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ORIGINAL ARTICLE

Municipal variation in health and social service use in the last 2 years of life among old people

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Abstract

Aims: To describe and analyse municipal differences in health and social service use among old people in the last 2 years of life. *Methods:* The data were derived from national registers. All those who died in 2002 or 2003 at the age of ≥70 years were included except those who lived in very small municipalities. The services included were different types of hospitals, long-term care, and home care. The variation in service use was described by coefficients of variation (CV). To analyse local differences, three-level (individual, municipal, and regional) binary logistic and Poisson regression analyses were performed. *Results:* A total of 67,027 decedents from 315 municipalities in 20 hospital districts were included. There was considerable variation in service use between residents of different municipalities, especially in the types of hospital used. Of the individual-level variables age and use of other services were associated ($p < 0.05$) with use of all services. Of the municipal-level variables, indicators describing the service pattern in the municipality were associated with use of all services and average age of decedents with most of the services. The presence of a university hospital in the hospital district increased the probability of using university and general hospitals, but among the users increased days in university hospital and decreased days in general hospital. ***Conclusions:*** **Considerable differences between municipalities exist, but these cannot be exhaustively explained. Behind the differences are probably factors which are difficult to describe and quantify, such as historical developments and political realities.**

Key Words: *Aged, end-of-life, health services, long-term care, multilevel analyses, municipalities, register studies*

Background

Individual characteristics such as age, disability, morbidity, and closeness of death have been found to determine health and social service use in old age [1–3]. However, supply side factors like available resources and local service structures also play a role [e.g. 4–6]. The local care system may be an even more important factor explaining service use than individual characteristics [7,8], and the variation explained by managed care programme sites was found to increase as death approached [7]. The regional variation in service use despite similar needs raises questions about equity and allocative efficiency.

In Finland the municipalities are responsible for organising social and health services for their residents, and in this they have considerable autonomy. Thus, the service structures in municipalities differ, likewise the ways in which they respond to the population's needs. There are differences, for example, in how municipalities have organised primary and secondary health care or inpatient and outpatient care [9]. Twenty hospital districts owned by the municipalities organise secondary health care and own general hospitals. Hospital districts constitute five university hospital districts. University hospitals organise tertiary health care, but also secondary care if there is no general hospital in their hospital district.

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Extensive variation in health service use has also been found between hospital districts [e.g. 10,11].

Regional variations in the use of health services are well known, and numerous differences have also been found in services for old people [e.g. 12–15]. However, the factors underlying these variations are not clear. In the USA differences were not due to variation in health levels [12,15], neither did patient preferences explain regional variation in end-of-life care [8,16]. Greater hospital capacity has been found to be associated with increased use of hospital care in the USA, even after controlling for socioeconomic characteristics and illness burden [4]. Variations in the number of hospital beds and in the local supply of specialists' services have explained about half of the regional variations in Medicare spending [5]. Virnig et al. [6] found that the level of hospice use was higher in wealthier and urban areas in the USA, while in a study by McConnel and Zetzman [17], use of hospital, nursing home, and physician services was unrelated to rural or urban residential location.

The aim of this study is to describe and explain differences between Finnish municipalities in old people's health and social service use in the last 2 years of life. The study is a part of more comprehensive project entitled "Costs Of Care Towards the End of Life" (COCTEL). The detailed study questions in this paper are:

(1) To what extent does the use of different health and social services in the last 2 years of life differ between municipalities? Both the proportion of users and number of days in care among the users are analysed.
(2) How is health and social service use in the last 2 years of life associated with individual, municipal, and regional factors?

Materials and methods

Data

The study population consists of all people resident in Finland who died in 2002 or 2003 at the age of $\geq$70 years. The sample was identified from the Causes of Death Register (Statistics Finland). Service use was studied for 730 days before the day of death.

The data on health and social service use were derived from national registers: the Care Register for Health Care, the Care Register for Social Welfare and the Home Care Census (National Institute for Health and Welfare). The information in registers was linked using a unique personal identification number. The collating of data was done in principle as in our earlier data [18].

The services included are: (1) hospital care (2) long-term care, and (3) regular home care (at least once a week). Hospitals include university hospitals, general hospitals (central and district) and the inpatient departments of health centres if the length of stay (LOS) was $<$90 days. Long-term care includes care in residential homes, housing with 24-hour assistance for older people and inpatient departments of health centres if LOS was $\geq$90 days. Public and private long-term care are analysed together because the use of private care is minor. Home care includes both home nursing and home help.

In the study years, there were 448 (2002) and 446 (2003) municipalities in Finland, but in 2007 there were 416 left due to mergers of municipalities. We used the municipality numbers valid at the beginning of 2007, thus individuals who died in municipalities which were later merged were coded as residents of the new municipality. The Åland Islands (16 municipalities) and municipalities with $<$2500 inhabitants (85) were excluded from the analyses, because in very small municipalities only a few inhabitants die annually and thus service use may vary randomly. In addition there was a risk that individual subjects from small municipalities could be identified from the data.

The ethics committee of the Pirkanmaa hospital district discussed the research plan and concluded that they did not object on ethical grounds to the research being undertaken.

Statistical design and indicators

It is assumed that service use of individuals residing in the same municipality does not vary independently, and thus, the data of this study have a hierarchical structure. Individuals (level one) are living in municipalities (level two), which belong to hospital districts (level three). Due to this data structure we constructed multilevel models making it possible also to include municipal and regional variables in the analyses [19].

We used a two-stage approach, first analysing individual use (yes/no) of each of the five services, and then among the users, the number of days in care in each of the four services (for home care, the number of visits was not available).

Independent variables in the models are on three levels and were chosen on the basis of earlier studies. Individual variables are age, gender, and use of other services (than that analysed in the model). The municipal factors concern the year 2003 and describe population (number of inhabitants, average age of

decedents, the proportion of those ≥65 years old in the population, and the proportion of old people living alone), economic conditions (annual contribution margin, tax revenue, health and social expenditure, and urbanity), and service pattern (support for informal care, outpatient care orientation, proportion of service users, and days in care per user). The regional level indicator is the existence of a university hospital in the hospital district. "Outpatient care orientation" (opco), one of the indicators of service pattern, was built on the basis of the SOTKAnet database (National Institute for Health and Welfare) [20,21]. It contains indicators describing, for example, municipalities' new care practices, the relation of inpatient and outpatient care, and supported living at home. The value of opco varies between 1 and 20; a small value indicates that the municipality has emphasised outpatient care. Some continuous variables were classified because of their wide range or abnormal distribution. Table I provides a descriptions and sources of all variables.

Analyses

Variation in service use between municipalities was assessed by coefficients of variation (CV = standard deviation/mean × 100) and by the variances of the intercepts, which are reported on the municipality level and on the hospital district level in empty (null) models.

Three-level analyses were performed to examine the effect of each level variables on service use after controlling for the effects of variables on other levels. The random intercept model allows the intercepts to vary across municipalities. The random coefficient model also allows regression coefficients to vary across municipalities. Random intercept (and random coefficient) models were used, when the variance of the intercept (and that of the coefficient) was more than two times higher than its own standard error [22], otherwise naïve models, which consider all individuals to be independent, are reported.

To analyse the probability of using services we performed three-level binary logistic regression analyses for each service type [19,22]. The number of days in care among the users was analysed by three-level Poisson regression analyses. We ran four logistic and four Poisson regression models for each of the services:

(I) individual level independent variables
(II) I + variables describing population and economic conditions of the municipality
(III) II + variables describing service pattern in municipality
(IV) III + regional level variable.

In general, results of models I–III did not vary considerably, thus we report here only the results of the final (IV) models.

Descriptive analyses were performed by the SPSS (16.0), and the MLwiN (2.10) was used for multilevel analyses.

Results

Descriptives

The sample included 67,027 individuals living in 315 municipalities belonging to 20 hospital districts. The average age was 82.5 (84.2 for women and 80.2 for men), and the proportion of women was 59.5% (Table I). Although the smallest municipalities were excluded, 33.7% of municipalities still only had 2500–5000 inhabitants. The average age of decedents ranged from 79.6 to 85.5 years between municipalities and the proportion of people ≥65 years old of all residents from 22.4 to 54.7%.

Variation in service use

For Figure 1 we organised the municipalities in ascending order according to the proportion of general hospital users. In all municipalities hospital care was the most frequently used service at least once in the last 2 years of life (on average 81% used it). The use of long-term care was second most common (54%), while the use of home care was least common (18%). Among the users, the average number of days in care was manifold in long-term care compared to hospital care. The proportion of users of different services varied extensively between municipalities. There was especially considerable variation in the types of hospital used; in municipalities, where use of university hospital was common, use of general hospital was low, and vice versa. The most varying proportion of users was for university hospital, but number of days in care varied most in general hospital (CV in Table II). The variances of intercepts were statistically significant on the hospital district level only for university hospital.

Factors associated with service use

Any use of services The probability of using a university hospital was higher among younger users, men, and users of other hospitals and home care, but lower among the users of long-term care (Table III).

Table I. Description and sources of individual level ($n = 67{,}027$), municipal level ($n = 315$) and regional level ($n = 20$) variables.

Level	Indicators	Mean or %	Range	Source of data
Individual				
	Age	82.5	70–107	Registers[a]
	Proportion of women (%)	59.5		Registers[a]
	Proportion of users (%)			Registers[a]
	University hospital	27.7		
	General hospital	49.3		
	Health centre	48.4		
	Long-term care	54.7		
	Home care	18.1		
	Days in care (if user)			Registers[a]
	University hospital	16.7	1–730	
	General hospital	21.3	1–730	
	Health centre	30.8	1–89	
	Long-term care	421.9	1–730	
Municipal				
Population	Number of inhabitants (%)			SOTKAnet[b]
	2500–4999	33.7		
	5000–9999	34.0		
	10,000–600,000	32.4		
	Average age of decedents	82.4	79.6–85.5	Registers[a]
	Prop. of 65 years old (%)		6.0–29.7	SOTKAnet[b]
	Prop. of living alone (%)[c]		22.4–54.7	SOTKAnet[b]
Economic conditions	Annual contribution margin, €/capita			SOTKanet[b]
	<0	11.1		
	≥0	88.9		
	Tax revenue, €/capita			SOTKAnet[b]
	<2000	41.9		
	2000–3000	56.2		
	>3000	1.9		
	Total operating health and social expenditure, €/capita			SOTKAnet[b]
	<2400	48.3		
	≥2400	51.7		
	Urbanity			Statistics Finland
	Urban	19.7		
	Semi-urban	23.5		
	Rural	56.8		
Service pattern	Support for informal care (%)[d]		0.1–6.9	SOTKAnet[b]
	Outpatient care orientation	10.4	1–19	Created on the base of SOTKAnet[b]
	Proportion of users (%)			Registers[a]
	University hospital	21.8	0.0–91.1	
	General hospital	57.6	0.0–91.8	
	Health centre	50.1	0.0–77.8	
	Long-term care	54.0	15.1–90.0	
	Home care	18.7	1.6–41.7	
	Days per user (if users in municipality)			Registers[a]
	University hospital	12.6	1.0–37.8	
	General hospital	18.1	1.0–37.5	
	Health centre	30.1	1.7–51.0	
	Long-term care	414.9	66.3–565.8	
Regional				
	University hospital in the hospital district (%)			Statistics Finland
	0 = no	75.0		
	1 = yes	25.0		

[a]Causes of Death Register (Statistics Finland), Care Register for Health Care, the Care Register for Social Welfare and the Home Care Census (National Institute for Health and Welfare).
[b]SOTKAnet indicator bank contains extensive statistical information on the Finnish municipalities (National Institute for Health and welfare).
[c]Living alone, population aged 75 and over, as % of total population of same age.
[d]Support for informal care, clients aged 65 and over, during year, as % of total population of same age.

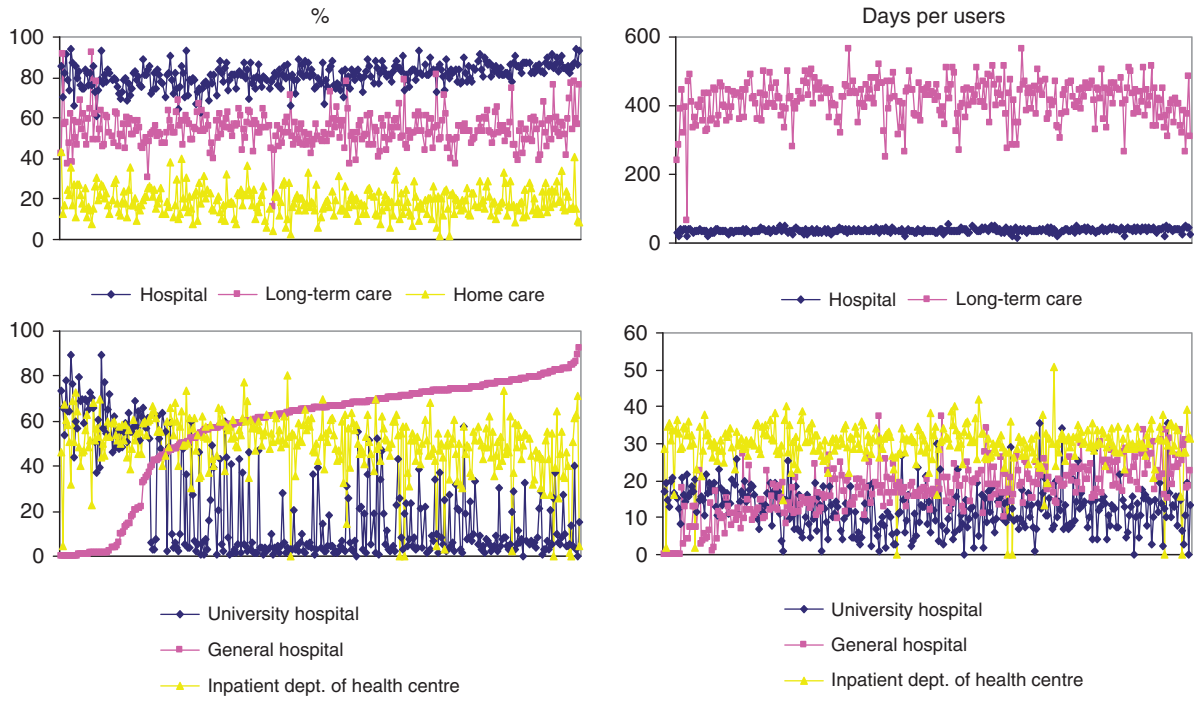

Figure 1. Proportions of service users and days per user in municipalities (adjusted to correspond to the age and gender distribution among all Finnish old people dying in 2002 and 2003. $n = 315$, for home care 309[a]). The order of municipalities is ascending according to the proportion of general hospital users. [a]Six municipalities have not reported their home care clients properly, and they were excluded from the analyses of home care.

Table II. Coefficient of variation (CV) and the variance of the intercept on the municipality level and on the hospital district level in empty (null) binary logistic and Poisson regression models.

	Proportion of the users			Days in care among the users		
		Variance of intercept			Variance of intercept	
	CV for municipalities	Municipality	Hospital district	CV for municipalities	Municipality	Hospital district
Hospital	7.0	0.03	NS	15.3	0.03	NS
University hospital	109.2	0.44	2.84	46.8	0.07	0.15
General hospital	43.2	2.46	NS	71.8	0.50	NS
Inpatient dept. of health centre	26.7	0.23	NS	16.3	0.01	NS
Long-term care	16.5	0.06	NS	14.2	0.03	NS
Home care	38.6	0.07	NS	NA	NA	NA

NA, not available; NS, not statistically significant ($p > 0.05$).

A higher proportion of university hospital users in the municipality and existence of a university hospital in the hospital district increased an individual's likelihood of using university hospital.

Use of general hospital was higher among younger users, men, users of other hospitals and home care, and in municipalities where the proportion of general hospital users was higher and belonged to a hospital district with a university hospital, but lower among the users of long-term care (Table III).

Use of the inpatient department of a health centre was higher among older users, users of other hospitals and home care, and in municipalities where the proportions of health centre and long-term care users were higher, but lower among users of long-term care (Table III).

Table III. Any use of services: three-level binary logistic regression models ($n = 67{,}027$, for home care $n = 66{,}551$).

	University hospital[a]		General hospital[b]		Inpatient dept. of health centre[a]		Long-term care[a]		Home care[a]	
Level	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Individual										
Age	**0.93**	0.93–0.94	**0.96**	0.95–0.96	**1.04**	1.04–1.04	**1.11**	1.10–1.11	**1.04**	1.03–1.04
Gender (0 = man, 1 = woman)	**0.89**	0.85–0.93	**0.80**	0.77–0.84	1.02	0.99–1.06	**1.47**	1.42–1.53	**1.36**	1.30–1.42
User of university hospital			**1.95**	1.81–2.11	**1.62**	1.55–1.70	**0.65**	0.62–0.68	**1.21**	1.14–1.28
User of general hospital	**2.06**	1.91–2.22			**2.03**	1.94–2.12	**0.66**	0.63–0.69	**1.77**	1.67–1.87
User of health centre	**1.63**	1.56–1.71	**2.04**	1.91–2.18			**0.27**	0.26–0.28	**1.70**	1.62–1.78
User of long-term care	**0.63**	0.60–0.66	**0.69**	0.64–0.73	**0.27**	0.26–0.28			**0.90**	0.86–0.94
User of home care	**1.21**	1.14–1.28	**1.78**	1.67–1.91	**1.69**	1.61–1.76	**0.87**	0.83–0.91		
Municipal										
No. of inhabitants										
0 = <5000, 1 = 5000–9999	0.97	0.88–1.08	1.08	0.98–1.19	1.00	0.93–1.07	0.99	0.92–1.07	1.02	0.94–1.11
0 = <5000, 1 = >10,000	0.95	0.83–1.09	1.07	0.94–1.22	1.02	0.93–1.12	1.00	0.91–1.10	1.02	0.92–1.14
Average age of decedents	1.02	0.99–1.06	1.03	1.00–1.07	0.97	0.95–1.00	**0.91**	0.89–0.93	**0.96**	0.93–0.99
65 years (%)	1.00	0.99–1.01	1.01	1.00–1.03	1.00	0.99–1.01	1.00	0.99–1.01	1.00	0.99–1.01
Living alone (%)	1.00	0.99–1.01	0.99	0.98–1.00	1.00	1.00–1.01	1.00	0.99–1.00	1.00	1.00–1.01
Annual contribution margin, 0 = <0, 1 = >0	0.95	0.87–1.04	0.97	0.88–1.07	1.01	0.95–1.08	1.02	0.97–1.06	1.00	0.93–1.08
Tax revenue										
0 = <2000, 1 = 2000–2999	1.00	0.92–1.09	1.01	0.93–1.10	0.99	0.93–1.05	0.99	0.93–1.05	0.98	0.91–1.06
0 = <2000, 1 = >3000	0.96	0.84–1.10	0.82	0.66–1.01	1.00	0.91–1.10	0.96	0.86–1.06	0.99	0.88–1.12
Expenditure, 0 = <2400, 1 = >2400	1.00	0.94–1.06	0.97	0.90–1.04	1.01	0.97–1.06	1.02	0.97–1.06	0.99	0.94–1.05
Urbanity										
0 = rural, 1 = urban	1.06	0.92–1.22	0.95	0.84–1.08	1.02	0.93–1.07	0.98	0.90–1.07	1.02	0.91–1.14
0 = rural, 1 = semi-urban	1.02	0.92–1.14	1.00	0.90–1.10	0.99	0.92–1.07	1.00	0.92–1.07	1.00	0.92–1.09
Support for informal care (%)	0.99	0.96–1.02	1.00	0.97–1.03	1.00	0.98–1.02	1.00	0.98–1.02	1.00	0.97–1.02
Outpatient care orientation	1.00	0.99–1.00	1.00	0.99–1.01	1.00	0.99–1.01	1.00	1.00–1.01	1.00	0.99–1.00
Proportion of service users										
University hospital	**1.06**	1.05–1.06	**0.99**	0.99–0.99	1.00	0.99–1.00	1.00	1.00–1.01	1.00	1.00–1.00
General hospital	1.00	0.99–1.00	**1.07**	1.06–1.07	0.99	0.99–1.00	1.00	1.00–1.01	0.99	0.99–1.00
Health centre	1.00	1.00–1.00	1.00	0.99–1.00	**1.05**	1.05–1.05	**1.01**	1.01–1.02	1.00	0.99–1.00
Long-term care	1.01	1.00–1.01	1.00	1.00–1.01	**1.01**	1.01–1.01	**1.05**	1.05–1.06	1.00	1.00–1.00
Home care	1.00	1.00–1.01	0.99	0.99–1.00	1.00	0.99–1.00	1.00	1.00–1.01	**1.07**	1.07–1.07
Regional										
University hospital in the district 0 = no, 1 = yes	**2.55**	2.29–2.84	**1.19**	1.03–1.37	0.99	0.91–1.08	1.01	0.93–1.10	1.03	0.93–1.13
Model statistics										
Variance of intercept (SE)	NA		**0.04**	(0.01)	NA		NA		NA	

Statistically significant ($p < 0.05$) odds ratios (OR) are on bold.
[a]Naïve model.
[b]Random intercept model at the municipality level. Random coefficient for age, gender, use of inpatient department of health centre, use of long-term care, and use of home care.
NA, not available.

Long-term care use was higher among older users, women, in municipalities where the average age of decedents was lower, and in municipalities with higher proportions of health centre and long-term care users. However, use of long-term care was lower among the users of other services (Table III).

Home care was used more by older users, women, hospital users and those living in municipalities with lower average age of decedents and higher proportions of home care users, but lower among long-term care users (Table III).

Extent of service use among users Number of days in university hospital was higher among younger users, users of other hospitals and long-term care, and in larger municipalities, but lower among users of home care and in municipalities with the highest tax revenue per capita (Table IV). Higher number of university hospital days per user in municipality and a university hospital in the hospital district were associated with individual's higher number of days in university hospital.

Number of days in general hospital was higher among younger users, among users of all other

Table IV. Days in care among the users: three-level Poisson regression analyses.

	University hospital[a] (n = 18,546)		General hospital[b] (n = 33,070)		Inpatient dept. of health centre[c] (n = 32,435)		Long-term care[d] (n = 36,653)	
Level	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Individual								
Age	**0.96**	0.96–0.96	**0.97**	0.97–0.97	**1.01**	1.01–1.01	**1.01**	1.01–1.01
Gender, 0 = man, 1 = woman	1.02	0.95–1.09	0.96	0.92–1.00	**1.08**	1.07–1.08	**1.13**	1.11–1.16
User of university hospital			**1.18**	1.17–1.19	**1.12**	1.11–1.12	**0.65**	0.65–0.65
User of general hospital	**1.18**	1.16–1.20			**1.11**	1.11–1.12	**0.72**	0.70–0.74
User of health centre	**1.20**	1.12–1.28	**1.11**	1.06–1.17			**0.85**	0.84–0.85
User of long-term care	**1.08**	1.08–1.09	**1.06**	1.01–1.11	**1.14**	1.14–1.14		
User of home care	**0.91**	0.84–0.99	**1.07**	1.07–1.08	**1.21**	1.20–1.21	**0.44**	0.44–0.45
Municipal								
No. of inhabitants								
0 = <5000, 1 = 5000–9999	**1.12**	1.05–1.20	0.95	0.88–1.04	**1.01**	1.01–1.02	1.01	0.98–1.03
0 = <5000, 1 = >10,000	**1.20**	1.09–1.31	0.99	0.88–1.12	1.01	1.00–1.02	1.02	0.98–1.06
Average age of decedents	1.00	0.97–1.02	**1.07**	1.03–1.11	**0.99**	0.99–0.99	0.99	0.98–1.00
65 years (%)	1.00	0.99–1.01	1.00	0.99–1.01	1.00	1.00–1.00	1.00	0.99–1.00
Living alone (%)	1.00	1.00–1.01	1.00	0.99–1.01	1.00	1.00–1.00	1.00	1.00–1.00
Annual contribution, 0 = <0, 1 = >0	1.01	0.94–1.08	1.04	0.94–1.15	**1.02**	1.01–1.02	1.00	0.96–1.03
Tax revenue								
0 = <2000, 1 = 2000–2999	0.95	0.89–1.01	1.06	0.98–1.15	0.99	0.99–1.00	1.02	0.99–1.04
0 = <2000, 1 = >3000	**0.86**	0.74–0.99	1.23	0.96–1.58	0.99	0.98–1.00	1.00	0.92–1.08
Expenditure, 0 = <2400–1 = >2400	1.01	0.96–1.07	0.94	0.87–1.02	1.01	1.00–1.01	1.02	0.99–1.04
Stat. grouping of municipality								
0 = rural, 1 = urban	0.95	0.86–1.04	1.03	0.90–1.19	0.99	0.98–1.00	0.98	0.93–1.02
0 = rural, 1 = semi–urban	0.94	0.87–1.01	0.97	0.88–1.08	1.00	1.00–1.01	0.98	0.95–1.02
Informal care	0.99	0.97–1.01	**0.94**	0.91–0.97	1.00	1.00–1.00	1.00	0.99–1.01
Opco	1.00	0.99–1.00	**1.02**	1.01–1.03	1.00	1.00–1.00	1.00	1.00–1.01
Days per user								
University hospital	**1.08**	1.07–1.08	0.99	0.99–1.00	1.00	1.00–1.00	1.00	1.00–1.00
General hospital	1.00	1.00–1.00	**1.01**	1.01–1.02	1.00	1.00–1.00	1.00	1.00–1.00
Health centre	1.00	1.00–1.01	1.00	0.99–1.00	**1.04**	1.04–1.04	1.00	1.00–1.00
Long-term care	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00
Home care (%)	1.00	1.00–1.00	1.00	0.99–1.00	1.00	1.00–1.00	1.00	1.00–1.01
Regional								
University hospital in the district 0 = no, 1 = yes	**1.40**	1.34–1.47	**0.76**	0.71–0.82	**0.98**	0.98–0.99	**1.03**	1.01–1.06
Model statistics								
Variance of intercept (SE)	**0.18**	(0.02)	**0.18**	(0.02)	NA		**0.04**	(0.003)

Statistically significant rate ratios (RR) are in bold face.
[a]Random intercept model at the municipality level. Random coefficient for gender, use of inpatient department of health centre, and use of home care.
[b]Random intercept model at the municipality level. Random coefficient for gender, use of inpatient department of health centre, and use of long-term care.
[c]Naive model.
[d]Random intercept model at the municipality level. Random coefficient for gender and use of general hospital.
NA, not available; SE, standard error.

services analysed in this study, in municipalities where decedents were older, in municipalities with low proportions of people receiving support for informal care, with higher outpatient care orientation (i.e. emphasising more institutional care), and with higher general hospital days per user (Table IV). There were fewer days in general hospital in hospital districts with a university hospital.

Number of days in inpatient department of health centre was higher among older users, women, users of all other services analysed in this study, in middle-sized municipalities (as opposed to the smallest municipalities), in municipalities with positive annual contribution margin, and higher number of health centre days per user (Table IV). Number of days in health centre was lower in municipalities with

older decedents and in hospital districts with a university hospital.

Number of days in long-term care was higher among older users, women, in municipalities with higher numbers of long-term care days per user, and in hospital districts with a university hospital, but lower among the users of all other services analysed in this study (Table IV).

Of individual level factors age and use of other services were associated ($p < 0.05$) with any use and extent of use of all services. Of the municipal level indicators the proportion of service users in a municipality was most important factor associated with service use. When this variable was added to the model, the variance of intercept fell to zero in all other services except general hospital. It stratified the service use in such a way, that the random intercept model allowing the intercept to vary across municipalities was not needed. Days per user in a municipality was also an important variable, but it did not have such an impact on the variance of the intercept as the proportion of users. The regional level indicator, university hospital in the hospital district, was associated with the probability of using university and general hospital, and with the number of days in care in all services.

Discussion

We found considerable variation between Finnish municipalities in health and social service use in the last 2 years of life among old people. There were differences in all services studied, but the widest variation was in use of different types of hospital, especially university hospital. However, a large amount of the observed variation was between individuals. We found that younger old people and men were more likely to use hospital care, while older old people and women were more likely to use long-term care in their last 2 years of life. These results confirm earlier findings by other researchers, [3,23] and ourselves [1,18].

The variation between municipalities was considerable, but disappeared when variables describing the municipal service pattern (indicated by proportion of service users and days per user) and availability of a university hospital were added to the models. There was no variation between hospital districts in any other services than university hospitals.

Some other important characteristics at individual, municipal, and regional levels could have been included in the analyses: at municipal level, e.g. distance to the nearest hospital, service capacity, and resources available, which have been included in many previous studies [4,5,17], but these were not available to our study. Yet underlying the municipal differences are probably factors that are difficult to describe and quantify, by exact quantitative indicators, such as care practices, which are consequences of municipalities' traditions and politics [24,25]

At municipal level there was a substitution between university and general hospital indicating that availability of hospital type determines use, but hospital care, long-term care, and home care seemed not to substitute each other. At individual level there was a negative association of use of long-term care and all other services studied. Of the users of long-term care, 17.3% stayed there the whole study period, 730 days, thus not having used other services.

The use of registers, which are considered reliable [26,27], and multilevel analyses necessary for hierarchical structured data are the strengths of this study. However, it was difficult to assess the fit of the models, because good tests do not exist and there are no -2 log likelihood test available for logistic and Poisson multilevel regression analyses. We included in the data all decedents in the years 2002 and 2003 (except those living in small municipalities, 4.3%) and were thus able to draw a picture of a whole older population living their last 2 years of life.

The service providers are heterogeneous, e.g. hospitals belonging to the category of general hospital may differ in respect to the content of care. The hospitals were categorised according to the "code of service producer" in the Care Register for Health Care. During the study period, there have been some organisational changes, like regional hospitals have been affiliated to university hospitals, and the codes may not be updated in all cases. We also performed logistic analyses without the municipalities where there is some confusion with the codes, but the results did not essentially change, and we decided to use the codes as such.

On the basis of this study, the consequences of the differences in service use between the municipalities cannot be identified. The fact that services are used differently does not imply that the service provision and use was more appropriate in some municipalities than in others [5,28]. Earlier studies indicate that health outcomes and satisfaction with care are not necessarily better in the areas where use of services is higher [12,15,29]. However, the cost consequences of services differ considerably; the costs of an inpatient day in university hospital are much higher than, for example, an inpatient day in a health centre [30]. One consequence of variations in service use is that the equity of access between residents in different regions may be compromised.

At present, remarkable changes are going on in the field of Finnish municipalities, the number of

municipalities is decreasing and services are being restructured. It is not yet known how these changes will affect differences between municipalities. The service patterns and practices in different municipalities have been formulated in a historical process; they have been modified by need for services, e.g. morbidity and age structure, but also by political power blocs, preferences, and other local conditions and habits. Further research, also using qualitative and historical approaches, is needed to better understand the differences between municipalities in service use.

Conclusions

Our results showed that there is considerable variation between municipalities in the use of health and social services in the last 2 years of life, but the underlying factors are not clear. Our results indicate that the use of services is not equal, but more analysis is needed to assess if it is equitable.

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Conflicts of interest

None declared.

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