year olds in two typical industrial towns in the west of Scotland: the high response rate means the sample is likely to be representative of this and similar populations. The study used occupational class, which is a more accurate indicator of social position in adult life than educational attainment or area-based measures often used in other studies. In particular, it avoids socioeconomic status misclassification due to changes in address as individuals move into communal care establishments in later life. The baseline data included a wide range of social and biological risk factors. Through linkage, loss to follow-up is low and the completeness of notification of death and hospital admissions is high.

Limitations includedgiven the relatively small proportion of men surviving to 80 in this population (36%), we only included women in the study, so results may not be applicable to men. Risk factors used for adjustment were measured at screening when the women were aged 45-64: changes in those risk factors may have occurred in the intervening period and may have been socially patterned. Baseline risk factors were not as relevant to mental health admissions as to general admissions. We could therefore not adjust completely in the mental health analyses. The data was limited to hospitals, so excluded nursing homes. We had too few events to look at mental health subgroups, except for dementia.

Conclusions

In this population, there were no socioeconomic gradients seen in hospital utilisation for general admissions in old age. However, occupational class was associated with mental health admissions, especially dementia, and with CHD, stroke and cancer even after accounting for baseline risk factors.

Acknowledgements

XX conducted the original study and YY was the administrator. The Privacy Advisory Committee of NHS Scotland Information Services gave permission for use of the hospital data.

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Table 1 Age adjusted variables at screening by occupational class in 4407 Renfrew & Paisley women who survived to age 80

	All	Occupational class				
		I & II	IIIN	IIIM	IV & V	Trend over all 6 occupational classes
Number of women in original cohort	7916	1436	1960	1469	3051	
Number of women (%) surviving to age 80	4407 (55.7%)	892 (62.1%)	1165 (59.4%)	757 (51.5%)	1593 (52.2%)	
Mean age at screening (years)	54.4 (54.3 – 54.6)	53.9 (53.5 – 54.2)	53.9 (53.6 – 54.2)	55.3 (54.9 – 55.7)	54.7 (54.4 – 55.0)	P<0.0001
Mean systolic blood pressure (mmHg)	148.0 (147.3 – 148.7)	146.1 (144.7 – 147.5)	146.4 (145.1 – 147.8)	150.2 (148.4 – 151.9)	148.7 (147.5 – 149.8)	P=0.001
Mean cholesterol (mmol/l)	6.43 (6.40 – 6.46)	6.49 (6.43 – 6.56)	6.47 (6.41 – 6.53)	6.45 (6.36 – 6.53)	6.36 (6.31 – 6.41)	P<0.0001
Mean body mass index (kg/m^2)	25.7 (25.6 – 25.8)	25.1 (24.8 – 25.3)	25.0 (24.8 – 25.2)	26.3 (25.9 – 26.6)	26.3 (26.1 – 26.5)	P<0.0001
Mean height (cm)	158.0 (157.8 – 158.2)	159.5 (159.1 – 159.9)	158.9 (158.6 – 159.2)	157.5 (157.0 – 157.9)	156.7 (156.4 – 157.0)	P<0.0001
Mean % predicted FEV1	96.5 (95.9 – 97.2)	100.3 (98.9 – 101.7)	99.1 (97.9 – 100.4)	95.5 (93.9 – 97.2)	93.0 (91.9 – 94.1)	P<0.0001
Mean cigarettes/day in current smokers	14.3 (14.0 – 14.6)	14.8 (14.0 – 15.6)	13.5 (12.9 – 14.0)	13.7 (12.9 – 14.6)	14.9 (14.4 – 15.4)	P=0.07
% overweight	38.6 (37.1 – 40.0)	36.6 (33.4 – 39.7)	33.5 (30.8 – 36.3)	42.3 (38.7 – 45.8)	41.2 (38.7 – 43.6)	P=0.001
% obese	13.2 (12.2 – 14.2)	8.9 (7.1 – 10.8)	9.9 (8.1 – 11.6)	15.2 (12.7 – 17.8)	16.7 (14.9 – 18.5)	P<0.0001

% angina	8.1 (7.3 – 8.9)	7.2 (5.5 – 9.0)	6.9 (5.4 – 8.4)	10.6 (8.5 – 12.8)	8.1 (6.7 – 9.4)	P=0.18
% ischaemic ECG	7.6 (6.9 – 8.4)	7.7 (6.0 – 9.5)	6.2 (4.8 – 7.6)	9.6 (7.6 – 11.7)	7.4 (6.2 – 8.7)	P=0.92
% bronchitis	2.1 (1.7 – 2.6)	0.7 (0.1 – 1.2)	1.4 (0.7 – 2.2)	2.1 (1.1 – 3.1)	3.4 (2.6 – 4.3)	P<0.0001
% current smoker	38.3 (36.9 – 39.7)	34.9 (31.8 – 38.0)	36.7 (33.9 – 39.5)	36.4 (32.9 – 39.9)	43.0 (40.6 – 45.4)	P<0.0001
% never smoker	53.5 (52.0 – 55.0)	56.5 (53.2 – 59.7)	53.5 (50.6 – 56.4)	56.7 (53.1 – 60.2)	49.8 (47.4 – 52.2)	P=0.001
% ex-smoker	8.2 (7.4 – 9.0)	8.5 (6.7 – 10.3)	9.7 (8.0 – 11.4)	6.8 (5.0 – 8.7)	7.2 (5.9 – 8.5)	P=0.026

FEV1 – forced expiratory volume in 1 second
ECG - electrocardiogram

Table 2 Admissions and bed-days after 80th birthday by occupational class: 4407 Renfrew & Paisley women who survived to age 80

	Occupational class			
	I & II	IIIN	IIIM	IV & V
No. of women	892	1165	757	1593
Person years	6461.1	8563.5	5514.4	11,270.9
All general admissions				
No. of admissions	3674	4701	2993	6195
Admissions/1000 person years	568.6	549.0	542.8	549.6
Rate ratio$_1$	1	0.95 (0.87 – 1.04)	0.97 (0.88 – 1.08)	0.98 (0.89 – 1.06)
Rate ratio$_2$	1	0.96 (0.87 – 1.05)	0.95 (0.86 – 1.06)	0.94 (0.86 – 1.02)
No. of bed-days	55,814	91,075	59,585	134,517
Bed-days/1000 person years	8638	10,635	10,805	11,935
Rate ratio$_1$	1	1.10 (0.97 – 1.25)	1.0 (0.87 – 1.15)	1.17 (1.04 – 1.32)
Rate ratio$_2$	1	1.06 (0.94 – 1.20)	0.92 (0.80 – 1.05)	1.04 (0.92 – 1.17)
Cardiovascular disease admissions				
No. of admissions	582	747	522	1164
Admissions/1000 person years	90.1	87.2	94.7	103.3
Rate ratio$_1$	1	0.99 (0.83 – 1.17)	1.05 (0.87 – 1.27)	1.18 (1.0 – 1.39)
Rate ratio$_2$	1	1.0 (0.84 – 1.19)	1.01 (0.84 -1.22)	1.11 (0.94 – 1.31)
No. of bed-days	11,213	20,048	13,166	40,693
Bed-days/1000 person years	1735	2341	2388	3610
Rate ratio$_1$	1	1.03 (0.76 – 1.39)	1.02 (0.74 – 1.43)	1.47 (1.11 – 1.94)
Rate ratio$_2$	1	1.10 (0.81 – 1.49)	0.99 (0.71 – 1.40)	1.34 (0.99 – 1.81)
Coronary heart disease admissions				
No. of admissions	112	168	170	325
Admissions/1000 person years	17.3	19.6	30.8	28.8
Rate ratio$_1$	1	1.17 (0.83 – 1.65)	1.80 (1.26 – 2.59)	1.79 (1.31 – 2.45)

Rate ratio$_2$	1	1.17 (0.83 – 1.64)	1.60 (1.12 – 2.28)	1.54 (1.11 – 2.12)
No. of bed-days	1621	2096	1646	4708
Bed-days/1000 person years	251	245	298	418
Rate ratio$_1$	1	0.65 (0.37 – 1.13)	0.79 (0.43 – 1.46)	1.66 (0.98 – 2.81)
Rate ratio$_2$	1	0.80 (0.44 – 1.46)	0.78 (0.41 – 1.49)	1.65 (0.90 – 3.03)
Stroke admissons				
No. of admissions	129	185	140	301
Admissions/1000 person years	20.0	21.6	25.4	26.7
Rate ratio$_1$	1	1.11 (0.83 – 1.48)	1.29 (0.94 – 1.76)	1.37 (1.05 – 1.79)
Rate ratio$_2$	1	1.12 (0.84 – 1.50)	1.22 (0.90 – 1.69)	1.33 (1.01 – 1.75)
No. of bed-days	4239	10,633	8163	23,092
Bed-days/1000 person years	656	1242	1480	2049
Rate ratio$_1$	1	1.62 (0.93 – 2.81)	2.05 (1.10 – 3.80)	2.58 (1.53 – 4.35)
Rate ratio$_2$	1	1.73 (0.97 – 3.11)	1.74 (0.91 – 3.33)	2.17 (1.23 – 3.82)
Respiratory admissions				
No. of admissions	215	356	225	531
Admissions/1000 person years	33.3	41.6	40.8	47.1
Rate ratio$_1$	1	1.17 (0.91 – 1.51)	1.22 (0.92 – 1.61)	1.39 (1.10 – 1.75)
Rate ratio$_2$	1	1.12 (0.88 – 1.42)	1.05 (0.80 – 1.38)	1.10 (0.87 – 1.39)
No. of bed-days	4119	6683	4628	9979
Bed-days/1000 person years	638	780	839	885
Rate ratio$_1$	1	1.24 (0.80 – 1.91)	1.02 (0.63 – 1.65)	1.22 (0.81 – 1.83)
Rate ratio$_2$	1	0.77 (0.49 – 1.20)	0.56 (0.33 – 0.94)	0.71 (0.46 – 1.10)
Cancer admissions				
No. of admissions	432	429	286	535
Admissions/1000 person years	66.9	50.1	51.9	47.5
Rate ratio$_1$	1	0.69 (0.50 – 0.96)	0.76 (0.53 – 1.10)	0.69 (0.50 – 0.94)
Rate ratio$_3$	1	0.72 (0.52 – 0.99)	0.78 (0.54 – 1.14)	0.67 (0.49 – 0.92)
No. of bed-days	4089	5430	3975	7748
Bed-days/1000	633	634	721	687

person years				
Rate ratio$_1$	1	0.82 (0.50 – 1.34)	0.69 (0.40 – 1.19)	0.68 (0.43 – 1.07)
Rate ratio$_3$	1	0.71 (0.43 – 1.18)	0.64 (0.37 – 1.12)	0.56 (0.35 – 0.91)
All mental health admissions				
No. of admissions	95	176	139	338
Admissions/1000 person years	14.7	20.6	25.2	30.0
Rate ratio$_1$	1	1.42 (1.02 – 1.98)	1.57 (1.09 – 2.25)	2.08 (1.53 – 2.84)
Rate ratio$_3$	1	1.47 (1.05 – 2.04)	1.63 (1.13 – 2.34)	2.09 (1.52 – 2.86)
No. of bed-days	19,789	37,901	34,199	46,201
Bed-days/1000 person years	3063	4426	6202	4099
Rate ratio$_1$	1	1.19 (0.62 – 2.31)	1.65 (0.80 – 3.44)	1.78 (0.96 – 3.30)
Rate ratio$_3$	1	1.18 (0.60 – 2.33)	1.71 (0.79 – 3.72)	2.17 (1.11 – 4.26)
Dementia (including Alzheimer's disease)				
No. of admissions	63	136	111	284
Admissions/1000 person years	9.8	15.9	20.1	25.2
Rate ratio$_1$	1	1.59 (1.07 – 2.36)	1.98 (1.30 – 3.03)	2.63 (1.83 – 3.79)
Rate ratio$_3$	1	1.61 (1.08 – 2.38)	2.04 (1.33 – 3.13)	2.60 (1.79 – 3.77)
No. of bed-days	17,364	29,024	28,726	39,891
Bed-days/1000 person years	2687	3389	5209	3539
Rate ratio$_1$	1	1.09 (0.51 – 2.31)	1.65 (0.72 – 3.79)	1.75 (0.87 – 3.54)
Rate ratio$_3$	1	1.09 (0.50 – 2.36)	1.67 (0.69 – 4.08)	2.10 (0.96 – 4.58)

Rate ratio$_1$ – adjusted for age
Rate ratio$_2$ – adjusted for age, systolic blood pressure, cholesterol, BMI, height, FEV1, angina, ischaemic ECG, bronchitis & smoking
Rate ratio$_3$ – adjusted for age, systolic blood pressure, cholesterol, BMI, height, FEV1 & smoking

Appendix 1

Details of the study methods

The study consisted of a self-completed questionnaire, which included questions on occupation, smoking habit, angina and bronchitis; and a screening examination where height, weight, blood pressure and lung function (forced expiratory volume in 1 second)(FEV1) were measured, an electrocardiogram (ECG) was taken and a non-fasting blood sample was taken for the measurement of plasma cholesterol. Occupational class was obtained from the reported occupation using the Registrar General's Classification of Occupations of the time[1]. Where women gave their occupation as "housewife", they were allocated the occupational class of their husband; otherwise occupational class based on their own occupation was used. Occupational class was categorised into four groupings – I&II, III non manual, III manual, and IV&V. Ex-smokers had given up smoking for at least a year before screening; otherwise they were defined as current smokers. Bronchitis was defined from the Medical Research Council bronchitis questionnaire[2] and angina from the Rose Angina questionnaire[3]. Body mass index (BMI) was calculated from height and weight, and overweight and obesity were defined according to World Health Organisation definitions (BMI 25 to <30 for overweight and e 30kg/m^2 for obesity). Percent predicted FEV1 was defined as the actual FEV1 as a percentage of the expected FEV1. The expected FEV1 was calculated from regression equations using a healthy subset of the cohort[4]. An ischaemic ECG was defined from the Minnesota coding system[5].

Appendix 2

Further details of the causes investigated

Discharges from general hospitals used were from Scottish Morbidity Records (SMR)01 (acute, including emergency and non-emergency) and SMR50 (geriatric long stay) systems, and discharges from mental health hospitals were from the SMR04 system.

Causes of discharges investigated were all general (all SMR01 and SMR50), cardiovascular disease (CVD), coronary heart disease (CHD), stroke, respiratory diseases, cancer, all mental health (all SMR04s; SMR01s or SMR50s from the mental and behavioural disorders chapter, and Alzheimer's disease), and dementia (including Alzheimer's disease) (from SMR01, 50 or 04). The International Classification of Diseases codes for these causes are shown in the table below. Causes were defined from the first cause recorded on each discharge.

International Classification of Diseases (ICD) codes for causes of discharges

	ICD8	ICD9	ICD10
Cardiovascular disease	390 – 458	390 - 459	I00 - I99, G45, M300, M303, R58X
Coronary heart disease	410 - 414	410 - 414	I20 - I25
Stroke	430 - 438	430 - 438	I60 - I69, G45
Respiratory diseases	460 - 519	460 - 519	J00 - J99
Cancer	140 - 209	140 - 208	C00 - C97
Dementia (including Alzheimer's disease)	290	290, 294.1, 331.0	F00 - F03, G30

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