Text 1. Geography and healthcare system of Switzerland.

Switzerland has 8.2 million residents, of whom almost a quarter (23.8%) are foreigners. It has four official languages: German (declared as main language by 64% of residents), French (23%), Italian (8%) and Romansch (0.5%). 85% of population live in urban areas, with 39% concentrated in five largest cities. Despite a strong economy and high standard of living, there is substantial spatial variation in socioeconomic position and health outcomes across the country. [1,2]

The Swiss, consumer-driven healthcare system is chiefly financed by compulsory basic health insurance (BHI) and out-of-pocket payments. Citizens choose standardized BHI package offered to everyone on a private, highly regulated market of 81 (state as of 10.08.11; estimate closest to the end of the study period; since then the number of companies dropped to 60) insurers, who deliver it on a non-profit basis. The standardized package covers all essential benefits related to medical illness and pregnancy (including ambulatory and in-patient care, medications and medical aids) and deemed medically- and cost-appropriate. Approximately half of in-patient costs are co-financed and subsidised by the cantons. A separate insurance system covers accident-related costs. Residents choose a deductible in a range of 300 – 2,500 Swiss Francs (CHF: 1 CHF = 0.90 Euro = 1.01 U.S. Dollar, as of 19.05.16). Higher deductibles and managed care plans lower the cost of yearly premiums. Patients also make co-payments of 10% of their yearly healthcare costs, up to a limit of CHF 700. Social assistance subsidizes premium payments for low-income individuals. The basic insurance package can be supplemented with voluntary, private insurance to extend provider and treatment choices (e.g. complementary medicine, dental care) and providing additional benefits (e.g. private room during hospital stay). [3–6]

References:

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Table 1. Data sources of the study. Databases used in the analyses, together with their purpose, temporal coverage, resolutions and content. Causes of death in 'Mortality records' database are coded according to the International Classification of Diseases, Injuries, and Causes of Death, Tenth Revision (ICD-10). Abbreviations: SFSO - Swiss Federal Statistical Office; SMA- Swiss Medical Association (FMH).

Data	Source	Years	Purpose	Data resolution	Spatial resolution	Variables used
Health insurance claims	Six insurance companies	2008-10	Main dataset	Individual patients, health insurance claim	Postcode	Date of birth, date of death, sex and postcode of place of residence, reimbursed claim
Mortality records	SFSO	2008-10	Assessing representativeness, record linkage to claims for cause of death and characteristics of decedents	Individual patients	Community	date of birth, date of death, sex, community of residence, civil status, nationality, religion, main cause of death
Hospital discharges	SFSO	2010	Creating Hospital Service Areas	Individual hospital discharges	MedStat	Age, major diagnostic category, type of entry, region of patient's place of residence, region of hospitalization
Physicians database	SMA	2010	Supply of ambulatory care	Individual physicians	Postcode	Sector of employment (ambulatory, stationary, other), specialization
Characteristics of hospitals	SFSO	2010	Supply of acute care	Individual institutions	MedStat	Type of hospital, location of hospital, number of utilized beds, number of doctors and nurses (full time equivalent)
Characteristics of socio-medical institutions	SFSO	2010	Supply of non-acute care	Individual institutions	MedStat	Type of institution, location of institution, number of beds, number of nurses
Population	SFSO	2010	Population denominator for healthcare supply indicators	Individual patients	Community	Age, sex, community of residence
Characteristics of communities	SFSO	2008-10	Description of place of residence	Community	Community	Level of urbanization, language region

Figure 1. Geographical regions of EOLC study. Swiss cantons (panel A), language regions (panel B), level of urbanization (panel C) and Swiss-SEP index quintiles (panel D).

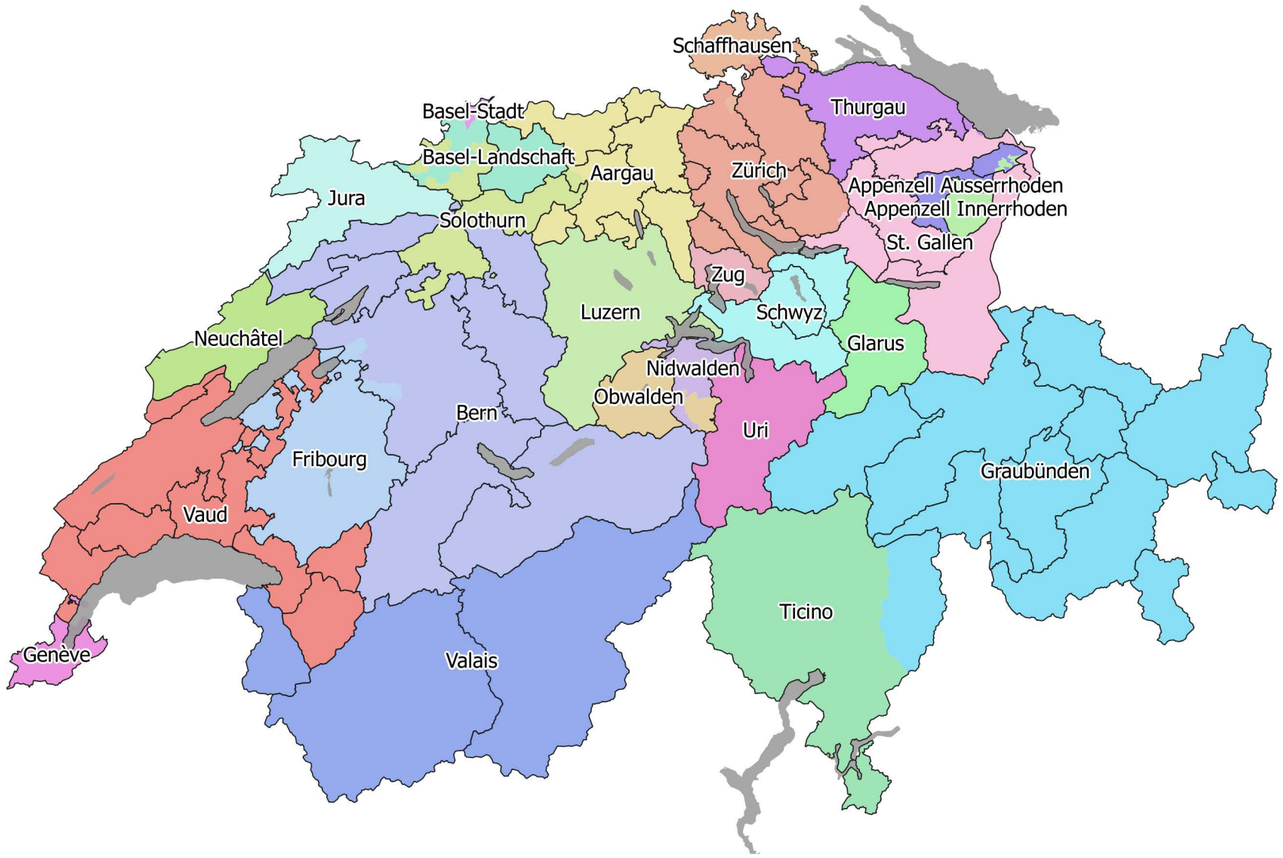
Panels B – D use 564 regions. All panels present overlay of 71 Hospital Service Areas.

Main language and and level of urbanization of the region was derived from SFSO's classification of Swiss communities (*Gemeinde*). On 1.1.2010 there were 2,596 communities – basic administrative unit of the country. The boundaries of communities and MedStat regions do not overlap. In cases when more than one community belonged to the region, and these differed in terms of level of urbanization or language region we used majority (>50%) assignment as criterion. Communities where Romansh language was used were grouped together with German language. Swiss-SEP (area based socioeconomic position) index was derived as median value of all neighbourhoods that overlapped with region.

Boundaries of the 564 regions were adjusted to exclude the high altitude areas of Swiss Alps with very low density or no population.

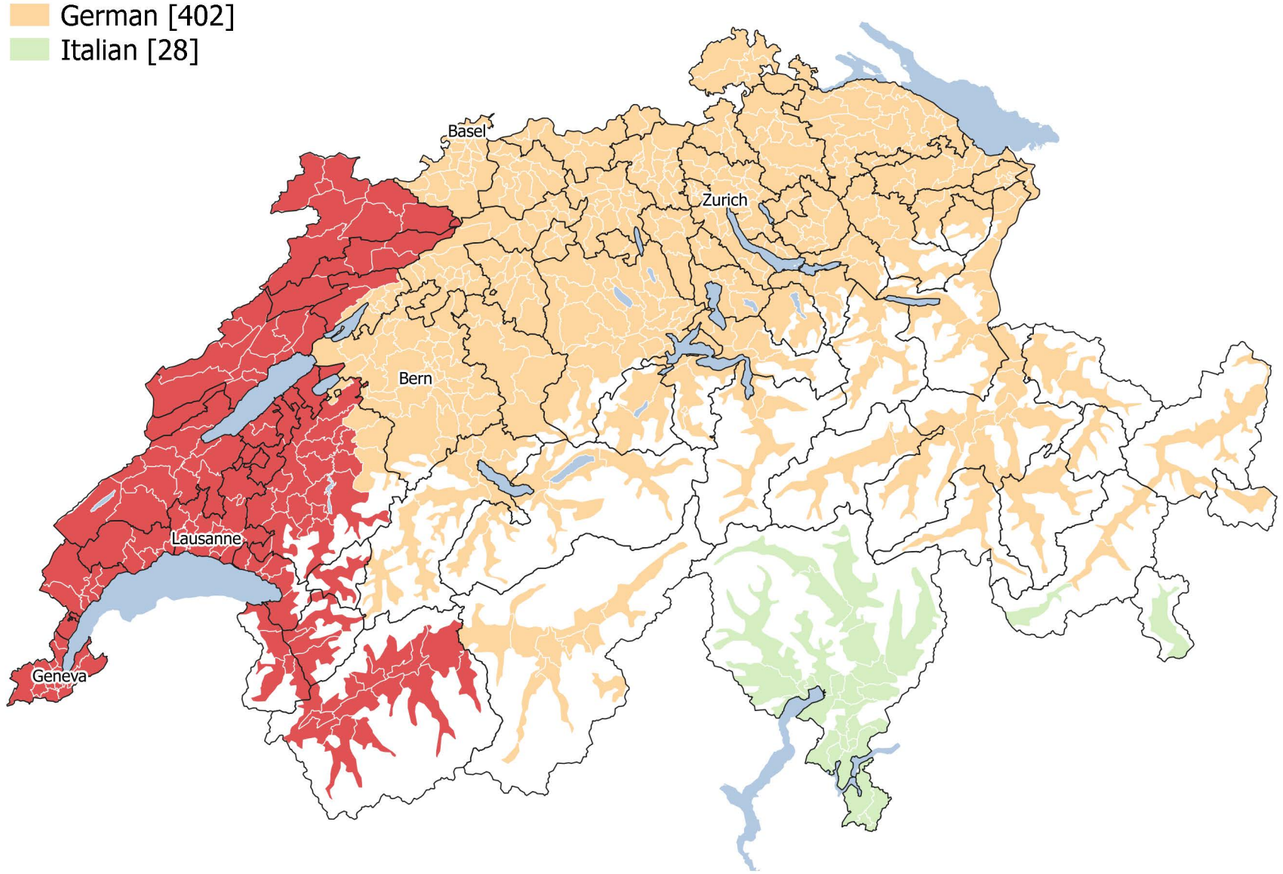
71 HSAs were build using SFSO's individual-level discharges of all Swiss hospitals in 2010. We created matrix of counts derived from cross tabulation of regions of patient's place of residence with region of hospitalization. We excluded records with missing geographical codes, records of individuals younger than 19, records belonging to major diagnostic category 'Births' and records of individuals from prisons. Patients' flows derived from the matrix were then used to aggregate regions to larger units where majority of residents were hospitalized.

A - cantons



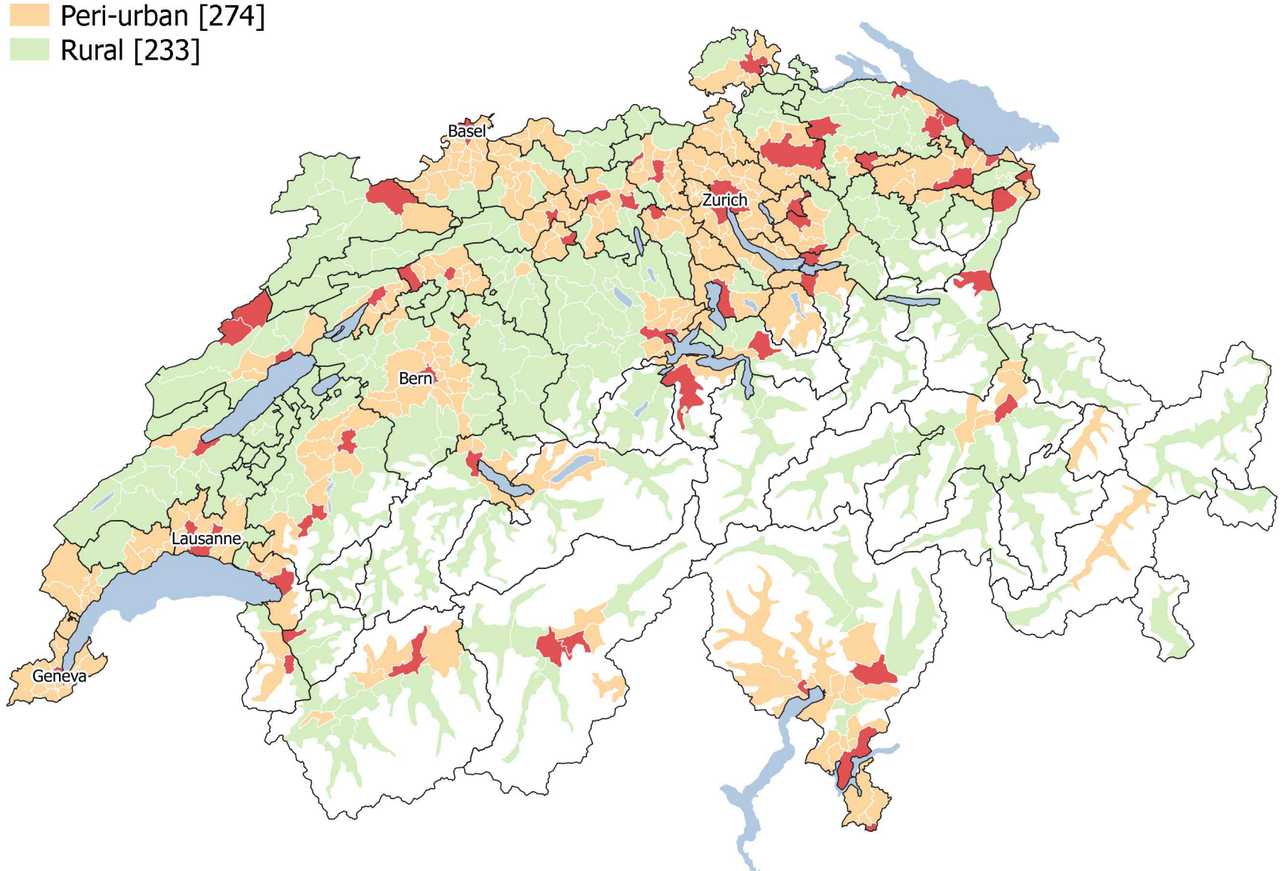
B - language regions

Language region [564]
- French [134]
- German [402]
- Italian [28]



C - urbanicity

Urbanicity [564]
- Urban [57]
- Peri-urban [274]
- Rural [233]



D - Swiss-SEP index

Swiss-SEP quintile [564]
- 1st (lowest) [76]
- 2nd [153]
- 3rd quintile [155]
- 4th [126]
- 5th (highest) [54]

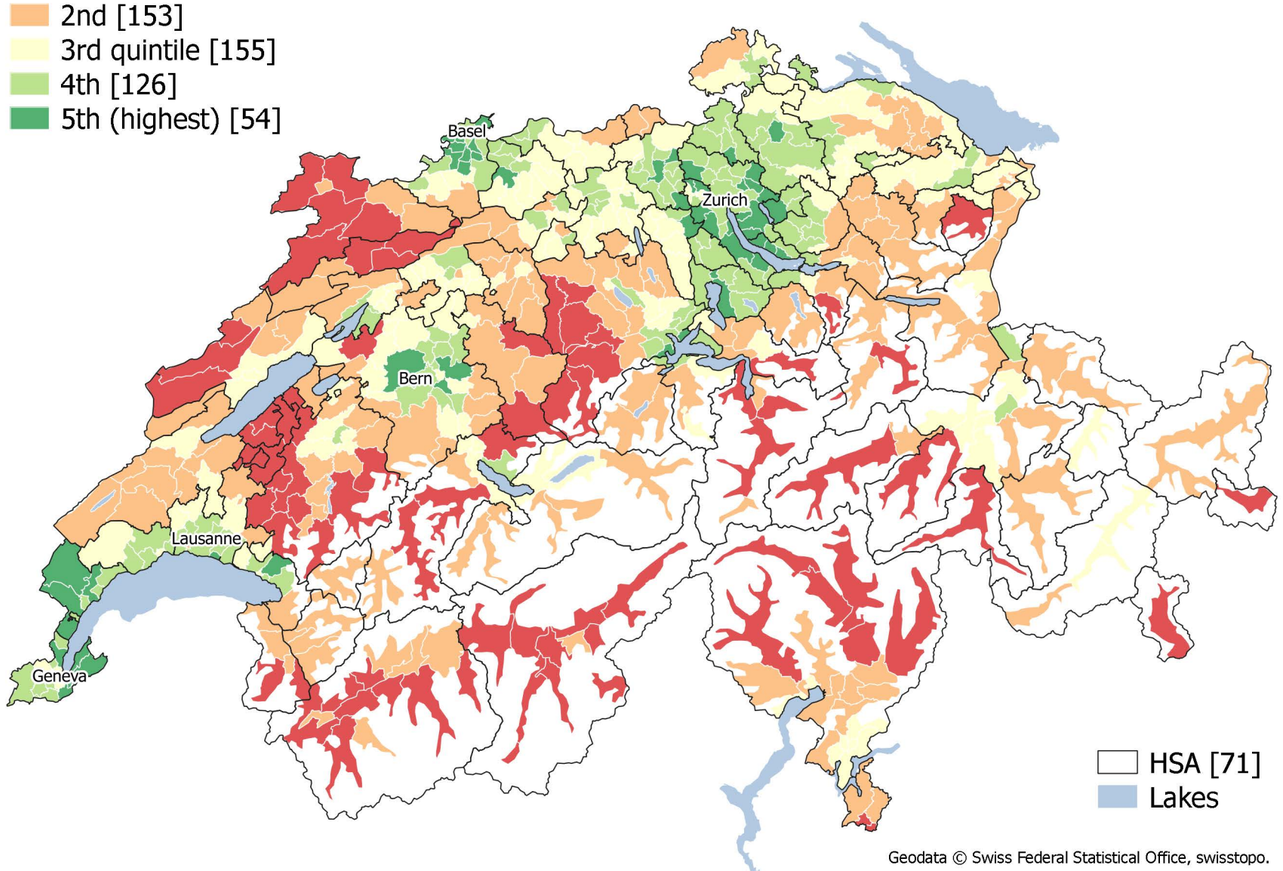


Table 2. Distribution of unlinked deaths across characteristics of the study population. Level of urbanization, language region and Swiss-SEP index measured on the level of community (*Gemeinde*). Abbreviations: Swiss-SEP – Swiss neighbourhood index of socioeconomic position.

Characteristic		Linked		Unlinked		Total	
		No.	*Col %*	*No.*	*Col %*	*No.*	*Col %*
Sex	*Male*	53,316	47%	2,508	48%	55,824	47%
	Female	59,961	53%	2,672	52%	62,633	53%
Age group	*19 - 30*	810	1%	114	2%	924	1%
	31 - 40	1,150	1%	119	2%	1,269	1%
	41 - 50	3,072	3%	234	5%	3,306	3%
	51 - 60	6,813	6%	380	7%	7,193	6%
	61 - 70	13,533	12%	715	14%	14,248	12%
	71 - 80	24,696	22%	1,048	20%	25,744	22%
	81 - 90	43,160	38%	1,753	34%	44,913	38%
	91+	20,043	18%	817	16%	20,860	18%
Level of urbanization	*Urban*	35,987	32%	1,813	35%	37,800	32%
	Peri-urban	47,779	42%	2,117	41%	49,896	42%
	Rural	29,510	26%	1,250	24%	30,760	26%
Language region	*German*	80,129	71%	2,966	57%	83,095	70%
	French	27,200	24%	1,909	37%	29,109	25%
	Italian	5,947	5%	305	6%	6,252	5%
Swiss-SEP quintile	*1st (lowest)*	8,902	8%	417	8%	9,319	8%
	2nd	22,583	20%	1,038	20%	23,621	20%
	3rd	30,902	27%	1,462	28%	32,364	27%
	4th	38,126	34%	1,721	33%	39,847	34%
	5th (highest)	12,764	11%	542	11%	13,306	11%
Total		113,277	100%	5,180	100%	118,457	100%

The Swiss Federal Statistical Office's (SFSO) database of causes of death was linked to insurance records to derive information on cause of death, nationality, civil status and religion. Probabilistic record linkage was used to estimate the probability that a pair of records from SFSO database and EOLC database relates to the same person. We used date of birth, date of death (or, if not available, date of last treatment), sex, and community of residence (as well as derived, lower resolution spatial variables of larger areas like district, canton, language region etc.) for the linkage. Using probabilistic record linkage allowed us to better use all available information (one insurance company did not deliver date of death; one company provided only monthly precision of date of birth or death). In addition, we were able to account for small discrepancies in linkage variables, such as one day difference or typo errors (e.g. '13' vs '31') in date variables, as well as mismatch on municipality code but match on variables representing broader areas (as district etc.). Based on probability weights, potential matches were accepted or rejected[1,2]. Probabilistic record linkage was performed using the Generalized record Linkage System (GRLS), developed by Statistics Canada.[3]

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Table 3. Representativeness of the study population across characteristics of overall Swiss mortality 2008-10.

Characteristic		Study population		National mortality		Representativeness
		No.	*Col. %*	*No.*	*Col. %*	*% of national mortality (row %)*
Sex	*Male*	53'316	47%	88'907	48%	60%
	Female	59'961	53%	95'910	52%	63%
Age group	*19 - 30*	810	1%	1'389	1%	58%
	31 - 40	1'150	1%	2'026	1%	57%
	41 - 50	3'072	3%	5'535	3%	56%
	51 - 60	6'813	6%	11'658	6%	58%
	61 - 70	13'533	12%	22'300	12%	61%
	71 - 80	24'696	22%	40'165	22%	61%
	81 - 90	43'160	38%	69'849	38%	62%
	91+	20'043	18%	31'895	17%	63%
Nationality	*Swiss*	104'200	92%	170'420	92%	61%
	Foreigner	9'077	8%	14'397	8%	63%
Civil status	*Single*	13'739	12%	22'839	12%	60%
	Married	44'123	39%	73'095	40%	60%
	Widowed	45'234	40%	72'432	39%	62%
	Divorced	10'181	9%	16'451	9%	62%
Religion	*Protestant*	55'163	49%	82'221	44%	67%
	Catholic	39'186	35%	71'919	39%	54%
	No affil.	5'664	5%	9'977	5%	57%
	Other/Unknown	13'264	12%	20'700	11%	64%
Cause of death	*Breast cancer*	2'588	2%	4'240	2%	61%
	Prostate cancer	2'453	2%	4'010	2%	61%
	Lung cancer	5'699	5%	9'163	5%	62%
	Colorectal cancer	3'044	3%	4'980	3%	61%
	Other cancer	15'697	14%	25'814	14%	61%
	Heart failure	4'851	4%	7'836	4%	62%
	Coronary heart disease	15'767	14%	25'756	14%	61%
	Stroke	7'255	6%	11'830	6%	61%
	Other CVD	13'100	12%	21'118	11%	62%
	COPD	3'450	3%	5'523	3%	62%
	Other respiratory	3'584	3%	5'851	3%	61%
	Dementia & Alzcheimer's	9'033	8%	14'665	8%	62%
	Other MBD	1'031	1%	1'717	1%	60%
	Other DNS	2'656	2%	4'426	2%	60%
	External	6'295	6%	10'597	6%	59%
	Other	16'774	15%	27'291	15%	61%
Level	*Urban*	36'075	32%	61'288	33%	59%
of urbanization	*Peri-urban*	47'725	42%	74'145	40%	64%
	Rural	29'477	26%	49'384	27%	60%
Language region	*German*	80'129	71%	133'177	72%	60%
	French	27'201	24%	42'586	23%	64%
	Italian	5'947	5%	9'054	5%	66%
Swiss-SEP	*1st (lowest)*	8'902	8%	16'291	9%	55%
	2nd	22'583	20%	36'660	20%	62%
	3rd quintile	30'902	27%	47'931	26%	64%
	4th	38'126	34%	63'707	34%	60%
	5th (highest)	12'764	11%	20'228	11%	63%
Total		113'277	100%	184'817	100%	61%

Table 4. Mean and standard deviation [SD] of cost of care in last 12 months of life across study population characteristics. All values given in thousands of Swiss Francs: 1 CHF = 0.91 Euro = 0.98 the U.S. Dollar, as of 27.01.16. Table cells are shaded with diverging red-blue colour scheme with red hues representing column-wise high values, and blue – low ones; hues are centred on the mean value for each strata. Abbreviations: Swiss-SEP – Swiss neighbourhood index of socioeconomic position; Physicians and hospital beds densities calculated using 2010 data, per 10,000 population 18 year old and older; Nursing home beds density calculated using population 55 year old and over.

Variable		Males, 19-65		Males, 65+		Females, 19-65		Females, 65+		Total	
	Category	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age group											
	19 - 25	17.4	48.5			36.9	57.2			22.6	51.6
	26 - 30	21.4	43.6			38.3	56.8			27.1	49.0
	31 - 35	31.2	62.7			39.8	57.9			34.2	61.2
	36 - 40	28.9	48.9			51.8	48.1			37.4	49.8
	41 - 45	28.9	50.6			52.3	53.2			37.1	52.7
	46 - 50	35.6	46.8			54.4	53.3			42.6	50.2
	51 - 55	36.9	51.4			49.0	46.9			41.6	50.1
	56 - 60	41.4	53.7			49.6	48.5			44.4	52.0
	61 - 65	41.8	47.2			48.7	45.5			44.4	46.7
	66 - 70			40.9	42.7			46.1	47.1	42.9	44.5
	71 - 75			38.6	38.9			40.0	38.2	39.2	38.6
	76 - 80			35.1	35.8			34.1	30.5	34.7	33.5
	81 - 85			29.8	27.9			28.9	22.8	29.3	25.3
	86 - 90			26.7	22.5			26.6	19.0	26.6	20.4
	91+			24.8	19.3			25.5	16.1	25.3	17.0
Cause of death											
	Breast cancer					70.2	47.7	41.3	32.6	50.7	40.5
	Prostate cancer	68.6	38.3	40.1	33.4					41.9	34.4
	Lung cancer	51.5	35.4	39.0	32.2	56.8	41.7	40.8	33.2	44.1	35.0
	Colorectal cancer	77.3	49.7	45.5	39.6	75.4	48.0	41.2	39.5	50.4	43.8
	Other cancer	65.8	56.3	43.4	38.4	66.4	50.1	39.7	34.6	48.1	43.4
	Heart failure	26.9	49.7	26.1	22.8	20.8	20.1	25.6	17.7	25.7	20.3
	Coronary heart disease	16.0	28.8	23.9	27.5	19.9	36.4	24.5	20.7	23.5	24.9
	Stroke	29.0	41.6	28.8	29.6	30.6	34.6	26.7	20.5	27.6	25.4
	Other cardiovascular diseases	22.4	49.1	25.5	29.9	26.8	50.3	25.3	23.7	25.2	29.0
	Chronic obstructive pulmonary disease	31.1	26.8	30.2	25.6	46.5	46.1	32.1	25.8	31.5	26.9
	Other respiratory diseases	39.0	48.4	30.8	28.3	43.3	49.0	28.7	21.9	30.4	27.3
	Dementia & Alzheimer's	37.7	30.9	30.3	20.2	34.1	20.6	29.5	16.2	29.8	17.6
	Other mental and behavioral disorders	15.8	30.3	24.1	20.5	21.8	29.7	26.5	19.5	22.5	24.8
	Other diseases of the nervous system	39.5	44.0	36.8	33.0	41.8	34.6	34.1	22.2	36.4	30.7
	External	11.1	24.3	24.4	28.1	18.9	24.5	25.3	24.0	19.9	26.0
	Other	32.8	60.7	32.3	33.9	38.4	51.4	30.1	27.4	31.6	36.2
Nationality											
	Swiss	37.1	50.9	31.5	31.5	49.1	49.1	29.5	25.1	32.0	32.5
	Foreigner	39.4	48.0	37.3	34.8	50.2	46.5	34.4	33.0	38.1	39.1
Civil status											
	Single	27.0	43.1	28.1	26.4	41.9	47.3	28.5	23.4	29.3	32.7
	Married	44.6	54.5	34.0	34.3	54.3	51.5	35.5	34.0	37.3	39.5
	Widowed	38.9	51.8	28.3	25.5	45.5	45.0	28.0	22.0	28.3	23.6
	Divorced	33.2	44.7	33.2	35.4	44.8	42.1	33.0	30.5	34.6	36.7
Religion											
	Protestant	37.4	47.4	30.8	31.3	49.3	48.8	28.7	24.8	31.0	31.1
	Catholic	39.2	52.5	32.6	30.7	49.8	48.0	30.7	25.2	33.4	33.0
	No affil.	35.2	51.9	35.5	38.5	51.2	49.3	31.6	31.5	36.0	41.5
	Other/Unknown	35.9	50.7	34.0	34.3	47.1	49.8	31.8	28.8	34.5	37.2
Urbanicity											
	Urban	37.7	47.7	33.8	32.4	49.2	48.2	31.1	26.2	33.7	32.8
	Peri-urban	38.5	52.2	32.9	33.6	51.2	50.4	29.8	26.3	33.2	34.7
	Rural	35.7	50.5	28.2	27.5	45.4	45.7	27.7	23.3	29.6	30.6
Language region											
	German	35.1	48.3	29.5	30.3	46.0	45.1	27.5	23.9	30.1	31.2
	French	43.2	55.6	38.2	35.1	58.1	56.8	36.0	29.4	39.0	37.8
	Italian	39.9	45.2	36.5	32.5	47.8	46.1	32.4	25.2	35.3	31.4
Swiss-SEP quintile											
	1st (lowest)	34.9	43.7	29.4	26.8	42.8	43.1	29.3	21.8	30.7	28.4
	2nd	35.6	44.0	29.4	27.7	44.9	44.0	28.4	22.4	30.4	29.0
	3rd	37.5	53.4	31.4	30.5	48.7	46.2	29.1	25.7	32.0	33.1
	4th	38.5	51.5	33.2	33.4	51.8	52.5	30.7	27.0	33.6	34.7
	5th (highest)	41.4	55.9	36.7	40.3	54.2	52.4	31.7	28.7	35.9	38.5
Physicians / 10,000											
	1st (lowest)	36.2	44.9	29.6	29.3	47.7	46.5	29.2	28.6	31.3	32.8
	2nd	35.5	45.6	29.4	29.8	49.8	49.8	28.4	23.1	31.0	31.5
	3rd quintile	36.7	54.4	28.8	28.7	44.2	44.6	27.1	23.1	29.7	31.6
	4th	38.6	52.4	32.7	32.8	50.7	49.6	30.2	25.1	33.2	33.7
	5th (highest)	38.4	50.8	34.2	33.5	50.7	49.9	30.9	26.4	33.9	33.9
Nursing home beds / 10'000 (65+)											
	1st (lowest)	39.7	56.5	36.4	35.9	57.8	58.0	33.8	29.1	37.0	38.4
	2nd	39.2	49.6	33.1	33.0	50.9	50.3	31.1	27.5	33.9	34.4
	3rd quintile	39.3	56.2	32.5	30.1	48.4	47.0	29.5	24.6	32.6	32.9
	4th	36.0	47.3	30.3	31.1	46.2	44.4	28.6	24.5	30.9	31.4
	5th (highest)	32.3	40.4	28.6	27.7	45.1	45.9	26.4	21.0	28.8	28.0
Hospital beds / 10,000											
	1st (lowest)	36.1	63.5	27.1	27.0	44.2	43.7	26.1	24.4	28.6	33.3
	2nd	35.3	44.7	29.1	29.0	46.1	45.6	27.5	22.0	29.9	29.6
	3rd quintile	37.4	51.6	31.0	30.5	48.2	48.2	28.8	24.4	31.8	32.9
	4th	38.8	49.4	35.1	35.3	52.3	51.4	32.3	28.3	35.1	35.4
	5th (highest)	37.6	49.0	31.3	29.8	49.1	48.0	29.0	24.0	31.8	31.2
Total		37.5	50.4	32.0	31.9	49.3	48.8	29.8	25.6	32.5	33.2

Table 5. Median cost (p50), 25th (p25) and 75th (p75) percentiles cost of care in last 12 months of life across study population characteristics. All values given in thousands of Swiss Francs: 1 CHF = 0.91 Euro = 0.98 the U.S. Dollar, as of 27.01.16. Table cells are shaded with diverging red-blue colour scheme with red hues representing column-wise high values, and blue – low ones; hues are centred on the median value for each strata. Abbreviations: Swiss-SEP – Swiss neighbourhood index of socioeconomic position; Physicians and hospital beds densities calculated using 2010 data, per 10,000 population 18 year old and older; Nursing home beds density calculated using population 55 year old and over.

Variable		Males, 19-65		Males, 65+		Females, 19-65		Females, 65+		Total	
	Category	*p50*	*(p25, p75)*	*p50*	*(p25, p75)*	*p50*	*(p25, p75)*	*p50*	*(p25, p75)*	*p50*	*(p25, p75)*
Age group											
	19 - 25	1.5	(0.1, 9.8)			10.7	(1.6, 54.3)			2.1	(0.3, 18.2)
	26 - 30	3.1	(0.4, 22.9)			15.6	(5, 53.1)			7.2	(0.7, 31.6)
	31 - 35	8.1	(1.1, 32.5)			15.7	(3.8, 60.5)			9.9	(1.9, 40.9)
	36 - 40	8.4	(1.4, 33)			40.9	(12.6, 77.7)			17.9	(2.9, 54.6)
	41 - 45	9.6	(1.2, 39.8)			40.8	(12.2, 69.5)			17.0	(2.9, 54)
	46 - 50	16.8	(2.5, 52)			42.2	(13.5, 76.8)			26.5	(5.3, 64.3)
	51 - 55	19.6	(3.4, 52.8)			39.7	(13.9, 67.2)			27.6	(6, 59.4)
	56 - 60	25.9	(6.5, 58.2)			38.3	(16.4, 66.5)			31.1	(9.3, 61.5)
	61 - 65	29.4	(8.6, 58.2)			38.6	(15.7, 65.9)			32.9	(10.8, 61.5)
	66 - 70			30.1	(10.5, 56.4)			35.5	(15.4, 60)	32.4	(12.4, 58)
	71 - 75			28.9	(12.4, 51.4)			31.9	(15, 51.6)	30.2	(13.5, 51.5)
	76 - 80			26.7	(12.3, 45.5)			27.9	(13.8, 44.1)	27.3	(12.9, 44.8)
	81 - 85			24.2	(11.6, 38.6)			26.2	(13.3, 37.9)	25.4	(12.5, 38.2)
	86 - 90			22.8	(11.3, 35.6)			25.4	(13, 35)	24.5	(12.3, 35.2)
	91+			22.4	(11.7, 33.4)			25.9	(14.2, 33.9)	25.1	(13.4, 33.8)
Cause of death											
	Breast cancer					59.0	(40.4, 87.4)	33.8	(20.5, 52.7)	41.3	(24.4, 65.2)
	Prostate cancer	62.9	(42, 88.8)	33.2	(19.3, 51.2)					34.4	(20.2, 54.1)
	Lung cancer	46.0	(27.8, 67.1)	31.4	(17.8, 50.5)	51.0	(30.1, 70.3)	33.3	(19.4, 51.4)	36.5	(20.8, 58)
	Colorectal cancer	68.2	(43.7, 104)	34.6	(18.1, 59.7)	68.4	(40.3, 100.8)	31.9	(18, 53.6)	38.2	(20.5, 67.7)
	Other cancer	52.4	(29.1, 84.4)	33.2	(18.3, 56.2)	54.2	(33.2, 85.5)	30.9	(17.9, 50)	36.3	(20.4, 61.6)
	Heart failure	5.9	(2.7, 30.6)	21.9	(10.3, 35.3)	16.5	(4.7, 30.3)	24.7	(12.5, 34.5)	23.7	(11.3, 34.6)
	Coronary heart disease	5.2	(1.7, 17.1)	16.9	(6.8, 31.9)	8.8	(2.7, 21)	22.2	(10.1, 33.3)	18.4	(7.1, 32.2)
	Stroke	14.7	(7.3, 37.1)	23.1	(11, 37.1)	18.1	(8.2, 39.3)	25.3	(12.2, 35.2)	24.2	(11.5, 36)
	Other cardiovascular diseases	5.9	(1.8, 22.4)	17.3	(6.7, 33.5)	9.1	(3, 27.2)	22.1	(9.9, 33.8)	19.4	(7.5, 33.3)
	Chronic obstructive pulmonary disease	23.6	(11.3, 43.9)	24.6	(13.3, 38.6)	35.5	(16.8, 59.7)	28.6	(15.9, 41.1)	26.6	(14.1, 40.2)
	Other respiratory diseases	21.5	(8.5, 45.5)	24.2	(13.2, 40.1)	25.5	(9.5, 55.5)	26.4	(14, 36.8)	25.7	(13.2, 38.1)
	Dementia & Alzheimer's	32.0	(19.8, 51.4)	30.1	(17.7, 39.1)	31.9	(20.6, 45)	30.4	(21.2, 37.6)	30.3	(20.1, 38.1)
	Other mental and behavioral disorders	5.2	(1, 18.6)	22.8	(8, 33.6)	12.2	(4.1, 28.1)	26.5	(11.5, 36.7)	18.4	(4.4, 33.3)
	Other diseases of the nervous system	29.4	(11.1, 50.2)	32.1	(18.7, 45.7)	35.4	(15.7, 56.6)	32.7	(22, 42)	32.4	(19.1, 44.7)
	External	2.6	(0.3, 12)	16.7	(6.9, 32.9)	8.1	(2.3, 27.7)	21.1	(10.2, 34)	12.0	(3.1, 28.8)
	Other	14.8	(4, 38.6)	23.8	(10.5, 41)	20.1	(7, 51.4)	26.0	(13.2, 37.6)	24.2	(10.6, 39.1)
Nationality											
	Swiss	20.6	(4, 52.6)	24.6	(11.5, 40.3)	38.2	(13.5, 67.3)	26.6	(13.7, 37.5)	26.0	(11.9, 40.2)
	Foreigner	24.1	(4.5, 57.5)	29.0	(14.5, 49)	39.6	(14.5, 71.3)	28.4	(14.8, 43.2)	28.7	(12.3, 50)
Civil status											
	Single	11.5	(1.9, 36.6)	23.7	(9.8, 37.7)	27.7	(8.1, 59.3)	26.4	(13.9, 36.3)	23.6	(8.4, 38)
	Married	29.0	(6.1, 63.7)	25.7	(12, 43.9)	43.6	(17, 73.7)	28.3	(14.1, 45.2)	27.5	(12.1, 48.4)
	Widowed	23.4	(6.7, 53.4)	24.0	(11.8, 36.6)	34.2	(10.8, 62.7)	26.2	(13.6, 36.1)	25.8	(13.1, 36.3)
	Divorced	19.4	(4.2, 47.1)	25.0	(10.1, 43.3)	36.7	(14.1, 62)	28.7	(13.9, 42.2)	27.4	(10.5, 45.2)
Religion											
	Protestant	21.8	(4.4, 53.6)	23.8	(11.2, 39.7)	38.5	(14.4, 66.1)	25.8	(12.9, 36.9)	25.3	(11.6, 39.3)
	Catholic	23.7	(4.9, 55.4)	26.4	(12.7, 41.5)	39.6	(14.8, 67.8)	27.8	(15, 38.5)	27.5	(13.1, 41.9)
	No affil.	19.4	(3.5, 47.7)	25.6	(10.9, 45.4)	38.8	(14.6, 72.3)	26.0	(12.9, 39.3)	26.0	(9.9, 46.1)
	Other/Unknown	16.6	(2.6, 51.4)	26.1	(11.4, 44)	33.2	(9.2, 68.4)	27.0	(14.2, 39.3)	26.2	(10.5, 44)
Urbanicity											
	Urban	22.3	(5, 54.1)	26.7	(12.9, 43.3)	38.1	(13.8, 68.2)	27.9	(14.8, 39.1)	27.6	(13.1, 42.3)
	Peri-urban	21.6	(3.8, 54.2)	25.3	(11.8, 42.1)	39.6	(14.5, 69.9)	26.2	(13.2, 37.7)	26.1	(11.7, 41.7)
	Rural	19.3	(3.4, 50.2)	22.4	(10.3, 36.9)	35.6	(11.9, 62.2)	25.6	(13.2, 35.4)	24.4	(10.9, 37.7)
Language region											
	German	19.3	(3.5, 50.3)	22.7	(10.4, 37.9)	36.6	(13.2, 63.4)	24.8	(12.3, 35.2)	24.2	(10.7, 37.9)
	French	25.1	(5.8, 60.4)	31.5	(15.5, 49.6)	44.2	(14.9, 80.7)	32.7	(18.1, 45.2)	32.3	(15.6, 49.2)
	Italian	28.1	(4.7, 61)	28.5	(17.5, 44.8)	39.3	(14.4, 66.1)	26.9	(20, 36.7)	27.7	(18, 42.6)
Swiss-SEP quintile											
	1st (lowest)	20.1	(3.2, 49)	24.6	(12, 38.2)	34.3	(11.4, 62.5)	27.6	(15.4, 37.1)	26.4	(12.5, 38.9)
	2nd	19.7	(3.9, 52.1)	23.7	(11.3, 38.1)	36.0	(11.6, 61.9)	26.0	(14.2, 36)	25.2	(11.8, 38.5)
	3rd	20.5	(4.2, 52.2)	24.5	(11.6, 40.8)	38.4	(14.2, 67.6)	26.1	(13.6, 36.5)	25.6	(11.8, 40.3)
	4th	22.3	(4.3, 54.5)	25.7	(11.8, 42.6)	38.7	(14.4, 71.6)	27.3	(13.5, 39)	26.9	(12, 42.2)
	5th (highest)	23.5	(3.8, 58.2)	27.9	(12.3, 45.7)	42.6	(15.7, 73.5)	28.0	(13, 40.4)	28.2	(12.1, 44.7)
Physicians / 10,000											
	1st (lowest)	20.3	(3.1, 52.4)	22.8	(10.8, 38.6)	38.5	(12.1, 66.2)	26.0	(12.9, 36.2)	24.9	(11, 39.3)
	2nd	20.4	(3.6, 50.3)	22.5	(10.4, 37.9)	38.7	(12.9, 68.9)	25.7	(13.3, 36.1)	24.6	(10.9, 39.1)
	3rd quintile	19.1	(3.5, 51.9)	22.4	(10.2, 37.1)	34.1	(12.2, 61.1)	24.5	(11.7, 34.9)	23.8	(10.2, 37.5)
	4th	22.0	(4.1, 53.4)	25.7	(12.3, 41.7)	38.7	(14.3, 71.1)	27.1	(14.3, 38.1)	26.8	(12.5, 41.4)
	5th (highest)	22.3	(4.7, 54.8)	27.0	(12.9, 43.8)	39.5	(14.3, 69.7)	27.6	(14.5, 39)	27.5	(13, 42.6)
Nursing home beds / 10'000 (65+)											
	1st (lowest)	19.3	(3, 51.5)	23.2	(10.9, 39.7)	40.4	(13.2, 68.5)	26.3	(12.9, 37.2)	25.2	(11, 40.5)
	2nd	20.1	(3.6, 49.6)	22.1	(10.1, 37.3)	37.8	(13.4, 65.3)	24.9	(12.8, 34.9)	24.1	(10.6, 38)
	3rd quintile	20.9	(4, 55.5)	24.1	(11, 39.7)	36.6	(11.6, 66.8)	25.8	(12.7, 36.5)	25.3	(11, 39.8)
	4th	21.4	(4.1, 53.4)	25.0	(11.8, 40.3)	38.1	(14.1, 66.4)	26.4	(13.8, 36.6)	26.0	(12.1, 40)
	5th (highest)	22.2	(4.8, 54.6)	27.0	(12.9, 43.8)	38.5	(14.1, 69.9)	27.8	(14.6, 39.4)	27.6	(13, 42.8)
Hospital beds / 10,000											
	1st (lowest)	21.3	(3.5, 52.6)	22.0	(10.3, 36.8)	33.4	(9.4, 60.9)	25.3	(12.2, 35.3)	24.1	(10.5, 38)
	2nd	17.4	(3.3, 47.6)	22.9	(10.1, 37.5)	39.6	(16.1, 67.9)	25.7	(13.4, 35.8)	24.6	(10.8, 38.6)
	3rd quintile	21.9	(3.7, 54.2)	23.3	(11.1, 39.2)	36.6	(12.8, 64.4)	25.7	(13, 36.3)	25.0	(11.3, 39.6)
	4th	19.3	(3.6, 51.1)	25.2	(11.7, 40.8)	38.4	(13.6, 68.9)	26.5	(13.8, 37.7)	26.0	(11.7, 40.7)
	5th (highest)	22.7	(4.8, 55.6)	27.0	(12.9, 43.9)	39.7	(14.5, 70.9)	27.7	(14.5, 39)	27.6	(13, 42.7)
Total		21.3	(4.1, 53.4)	25.0	(11.7, 41)	38.3	(13.6, 67.8)	26.7	(13.8, 37.7)	26.2	(11.9, 40.9)

Table 6.Significance of interaction parameters. P-values from test of interaction of sex variable (second column) and binary age indicator variable (19-65 vs. 66+; second and third columns) with the variables presented in rows. Multilevel models using individual patient data with inverse hyperbolic sine transfromed cost as outcome with regions of place of residence nested within Hospital Service Areas as additional two levels, adjusted for all variables listed in the table.

Variable	Interaction with sex	Interaction with age	
		Males	*Females*
Age group	<0.0001	--	--
Nationality	0.613	0.467	0.237
Civil status	<0.0001	<0.0001	<0.0001
Religion	0.002	0.030	<0.0001
Cause of death	<0.0001	<0.0001	<0.0001
Level of urbanization	<0.0001	0.896	<0.0001
Language region	0.526	0.024	<0.0001
Swiss-SEP quintile	<0.0001	0.433	<0.0001

Figure 2. Variance estimates of regional cost variation from four multilevel models for males and females aged below and above 65 years at death. Regional variation was modelled at the level of 564 regions of place of residence (MedStat, blue bars) and 71 Hospital Service Areas (HSA, red bars). Model 1 included no individual or regional characteristics; Model 2 included age and cause of death of individuals; Model 3 included all characteristics from Model 2 plus additionally civil status, nationality, religion of individuals and urbanicity, Swiss-SEP and three healthcare supply measures; Model 4 included all characteristics from Model 3 plus additionally language region.

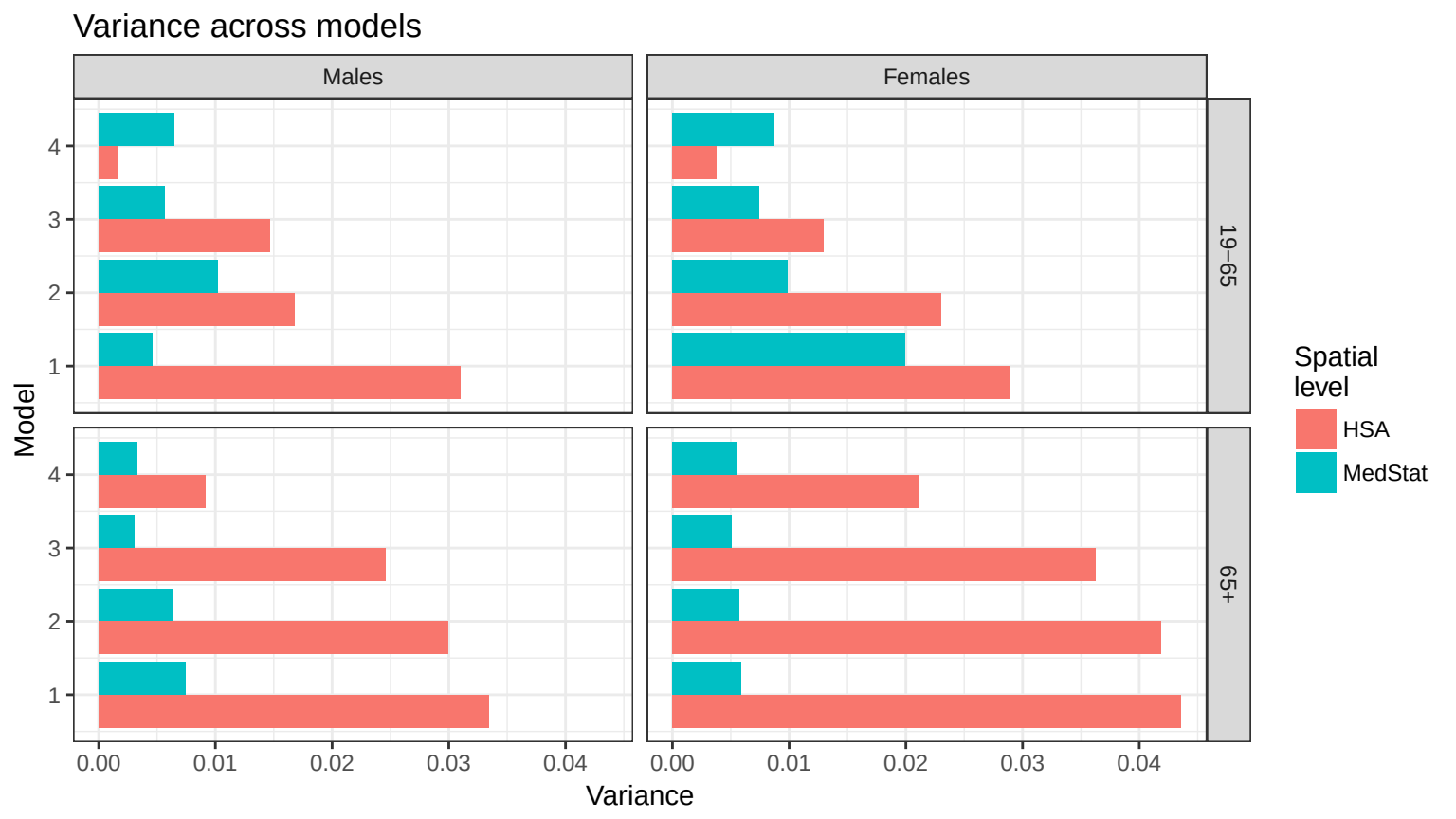
Variance across models
Males
Females
19–65
65+
Model
4
3
2
1
0.00
0.01
0.02
0.03
0.04
Variance
Spatial level
HSA
MedStat

Figure 3. Estimates of regional cost variation from unadjusted mode for males and females aged below and above 65 years at death (Model 1). Regional values derived from exponentiated sum of random effects across 564 regions of place of residence. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost.

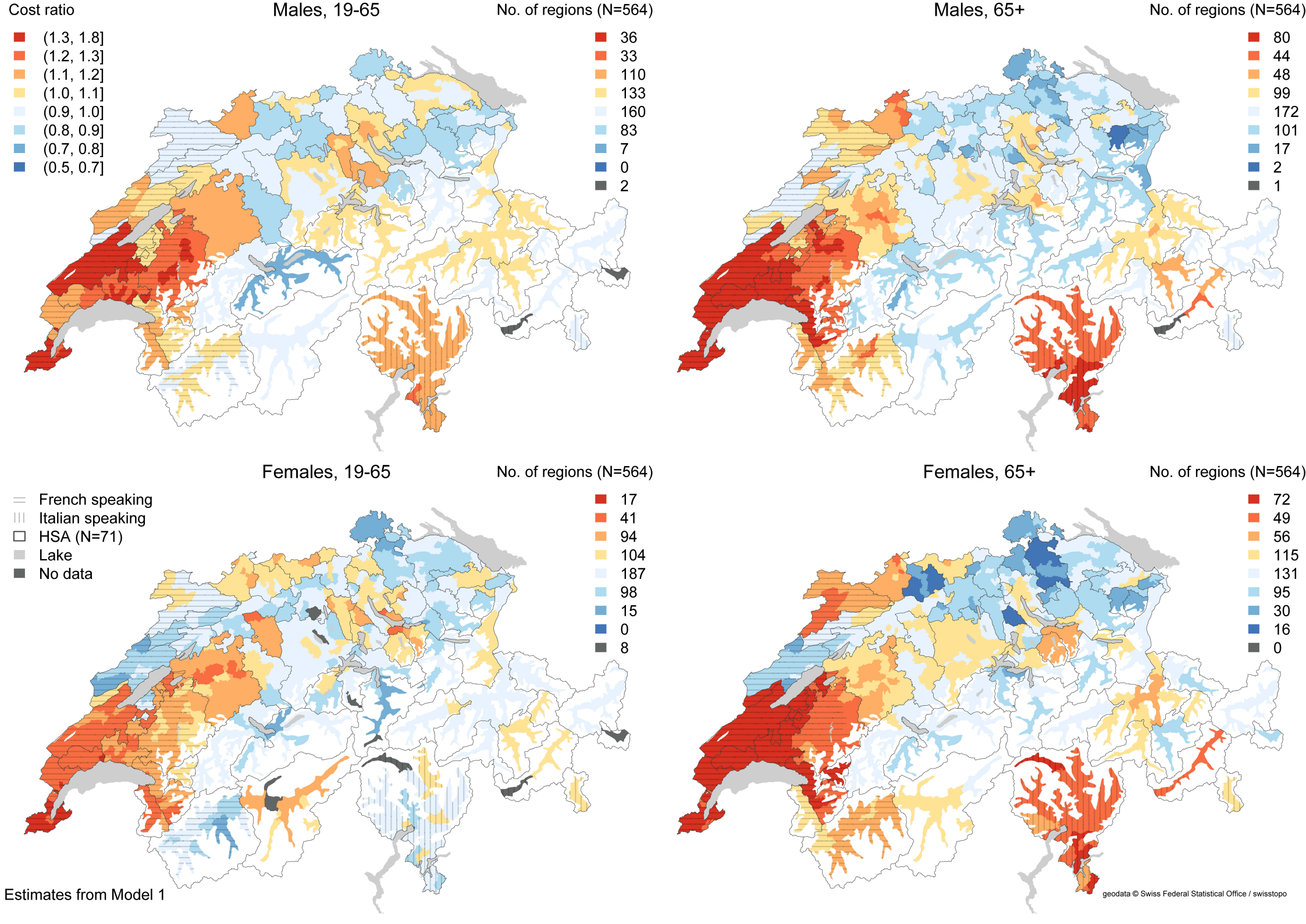
Cost ratio
(1.3, 1.8]
(1.2, 1.3]
(1.1, 1.2]
(1.0, 1.1]
(0.9, 1.0]
(0.8, 0.9]
(0.7, 0.8]
(0.5, 0.7]
Males, 19-65
No. of regions (N=564)
36
33
110
133
160
83
7
0
2
Males, 65+
No. of regions (N=564)
80
44
48
99
172
101
17
2
1
Females, 19-65
No. of regions (N=564)
French speaking
Italian speaking
HSA (N=71)
Lake
No data
17
41
94
104
187
98
15
0
8
Females, 65+
No. of regions (N=564)
72
49
56
115
131
95
30
16
0
Estimates from Model 1
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Figure 4. Estimates of regional cost variation from model adjusted for age, cause of death, civil status, religion, nationality, Swiss-SEP, level of urbanization and three healthcare supply measures for males and females aged below and above 65 years at death (Model 3). Regional values derived from exponentiated sum of random effects across 564 regions of place of residence. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost.

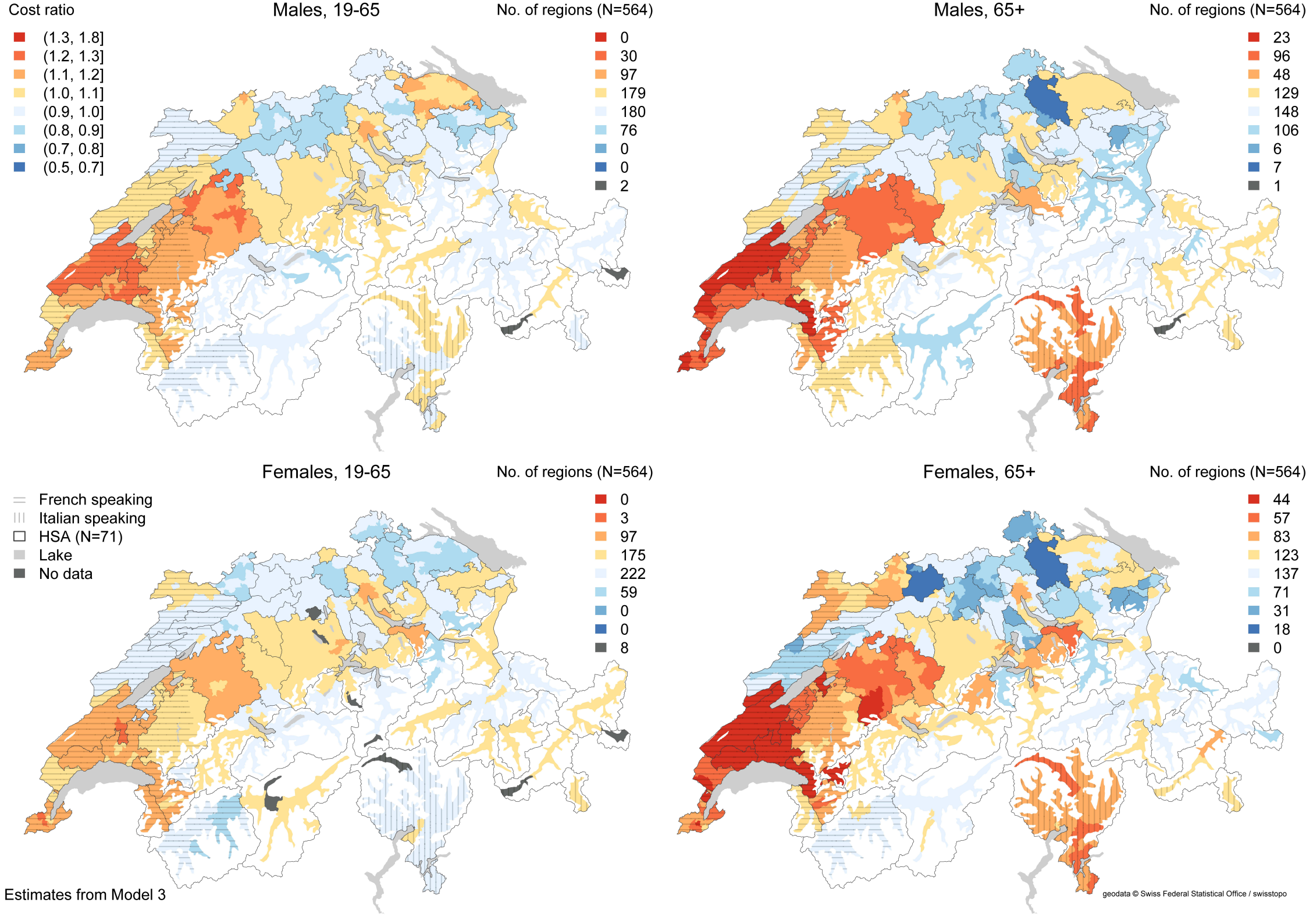
Cost ratio
(1.3, 1.8]
(1.2, 1.3]
(1.1, 1.2]
(1.0, 1.1]
(0.9, 1.0]
(0.8, 0.9]
(0.7, 0.8]
(0.5, 0.7]
Males, 19-65
No. of regions (N=564)
0
30
97
179
180
76
0
0
2
Males, 65+
No. of regions (N=564)
23
96
48
129
148
106
6
7
1
Females, 19-65
No. of regions (N=564)
French speaking
Italian speaking
HSA (N=71)
Lake
No data
0
3
97
175
222
59
0
0
8
Females, 65+
No. of regions (N=564)
44
57
83
123
137
71
31
18
0
Estimates from Model 3
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Table 7. Estimates of coefficients from Model 1 (no covariates), 2 (adjusted for individual factors), 3 (adjusted for individual and regional factors) and 4 (adjusted for individual, regional factors and health supply measures) for males 19-65. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Variable	Group	Model: 1		Model: 2		Model: 3		Model: 4	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*19-25*			0.45	(0.39, 0.53)	0.50	(0.42, 0.59)	0.50	(0.42, 0.59)
	26-30			0.65	(0.55, 0.78)	0.70	(0.59, 0.84)	0.70	(0.59, 0.84)
	31-35			0.86	(0.73, 1.01)	0.90	(0.76, 1.06)	0.89	(0.76, 1.05)
	36-40			0.84	(0.73, 0.97)	0.87	(0.76, 1.00)	0.87	(0.76, 1.00)
	41-45			0.77	(0.69, 0.86)	0.79	(0.71, 0.88)	0.79	(0.71, 0.88)
	46-50			0.82	(0.75, 0.89)	0.84	(0.77, 0.92)	0.84	(0.77, 0.92)
	51-55			0.83	(0.76, 0.89)	0.84	(0.78, 0.91)	0.84	(0.78, 0.91)
	56-60			0.95	(0.88, 1.01)	0.96	(0.89, 1.02)	0.96	(0.89, 1.02)
	61-65			ref.	-	ref.	-	ref.	-
Cause of death	*Prostate cancer*			4.59	(3.69, 5.73)	4.35	(3.49, 5.43)	4.36	(3.50, 5.44)
	Lung cancer			3.35	(3.03, 3.70)	3.25	(2.94, 3.59)	3.23	(2.92, 3.58)
	Colorectal cancer			4.83	(4.15, 5.62)	4.67	(4.01, 5.44)	4.66	(4.00, 5.43)
	Other cancer			3.82	(3.52, 4.14)	3.68	(3.39, 3.99)	3.67	(3.38, 3.99)
	Heart failure			0.69	(0.51, 0.93)	0.69	(0.51, 0.93)	0.68	(0.51, 0.92)
	Coronary heart disease			0.48	(0.44, 0.53)	0.47	(0.43, 0.52)	0.47	(0.43, 0.52)
	Stroke			1.13	(0.94, 1.35)	1.09	(0.91, 1.32)	1.09	(0.91, 1.31)
	Other CVD			0.57	(0.51, 0.64)	0.56	(0.50, 0.62)	0.56	(0.50, 0.62)
	COPD			1.56	(1.27, 1.92)	1.56	(1.26, 1.91)	1.54	(1.25, 1.89)
	Other respiratory			1.54	(1.24, 1.93)	1.53	(1.23, 1.91)	1.53	(1.23, 1.91)
	Dementia & Alzheimer's			1.77	(1.22, 2.58)	1.72	(1.18, 2.51)	1.73	(1.19, 2.52)
	Other MBD			0.47	(0.39, 0.55)	0.48	(0.40, 0.56)	0.48	(0.40, 0.56)
	Other DNS			1.88	(1.59, 2.22)	1.86	(1.57, 2.20)	1.86	(1.57, 2.20)
	External			0.32	(0.30, 0.35)	0.32	(0.29, 0.35)	0.32	(0.29, 0.35)
	Other			1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*					0.86	(0.81, 0.92)	0.87	(0.81, 0.93)
	Married					ref.	-	ref.	-
	Widowed					0.99	(0.84, 1.17)	0.98	(0.83, 1.16)
	Divorced					0.86	(0.80, 0.92)	0.85	(0.80, 0.91)
Nationality	*Swiss*					ref.	-	ref.	-
	Foreigner					1.03	(0.96, 1.10)	1.03	(0.96, 1.10)
Religion	*Protestant*					ref.	-	ref.	-
	Catholic					1.00	(0.94, 1.07)	1.00	(0.94, 1.07)
	No affil.					0.98	(0.90, 1.08)	0.99	(0.90, 1.08)
	Other/Unknown					0.90	(0.83, 0.97)	0.90	(0.84, 0.98)
Level of urbanization	*Urban*					1.06	(0.97, 1.17)	1.05	(0.96, 1.16)

	Peri-urban					ref.	-	ref.	-
	Rural					0.97	(0.89, 1.06)	1.00	(0.92, 1.09)
Swiss-SEP	*1st (lowest)*					0.96	(0.84, 1.10)	0.87	(0.76, 0.99)
	2nd					0.99	(0.91, 1.08)	0.95	(0.87, 1.03)
	3rd quintile					ref.	-	ref.	-
	4th					1.04	(0.96, 1.13)	1.09	(1.01, 1.17)
	5th (highest)					1.04	(0.92, 1.17)	1.09	(0.98, 1.23)
Density of physicians	*1st (lowest)*					0.92	(0.83, 1.02)	0.93	(0.84, 1.03)
	2nd					0.92	(0.84, 1.02)	0.94	(0.85, 1.03)
	3rd quintile					ref.	-	ref.	-
	4th					0.98	(0.89, 1.08)	0.99	(0.91, 1.09)
	5th (highest)					0.96	(0.87, 1.07)	0.97	(0.88, 1.08)
Density of nursing home beds	*1st (lowest)*					0.98	(0.84, 1.13)	0.89	(0.80, 1.00)
	2nd					0.95	(0.83, 1.10)	0.91	(0.82, 1.02)
	3rd quintile					ref.	-	ref.	-
	4th					0.90	(0.78, 1.04)	0.96	(0.87, 1.07)
	5th (highest)					0.87	(0.74, 1.03)	0.87	(0.76, 0.98)
Density of hospital beds	*1st (lowest)*					0.91	(0.78, 1.06)	1.08	(0.95, 1.22)
	2nd					0.97	(0.84, 1.11)	1.07	(0.96, 1.19)
	3rd quintile					ref.	-	ref.	-
	4th					0.98	(0.87, 1.12)	1.02	(0.94, 1.12)
	5th (highest)					0.91	(0.79, 1.06)	1.05	(0.95, 1.17)
Language region	*German*							ref.	-
	French							1.38	(1.26, 1.50)
	Italian							1.15	(0.95, 1.39)
Constant		26.53	(24.99, 28.16)	24.89	(22.91, 27.04)	30.84	(25.86, 36.78)	26.28	(22.52, 30.67)
Variance	*HSA level*	0.03	(0.02, 0.06)	0.02	(0.01, 0.03)	0.01	(0.01, 0.03)	0.00	(0.00, 0.04)
	MedStat level	0.00	(0.00, 0.19)	0.01	(0.00, 0.03)	0.01	(0.00, 0.03)	0.01	(0.00, 0.03)
	Residual	2.86	(2.78, 2.94)	1.78	(1.74, 1.83)	1.78	(1.73, 1.83)	1.78	(1.73, 1.83)

Table 8. Estimates of coefficients from Model 1 (no covariates), 2 (adjusted for individual factors), 3 (adjusted for individual and regional factors) and 4 (adjusted for individual, regional factors and health supply measures) for males 66 and older. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Variable	Group	Model: 1		Model: 2		Model: 3		Model: 4	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*66-70*			ref.	-	ref.	-	ref.	-
	71-75			1.05	(1.01, 1.09)	1.04	(1.00, 1.08)	1.04	(1.00, 1.08)
	76-80			1.04	(1.00, 1.08)	1.02	(0.98, 1.06)	1.02	(0.98, 1.06)
	81-85			0.99	(0.95, 1.03)	0.97	(0.93, 1.01)	0.97	(0.93, 1.00)
	86-90			0.96	(0.92, 1.00)	0.93	(0.90, 0.97)	0.93	(0.90, 0.97)
	91+			0.95	(0.91, 0.99)	0.93	(0.89, 0.97)	0.93	(0.89, 0.97)
	Prostate cancer			1.59	(1.51, 1.67)	1.56	(1.49, 1.65)	1.56	(1.48, 1.64)
	Lung cancer			1.50	(1.43, 1.58)	1.47	(1.40, 1.54)	1.47	(1.40, 1.54)
	Colorectal cancer			1.67	(1.56, 1.77)	1.63	(1.53, 1.74)	1.64	(1.54, 1.74)
	Other cancer			1.60	(1.54, 1.67)	1.57	(1.51, 1.63)	1.57	(1.51, 1.63)
	Heart failure			0.93	(0.88, 0.99)	0.93	(0.87, 0.98)	0.93	(0.87, 0.98)
	Coronary heart disease			0.76	(0.73, 0.78)	0.75	(0.72, 0.77)	0.75	(0.72, 0.78)
	Stroke			1.05	(1.00, 1.10)	1.04	(0.99, 1.09)	1.04	(0.99, 1.09)
	Other CVD			0.76	(0.73, 0.79)	0.75	(0.72, 0.78)	0.75	(0.72, 0.78)
	COPD			1.14	(1.08, 1.20)	1.13	(1.07, 1.20)	1.13	(1.07, 1.20)
	Other respiratory			1.11	(1.04, 1.18)	1.10	(1.03, 1.17)	1.10	(1.03, 1.17)
	Dementia & Alzheimer's			1.20	(1.14, 1.26)	1.18	(1.13, 1.24)	1.18	(1.13, 1.24)
	Other MBD			0.76	(0.66, 0.87)	0.78	(0.68, 0.89)	0.78	(0.68, 0.89)
	Other DNS			1.39	(1.29, 1.49)	1.36	(1.27, 1.46)	1.36	(1.27, 1.46)
	External			0.74	(0.70, 0.78)	0.74	(0.70, 0.78)	0.74	(0.70, 0.78)
	Other			1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*					0.84	(0.81, 0.88)	0.84	(0.81, 0.88)
	Married					ref.	-	ref.	-
	Widowed					0.98	(0.96, 1.01)	0.98	(0.96, 1.01)
	Divorced					0.86	(0.83, 0.90)	0.86	(0.83, 0.90)
Nationality	*Swiss*					ref.	-	ref.	-
	Foreigner					1.04	(1.00, 1.08)	1.04	(1.00, 1.08)
Religion	*Protestant*					ref.	-	ref.	-
	Catholic					1.03	(1.00, 1.05)	1.03	(1.00, 1.05)
	No affil.					1.01	(0.96, 1.06)	1.01	(0.96, 1.06)
	Other/Unknown					0.89	(0.86, 0.93)	0.89	(0.86, 0.92)
Level of urbanization	*Urban*					1.01	(0.96, 1.05)	1.00	(0.96, 1.05)
	Peri-urban					ref.	-	ref.	-
	Rural					0.98	(0.94, 1.02)	0.98	(0.94, 1.02)
Swiss-SEP	*1st (lowest)*					0.96	(0.90, 1.02)	0.93	(0.88, 0.99)

	2nd					0.97	(0.93, 1.01)	0.96	(0.92, 1.00)
	3rd quintile					ref.	-	ref.	-
	4th					1.04	(1.00, 1.08)	1.04	(1.00, 1.08)
	5th (highest)					1.08	(1.02, 1.14)	1.09	(1.04, 1.15)
Density of physicians	*1st (lowest)*					0.99	(0.94, 1.03)	0.99	(0.94, 1.03)
	2nd					0.96	(0.92, 1.00)	0.96	(0.92, 1.00)
	3rd quintile					ref.	-	ref.	-
	4th					1.02	(0.98, 1.07)	1.03	(0.99, 1.07)
	5th (highest)					1.05	(1.00, 1.10)	1.05	(1.01, 1.10)
Density of nursing home beds	*1st (lowest)*					0.96	(0.84, 1.10)	0.95	(0.87, 1.05)
	2nd					0.95	(0.84, 1.09)	0.97	(0.88, 1.06)
	3rd quintile					ref.	-	ref.	-
	4th					0.85	(0.75, 0.97)	0.93	(0.85, 1.03)
	5th (highest)					0.89	(0.77, 1.02)	0.93	(0.85, 1.03)
Density of hospital beds	*1st (lowest)*					0.86	(0.75, 0.98)	0.97	(0.88, 1.07)
	2nd					0.94	(0.82, 1.07)	1.01	(0.92, 1.11)
	3rd quintile					ref.	-	ref.	-
	4th					0.99	(0.87, 1.13)	1.00	(0.92, 1.09)
	5th (highest)					0.93	(0.82, 1.07)	1.00	(0.91, 1.09)
Language region	*German*							ref.	-
	French							1.33	(1.24, 1.42)
	Italian							1.40	(1.13, 1.72)
Constant		37.79	(36.02, 39.64)	35.35	(33.31, 37.51)	42.33	(36.95, 48.49)	36.18	(32.54, 40.24)
Variance	*HSA level*	0.03	(0.02, 0.05)	0.03	(0.02, 0.04)	0.02	(0.02, 0.04)	0.01	(0.01, 0.02)
	MedStat level	0.01	(0.00, 0.01)	0.01	(0.00, 0.01)	0.00	(0.00, 0.01)	0.00	(0.00, 0.01)
	Residual	1.19	(1.18, 1.21)	1.10	(1.09, 1.12)	1.10	(1.08, 1.11)	1.10	(1.08, 1.11)

Table 9. Estimates of coefficients from Model 1 (no covariates), 2 (adjusted for individual factors), 3 (adjusted for individual and regional factors) and 4 (adjusted for individual, regional factors and health supply measures) for females 19-65. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Variable	Group	Model: 1		Model: 2		Model: 3		Model: 4	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*19-25*			0.72	(0.58, 0.91)	0.77	(0.61, 0.98)	0.77	(0.62, 0.98)
	26-30			0.96	(0.78, 1.19)	1.02	(0.82, 1.26)	1.01	(0.82, 1.26)
	31-35			0.87	(0.72, 1.05)	0.88	(0.73, 1.07)	0.88	(0.73, 1.07)
	36-40			1.20	(1.03, 1.40)	1.23	(1.05, 1.43)	1.22	(1.05, 1.42)
	41-45			1.12	(0.99, 1.27)	1.13	(1.00, 1.28)	1.13	(1.00, 1.28)
	46-50			1.06	(0.96, 1.17)	1.07	(0.97, 1.18)	1.07	(0.97, 1.18)
	51-55			0.98	(0.90, 1.07)	0.99	(0.91, 1.08)	0.99	(0.91, 1.08)
	56-60			0.96	(0.89, 1.04)	0.96	(0.89, 1.04)	0.96	(0.89, 1.03)
	61-65			ref.	-	ref.	-	ref.	-
	Breast cancer			3.19	(2.86, 3.55)	3.10	(2.78, 3.45)	3.10	(2.78, 3.45)
	Lung cancer			2.59	(2.31, 2.90)	2.54	(2.26, 2.84)	2.53	(2.26, 2.83)
	Colorectal cancer			3.50	(2.99, 4.09)	3.42	(2.93, 4.00)	3.43	(2.93, 4.01)
	Other cancer			2.97	(2.71, 3.26)	2.91	(2.65, 3.19)	2.91	(2.65, 3.19)
	Heart failure			0.61	(0.41, 0.92)	0.61	(0.40, 0.91)	0.60	(0.40, 0.91)
	Coronary heart disease			0.47	(0.40, 0.56)	0.46	(0.39, 0.54)	0.46	(0.40, 0.55)
	Stroke			0.95	(0.80, 1.14)	0.95	(0.79, 1.13)	0.95	(0.80, 1.13)
	Other CVD			0.54	(0.47, 0.62)	0.53	(0.46, 0.62)	0.53	(0.46, 0.62)
	COPD			1.67	(1.34, 2.09)	1.64	(1.32, 2.04)	1.64	(1.31, 2.04)
	Other respiratory			1.26	(0.98, 1.61)	1.22	(0.95, 1.56)	1.22	(0.95, 1.56)
	Dementia & Alzheimer's			1.40	(1.03, 1.91)	1.39	(1.02, 1.89)	1.38	(1.01, 1.88)
	Other MBD			0.62	(0.50, 0.77)	0.62	(0.51, 0.77)	0.63	(0.51, 0.77)
	Other DNS			1.62	(1.37, 1.92)	1.61	(1.36, 1.90)	1.60	(1.35, 1.89)
	External			0.46	(0.41, 0.52)	0.46	(0.41, 0.52)	0.46	(0.41, 0.52)
	Other			1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*					0.90	(0.83, 0.98)	0.90	(0.83, 0.97)
	Married					ref.	-	ref.	-
	Widowed					0.92	(0.82, 1.02)	0.92	(0.82, 1.02)
	Divorced					0.95	(0.88, 1.02)	0.94	(0.88, 1.02)
Nationality	*Swiss*					ref.	-	ref.	-
	Foreigner					1.08	(0.99, 1.18)	1.07	(0.98, 1.17)
Religion	*Protestant*					ref.	-	ref.	-
	Catholic					0.99	(0.92, 1.06)	0.99	(0.92, 1.06)
	No affil.					0.99	(0.89, 1.10)	1.00	(0.90, 1.11)
	Other/Unknown					0.83	(0.76, 0.90)	0.83	(0.76, 0.91)
Level of urbanization	*Urban*					1.02	(0.92, 1.14)	1.01	(0.91, 1.13)

	Peri-urban					ref.	-	ref.	-
	Rural					1.01	(0.92, 1.12)	1.03	(0.93, 1.14)
Swiss-SEP	*1st (lowest)*					0.84	(0.72, 0.99)	0.78	(0.67, 0.91)
	2nd					0.88	(0.80, 0.98)	0.86	(0.78, 0.94)
	3rd quintile					ref.	-	ref.	-
	4th					1.03	(0.94, 1.12)	1.05	(0.97, 1.15)
	5th (highest)					1.06	(0.93, 1.20)	1.09	(0.96, 1.24)
Density of physicians	*1st (lowest)*					1.01	(0.89, 1.14)	1.00	(0.88, 1.12)
	2nd					1.12	(1.00, 1.25)	1.11	(0.99, 1.24)
	3rd quintile					ref.	-	ref.	-
	4th					1.14	(1.03, 1.27)	1.13	(1.02, 1.25)
	5th (highest)					1.11	(0.99, 1.25)	1.10	(0.98, 1.23)
Density of nursing home beds	*1st (lowest)*					1.05	(0.90, 1.23)	0.98	(0.86, 1.13)
	2nd					0.90	(0.78, 1.04)	0.88	(0.78, 1.00)
	3rd quintile					ref.	-	ref.	-
	4th					0.82	(0.71, 0.95)	0.88	(0.78, 1.00)
	5th (highest)					0.79	(0.67, 0.93)	0.81	(0.70, 0.94)
Density of hospital beds	*1st (lowest)*					0.91	(0.77, 1.06)	1.04	(0.90, 1.20)
	2nd					0.99	(0.86, 1.15)	1.10	(0.97, 1.24)
	3rd quintile					ref.	-	ref.	-
	4th					0.98	(0.87, 1.12)	1.03	(0.93, 1.14)
	5th (highest)					1.04	(0.89, 1.20)	1.11	(0.98, 1.25)
Language region	*German*							ref.	-
	French							1.30	(1.18, 1.44)
	Italian							1.08	(0.85, 1.38)
Constant		51.81	(48.73, 55.08)	32.73	(29.76, 36.01)	37.22	(30.79, 44.99)	32.86	(27.46, 39.33)
Variance	*HSA level*	0.03	(0.01, 0.06)	0.02	(0.01, 0.05)	0.01	(0.01, 0.03)	0.00	(0.00, 0.02)
	MedStat level	0.02	(0.01, 0.06)	0.01	(0.00, 0.04)	0.01	(0.00, 0.04)	0.01	(0.00, 0.04)
	Residual	1.87	(1.81, 1.94)	1.32	(1.28, 1.37)	1.31	(1.27, 1.36)	1.31	(1.27, 1.36)

Table 10. Estimates of coefficients from Model 1 (no covariates), 2 (adjusted for individual factors), 3 (adjusted for individual and regional factors) and 4 (adjusted for individual, regional factors and health supply measures) for females 66 and older. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Variable	Group	Model: 1		Model: 2		Model: 3		Model: 4	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*66-70*			ref.	-	ref.	-	ref.	-
	71-75			0.95	(0.90, 0.99)	0.95	(0.90, 0.99)	0.95	(0.90, 0.99)
	76-80			0.89	(0.86, 0.93)	0.89	(0.86, 0.93)	0.89	(0.86, 0.93)
	81-85			0.85	(0.82, 0.89)	0.85	(0.82, 0.89)	0.85	(0.82, 0.89)
	86-90			0.83	(0.80, 0.87)	0.84	(0.80, 0.87)	0.84	(0.80, 0.87)
	91+			0.83	(0.80, 0.87)	0.84	(0.80, 0.87)	0.84	(0.80, 0.87)
	Breast cancer			1.46	(1.39, 1.54)	1.45	(1.38, 1.53)	1.45	(1.38, 1.53)
	Lung cancer			1.42	(1.34, 1.50)	1.42	(1.33, 1.50)	1.42	(1.33, 1.50)
	Colorectal cancer			1.43	(1.35, 1.52)	1.43	(1.34, 1.52)	1.43	(1.34, 1.52)
	Other cancer			1.38	(1.34, 1.43)	1.37	(1.33, 1.42)	1.37	(1.33, 1.42)
	Heart failure			0.94	(0.90, 0.98)	0.94	(0.90, 0.98)	0.94	(0.90, 0.98)
	Coronary heart disease			0.85	(0.83, 0.88)	0.85	(0.83, 0.88)	0.85	(0.83, 0.88)
	Stroke			0.97	(0.93, 1.00)	0.96	(0.93, 1.00)	0.96	(0.93, 1.00)
	Other CVD			0.84	(0.81, 0.86)	0.84	(0.81, 0.86)	0.84	(0.81, 0.86)
	COPD			1.13	(1.07, 1.20)	1.13	(1.07, 1.20)	1.13	(1.07, 1.20)
	Other respiratory			1.02	(0.97, 1.07)	1.02	(0.97, 1.07)	1.02	(0.97, 1.07)
	Dementia & Alzheimer's			1.13	(1.09, 1.17)	1.13	(1.09, 1.16)	1.13	(1.09, 1.16)
	Other MBD			0.80	(0.73, 0.89)	0.81	(0.73, 0.90)	0.81	(0.73, 0.90)
	Other DNS			1.31	(1.23, 1.39)	1.30	(1.22, 1.38)	1.30	(1.22, 1.38)
	External			0.86	(0.82, 0.90)	0.86	(0.82, 0.91)	0.86	(0.82, 0.90)
	Other			1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*					0.90	(0.87, 0.93)	0.90	(0.87, 0.93)
	Married					ref.	-	ref.	-
	Widowed					0.96	(0.94, 0.98)	0.96	(0.94, 0.98)
	Divorced					0.92	(0.89, 0.96)	0.92	(0.89, 0.96)
Nationality	*Swiss*					ref.	-	ref.	-
	Foreigner					0.98	(0.95, 1.02)	0.98	(0.95, 1.02)
Religion	*Protestant*					ref.	-	ref.	-
	Catholic					1.03	(1.01, 1.06)	1.03	(1.01, 1.06)
	No affil.					0.96	(0.92, 1.01)	0.96	(0.92, 1.01)
	Other/Unknown					0.94	(0.91, 0.97)	0.94	(0.91, 0.97)
Level of urbanization	*Urban*					1.03	(0.99, 1.07)	1.02	(0.98, 1.07)
	Peri-urban					ref.	-	ref.	-
	Rural					0.99	(0.95, 1.03)	0.99	(0.95, 1.03)
Swiss-SEP	*1st (lowest)*					1.00	(0.94, 1.06)	0.99	(0.93, 1.05)

	2nd					0.99	(0.95, 1.02)	0.98	(0.94, 1.02)
	3rd quintile					ref.	-	ref.	-
	4th					0.99	(0.96, 1.03)	0.99	(0.96, 1.03)
	5th (highest)					1.00	(0.95, 1.06)	1.00	(0.95, 1.06)
Density of physicians	*1st (lowest)*					1.02	(0.98, 1.07)	1.02	(0.98, 1.07)
	2nd					1.02	(0.98, 1.07)	1.03	(0.98, 1.07)
	3rd quintile					ref.	-	ref.	-
	4th					1.05	(1.01, 1.09)	1.06	(1.01, 1.10)
	5th (highest)					1.04	(0.99, 1.08)	1.04	(1.00, 1.09)
Density of nursing home beds	*1st (lowest)*					1.04	(0.89, 1.22)	1.02	(0.89, 1.16)
	2nd					1.00	(0.85, 1.17)	0.99	(0.87, 1.13)
	3rd quintile					ref.	-	ref.	-
	4th					0.89	(0.76, 1.04)	0.95	(0.84, 1.08)
	5th (highest)					0.93	(0.80, 1.10)	0.96	(0.84, 1.09)
Density of hospital beds	*1st (lowest)*					0.85	(0.73, 1.00)	0.95	(0.83, 1.08)
	2nd					0.95	(0.82, 1.11)	1.01	(0.89, 1.14)
	3rd quintile					ref.	-	ref.	-
	4th					0.99	(0.85, 1.15)	1.00	(0.88, 1.12)
	5th (highest)					0.95	(0.81, 1.11)	0.99	(0.87, 1.12)
Language region	*German*							ref.	-
	French							1.25	(1.15, 1.36)
	Italian							1.26	(0.96, 1.66)
Constant		39.58	(37.55, 41.73)	44.83	(41.98, 47.88)	49.07	(41.97, 57.36)	43.93	(38.41, 50.25)
Variance	*HSA level*	0.04	(0.03, 0.06)	0.04	(0.03, 0.06)	0.04	(0.02, 0.05)	0.02	(0.01, 0.03)
	MedStat level	0.01	(0.00, 0.01)	0.01	(0.00, 0.01)	0.01	(0.00, 0.01)	0.01	(0.00, 0.01)
	Residual	0.98	(0.97, 0.99)	0.94	(0.93, 0.95)	0.94	(0.93, 0.95)	0.94	(0.93, 0.95)

Table 11. Estimates of coefficients of sensitivity analyses based on the cost of the last 3 months of life. Multilevel models specified in the same way as Model 4 (adjusted for individual, regional factors and health supply measures) for males and females aged below and above 65 years at death. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Note: none of the coefficients changed the direction of association. The mean value of change between the coefficients of fully adjusted Model 4 using cost from last 12 months of life as an outcome and equivalent models using last 3 months of life was 0.03 (SD 0.17).

Variable	Group	Males, <19-65		Males, 66+		Females, 19-65		Females, 66+	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*19-25*	0.62	(0.54, 0.73)			0.96	(0.77, 1.19)		
	26-30	0.78	(0.66, 0.92)			0.89	(0.72, 1.09)		
	31-35	0.99	(0.86, 1.15)			0.99	(0.82, 1.19)		
	36-40	0.91	(0.80, 1.03)			1.11	(0.96, 1.28)		
	41-45	0.83	(0.75, 0.91)			1.11	(0.98, 1.25)		
	46-50	0.88	(0.82, 0.96)			1.11	(1.01, 1.23)		
	51-55	0.88	(0.82, 0.94)			0.99	(0.91, 1.07)		
	56-60	0.94	(0.89, 1.00)			0.97	(0.90, 1.05)		
	61-65	ref.	-			ref.	-		
	66-70			ref.	-			ref.	-
	71-75			1.04	(1.00, 1.09)			0.96	(0.92, 1.00)
	76-80			1.04	(1.00, 1.08)			0.90	(0.86, 0.94)
	81-85			0.98	(0.94, 1.02)			0.85	(0.82, 0.88)
	86-90			0.93	(0.89, 0.96)			0.81	(0.78, 0.84)
	91+			0.89	(0.85, 0.93)			0.76	(0.73, 0.79)
	Breast cancer					2.50	(2.25, 2.77)	1.36	(1.30, 1.43)
	Prostate cancer	3.38	(2.78, 4.11)	1.39	(1.33, 1.46)				
	Lung cancer	3.11	(2.85, 3.41)	1.58	(1.51, 1.66)	2.58	(2.31, 2.87)	1.63	(1.54, 1.72)
	Colorectal cancer	3.21	(2.81, 3.68)	1.52	(1.43, 1.62)	2.41	(2.07, 2.80)	1.47	(1.38, 1.55)
	Other cancer	3.19	(2.96, 3.43)	1.59	(1.53, 1.65)	2.64	(2.41, 2.88)	1.51	(1.46, 1.56)
	Heart failure	0.52	(0.40, 0.68)	0.86	(0.81, 0.91)	0.46	(0.31, 0.68)	0.86	(0.83, 0.90)
	Coronary heart disease	0.54	(0.50, 0.59)	0.74	(0.71, 0.77)	0.53	(0.45, 0.61)	0.81	(0.79, 0.84)
	Stroke	1.40	(1.19, 1.65)	1.05	(1.00, 1.10)	1.40	(1.18, 1.66)	0.98	(0.95, 1.02)
	Other CVD	0.62	(0.56, 0.69)	0.77	(0.74, 0.81)	0.65	(0.56, 0.74)	0.83	(0.81, 0.85)
	COPD	1.37	(1.14, 1.65)	1.01	(0.95, 1.06)	1.38	(1.12, 1.71)	0.99	(0.94, 1.04)
	Other respiratory	1.63	(1.34, 1.98)	1.20	(1.13, 1.27)	1.26	(0.99, 1.60)	1.02	(0.98, 1.07)
	Dementia & Alzheimer's	1.33	(0.95, 1.85)	0.93	(0.88, 0.97)	1.02	(0.76, 1.38)	0.89	(0.86, 0.92)
	Other MBD	0.41	(0.35, 0.47)	0.70	(0.62, 0.80)	0.47	(0.38, 0.58)	0.69	(0.63, 0.76)
	Other DNS	1.47	(1.27, 1.71)	1.10	(1.03, 1.18)	1.32	(1.12, 1.55)	1.03	(0.97, 1.09)
	External	0.36	(0.33, 0.38)	0.85	(0.80, 0.90)	0.46	(0.41, 0.52)	1.06	(1.01, 1.11)
	Other	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*	0.80	(0.76, 0.85)	0.78	(0.75, 0.81)	0.81	(0.75, 0.87)	0.84	(0.82, 0.87)
	Married	ref.	-	ref.	-	ref.	-	ref.	-
	Widowed	0.82	(0.70, 0.95)	0.91	(0.89, 0.93)	0.83	(0.75, 0.92)	0.90	(0.88, 0.92)
	Divorced	0.83	(0.78, 0.88)	0.83	(0.80, 0.87)	0.85	(0.79, 0.92)	0.87	(0.84, 0.90)

Nationality	*Swiss*	ref.	-	ref.	-	ref.	-	ref.	-
	Foreigner	1.07	(1.01, 1.14)	1.05	(1.01, 1.09)	1.07	(0.99, 1.17)	1.03	(0.99, 1.07)
Religion	*Protestant*	ref.	-	ref.	-	ref.	-	ref.	-
	Catholic	0.99	(0.93, 1.04)	1.02	(1.00, 1.05)	1.04	(0.97, 1.11)	1.02	(1.00, 1.04)
	No affil.	1.00	(0.92, 1.08)	1.02	(0.97, 1.07)	1.00	(0.90, 1.10)	0.94	(0.90, 0.98)
	Other/Unknown	0.86	(0.80, 0.92)	0.90	(0.87, 0.93)	0.85	(0.78, 0.93)	0.94	(0.92, 0.97)
Level of urbanization	*Urban*	1.02	(0.94, 1.11)	1.01	(0.97, 1.05)	1.01	(0.92, 1.12)	1.02	(0.98, 1.06)
	Peri-urban	ref.	-	ref.	-	ref.	-	ref.	-
	Rural	1.00	(0.93, 1.08)	0.96	(0.92, 1.00)	1.04	(0.94, 1.14)	1.00	(0.97, 1.04)
Swiss-SEP	*1st (lowest)*	0.97	(0.86, 1.09)	0.94	(0.88, 0.99)	0.86	(0.74, 1.00)	0.98	(0.92, 1.03)
	2nd	0.97	(0.90, 1.04)	0.96	(0.92, 1.00)	0.87	(0.79, 0.95)	0.97	(0.94, 1.01)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	1.09	(1.02, 1.17)	1.04	(1.00, 1.08)	1.02	(0.94, 1.11)	0.99	(0.96, 1.03)
	5th (highest)	1.06	(0.96, 1.18)	1.07	(1.01, 1.12)	1.10	(0.98, 1.25)	1.01	(0.96, 1.06)
Density of physicians	*1st (lowest)*	0.98	(0.89, 1.07)	0.99	(0.95, 1.03)	0.98	(0.87, 1.10)	1.02	(0.98, 1.06)
	2nd	0.97	(0.89, 1.06)	0.97	(0.93, 1.01)	1.08	(0.97, 1.21)	1.00	(0.96, 1.04)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	0.99	(0.91, 1.07)	1.00	(0.97, 1.05)	1.08	(0.97, 1.19)	1.06	(1.02, 1.10)
	5th (highest)	1.00	(0.91, 1.09)	1.03	(0.99, 1.08)	1.04	(0.94, 1.16)	1.04	(1.00, 1.09)
Density of nursing home beds	*1st (lowest)*	0.92	(0.82, 1.03)	0.97	(0.88, 1.07)	1.06	(0.92, 1.24)	1.04	(0.93, 1.16)
	2nd	0.95	(0.85, 1.05)	0.98	(0.89, 1.08)	0.93	(0.81, 1.07)	1.02	(0.91, 1.14)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	0.98	(0.88, 1.09)	0.96	(0.87, 1.05)	0.92	(0.80, 1.06)	0.98	(0.88, 1.10)
	5th (highest)	0.89	(0.78, 1.00)	0.96	(0.87, 1.06)	0.86	(0.74, 1.00)	0.96	(0.85, 1.07)
Density of hospital beds	*1st (lowest)*	1.06	(0.94, 1.20)	1.01	(0.91, 1.11)	1.05	(0.90, 1.22)	1.01	(0.90, 1.13)
	2nd	1.03	(0.93, 1.14)	1.02	(0.93, 1.12)	1.06	(0.92, 1.21)	1.02	(0.91, 1.13)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	1.00	(0.92, 1.10)	1.00	(0.92, 1.10)	1.02	(0.90, 1.15)	1.00	(0.90, 1.11)
	5th (highest)	1.00	(0.90, 1.11)	1.01	(0.92, 1.10)	1.14	(1.00, 1.31)	1.01	(0.91, 1.13)
Language region	*German*	ref.	-	ref.	-	ref.	-	ref.	-
	French	1.32	(1.21, 1.44)	1.35	(1.27, 1.45)	1.20	(1.08, 1.34)	1.29	(1.20, 1.39)
	Italian	1.20	(0.97, 1.48)	1.26	(1.02, 1.56)	1.24	(0.93, 1.64)	1.08	(0.85, 1.38)
Constant		11.40	(9.84, 13.20)	14.38	(12.93, 15.99)	13.19	(10.96, 15.87)	16.30	(14.48, 18.34)
Variance	*HSA level*	0.00	(0.00, 0.01)	0.01	(0.01, 0.02)	0.01	(0.00, 0.03)	0.02	(0.01, 0.02)
	MedStat level	0.00	(0.00, 0.04)	0.00	(0.00, 0.01)	0.01	(0.00, 0.06)	0.00	(0.00, 0.01)
	Residual	1.41	(1.37, 1.44)	1.03	(1.01, 1.04)	1.21	(1.17, 1.26)	0.82	(0.81, 0.83)

Figure 5. Spatial distribution of the difference in the estimates of deviation from national mean (random effects) between models using cost from last 12 months of life and last 3 months of life across 564 regions. Models using cost during last 3 months across four strata were specified in the same way as main model 4 and were adjusted for individual, regional factors and health supply measures (see manuscript for details). Areas in shades of orange have higher values of area specific random effects from models using last three months of life aggregated cost of care as outcome, as compared to estimates from models using last 12 months.

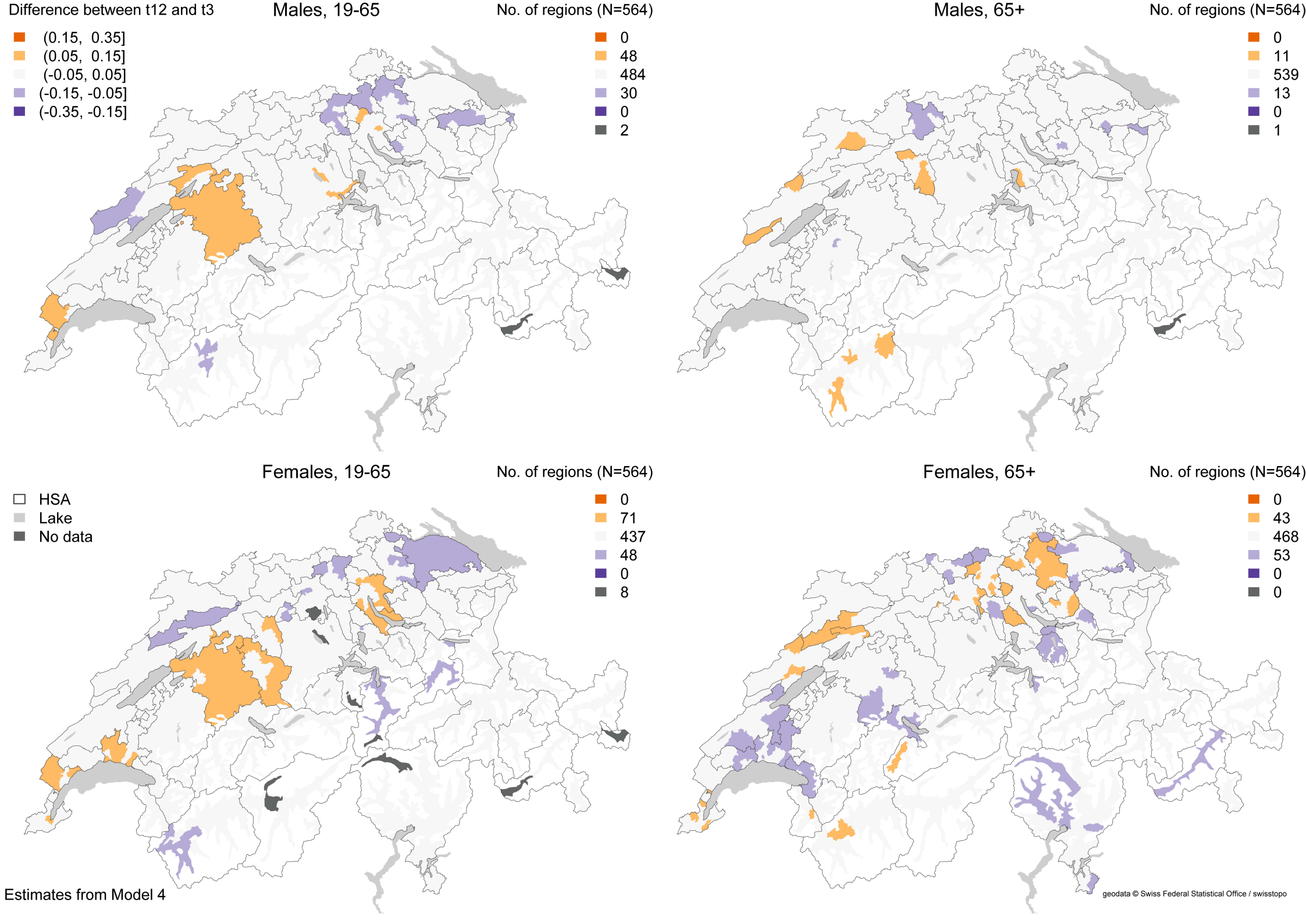
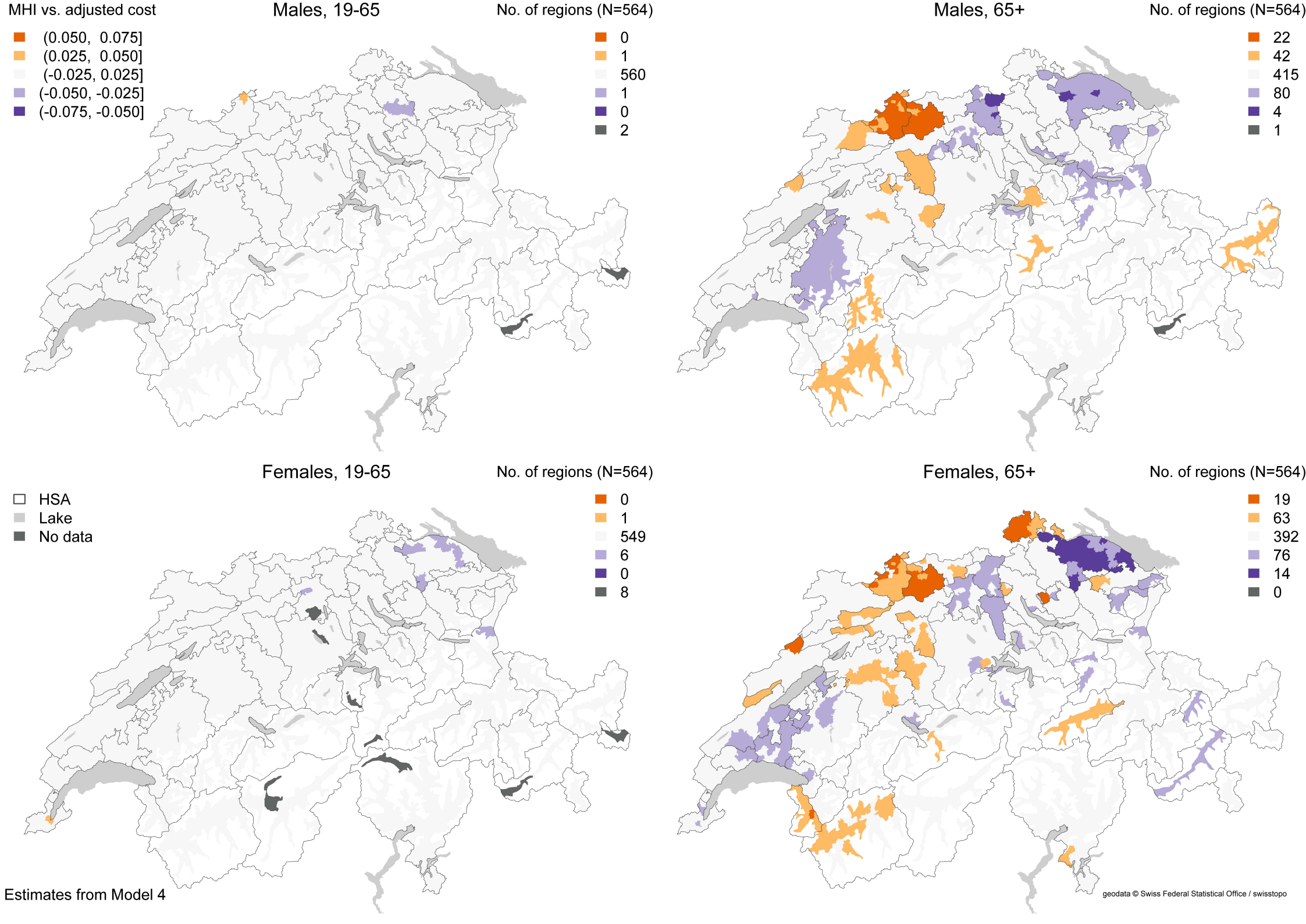

Difference between t12 and t3
(0.15, 0.35]
(0.05, 0.15]
(-0.05, 0.05]
(-0.15, -0.05]
(-0.35, -0.15]
Males, 19-65
No. of regions (N=564)
0
48
484
30
0
2
Males, 65+
No. of regions (N=564)
0
11
539
13
0
1
Females, 19-65
No. of regions (N=564)
HSA
Lake
No data
0
71
437
48
0
8
Females, 65+
No. of regions (N=564)
0
43
468
53
0
0
Estimates from Model 4
geodata © Swiss Federal Statistical Office / swisstopo

Table 12. Estimates of coefficients of sensitivity analyses using cost reimbursed by MHI versus cost adjusted for TARMED differences and cantonal subsidies. Multilevel models specified in the same way as Model 4 (adjusted for individual, regional factors and health supply measures) for males and females aged below and above 65 years at death. Cost ratios across analysed variables, derived from exponentiated coefficients. Cost ratio represents ratio by which costs were higher or lower when compared to the national mean; for instance, coefficient of 1.2 indicates 1.2 times (or 20%) higher cost. Density of supply measures divided into quintiles of spatial units. P-values from the Wald test of the group parameters being jointly one. Abbreviations: 'Est.' – estimate; 'CI' confidence interval; 'Swiss-SEP' – Swiss neighbourhood index of socioeconomic position. See main text for ICD-10 codes of the causes of death classification.

Variable	Group	Males, <19-65		Males, 66+		Females, 19-65		Females, 66+	
		Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Age	*19-25*	0.45	(0.37, 0.54)			0.75	(0.58, 0.97)		
	26-30	0.65	(0.53, 0.80)			1.05	(0.83, 1.33)		
	31-35	0.87	(0.73, 1.05)			0.92	(0.75, 1.13)		
	36-40	0.81	(0.69, 0.94)			1.23	(1.04, 1.46)		
	41-45	0.77	(0.68, 0.87)			1.13	(0.98, 1.30)		
	46-50	0.80	(0.72, 0.88)			1.06	(0.95, 1.19)		
	51-55	0.81	(0.74, 0.88)			0.99	(0.90, 1.09)		
	56-60	0.95	(0.88, 1.03)			0.97	(0.89, 1.05)		
	61-65	ref.	-			ref.	-		
	66-70			ref.	-			ref.	-
	71-75			1.04	(0.99, 1.08)			0.95	(0.91, 1.00)
	76-80			1.03	(0.99, 1.07)			0.90	(0.86, 0.94)
	81-85			0.97	(0.93, 1.01)			0.84	(0.80, 0.88)
	86-90			0.91	(0.88, 0.96)			0.79	(0.76, 0.83)
	91+			0.85	(0.81, 0.89)			0.75	(0.71, 0.78)
	Breast cancer					2.97	(2.64, 3.34)	1.48	(1.40, 1.56)
	Prostate cancer	4.44	(3.48, 5.67)	1.60	(1.52, 1.69)				
	Lung cancer	3.49	(3.12, 3.90)	1.57	(1.49, 1.66)	2.66	(2.35, 3.01)	1.57	(1.48, 1.68)
	Colorectal cancer	4.59	(3.88, 5.44)	1.73	(1.62, 1.86)	3.41	(2.87, 4.05)	1.58	(1.48, 1.68)
	Other cancer	3.98	(3.63, 4.36)	1.72	(1.65, 1.79)	3.17	(2.86, 3.51)	1.53	(1.48, 1.58)
	Heart failure	0.62	(0.45, 0.86)	0.90	(0.84, 0.96)	0.55	(0.35, 0.86)	0.90	(0.86, 0.94)
	Coronary heart disease	0.41	(0.37, 0.46)	0.72	(0.70, 0.75)	0.42	(0.35, 0.50)	0.83	(0.81, 0.86)
	Stroke	1.24	(1.01, 1.52)	1.04	(0.99, 1.10)	1.06	(0.87, 1.29)	0.97	(0.93, 1.00)
	Other CVD	0.50	(0.44, 0.57)	0.74	(0.71, 0.78)	0.50	(0.43, 0.59)	0.82	(0.80, 0.85)
	COPD	1.55	(1.23, 1.94)	1.11	(1.05, 1.18)	1.68	(1.32, 2.13)	1.11	(1.05, 1.18)
	Other respiratory	1.65	(1.29, 2.10)	1.16	(1.08, 1.24)	1.29	(0.98, 1.69)	1.02	(0.97, 1.07)
	Dementia & Alzheimer's	1.60	(1.05, 2.43)	1.06	(1.01, 1.12)	1.07	(0.77, 1.51)	0.99	(0.96, 1.03)
	Other MBD	0.43	(0.35, 0.52)	0.74	(0.64, 0.86)	0.56	(0.44, 0.70)	0.74	(0.66, 0.82)
	Other DNS	1.66	(1.38, 2.00)	1.24	(1.15, 1.34)	1.38	(1.15, 1.66)	1.15	(1.08, 1.23)
	External	0.28	(0.25, 0.31)	0.76	(0.72, 0.81)	0.42	(0.37, 0.47)	0.94	(0.90, 0.99)
	Other	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)	1.00	(1.00, 1.00)
Civil status	*Single*	0.88	(0.82, 0.94)	0.81	(0.78, 0.84)	0.88	(0.80, 0.96)	0.86	(0.83, 0.90)
	Married	ref.	-	ref.	-	ref.	-	ref.	-
	Widowed	0.98	(0.82, 1.18)	0.96	(0.93, 0.98)	0.91	(0.80, 1.02)	0.94	(0.91, 0.96)
	Divorced	0.88	(0.81, 0.95)	0.84	(0.80, 0.88)	0.95	(0.87, 1.03)	0.90	(0.86, 0.93)

Nationality	*Swiss*	ref.	-	ref.	-	ref.	-	ref.	-
	Foreigner	1.05	(0.97, 1.14)	1.05	(1.01, 1.10)	1.09	(0.99, 1.20)	1.00	(0.96, 1.04)
Religion	*Protestant*	ref.	-	ref.	-	ref.	-	ref.	-
	Catholic	1.01	(0.94, 1.09)	1.03	(1.00, 1.06)	1.00	(0.92, 1.08)	1.04	(1.02, 1.07)
	No affil.	0.98	(0.89, 1.08)	1.02	(0.96, 1.07)	0.99	(0.89, 1.11)	0.96	(0.91, 1.01)
	Other/Unknown	0.88	(0.81, 0.96)	0.88	(0.84, 0.91)	0.81	(0.74, 0.89)	0.93	(0.90, 0.96)
Level of urbanization	*Urban*	1.04	(0.94, 1.16)	1.00	(0.96, 1.05)	1.00	(0.89, 1.12)	1.02	(0.97, 1.07)
	Peri-urban	ref.	-	ref.	-	ref.	-	ref.	-
	Rural	0.99	(0.90, 1.09)	0.97	(0.93, 1.01)	1.00	(0.90, 1.12)	0.99	(0.95, 1.03)
Swiss-SEP	*1st (lowest)*	0.90	(0.78, 1.04)	0.94	(0.88, 1.00)	0.81	(0.68, 0.96)	1.00	(0.94, 1.06)
	2nd	0.95	(0.87, 1.05)	0.96	(0.91, 1.00)	0.87	(0.78, 0.97)	0.98	(0.94, 1.02)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	1.09	(1.00, 1.19)	1.05	(1.00, 1.09)	1.06	(0.96, 1.16)	0.99	(0.95, 1.03)
	5th (highest)	1.09	(0.96, 1.24)	1.09	(1.03, 1.15)	1.10	(0.96, 1.26)	0.99	(0.94, 1.05)
Density of physicians	*1st (lowest)*	0.91	(0.82, 1.02)	0.98	(0.93, 1.03)	0.98	(0.86, 1.12)	1.02	(0.98, 1.07)
	2nd	0.94	(0.84, 1.04)	0.95	(0.91, 1.00)	1.12	(0.99, 1.26)	1.01	(0.97, 1.06)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	1.01	(0.91, 1.12)	1.04	(0.99, 1.08)	1.13	(1.01, 1.27)	1.06	(1.02, 1.11)
	5th (highest)	0.98	(0.88, 1.10)	1.07	(1.01, 1.12)	1.11	(0.98, 1.25)	1.05	(1.00, 1.10)
Density of nursing home beds	*1st (lowest)*	0.89	(0.78, 1.01)	0.95	(0.86, 1.05)	0.98	(0.84, 1.14)	1.02	(0.89, 1.16)
	2nd	0.91	(0.81, 1.02)	0.96	(0.87, 1.06)	0.89	(0.77, 1.02)	1.00	(0.88, 1.14)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	0.96	(0.86, 1.08)	0.92	(0.83, 1.01)	0.90	(0.79, 1.03)	0.94	(0.83, 1.07)
	5th (highest)	0.86	(0.75, 0.99)	0.91	(0.82, 1.01)	0.81	(0.69, 0.95)	0.94	(0.82, 1.07)
Density of hospital beds	*1st (lowest)*	1.09	(0.95, 1.25)	0.97	(0.87, 1.07)	1.06	(0.90, 1.24)	0.95	(0.84, 1.08)
	2nd	1.08	(0.97, 1.21)	1.02	(0.93, 1.13)	1.11	(0.97, 1.27)	1.02	(0.90, 1.16)
	3rd quintile	ref.	-	ref.	-	ref.	-	ref.	-
	4th	1.04	(0.95, 1.14)	1.01	(0.92, 1.10)	1.03	(0.92, 1.16)	1.01	(0.89, 1.14)
	5th (highest)	1.09	(0.97, 1.22)	1.02	(0.92, 1.13)	1.15	(1.01, 1.31)	1.02	(0.90, 1.15)
Language region	*German*	ref.	-	ref.	-	ref.	-	ref.	-
	French	1.38	(1.26, 1.52)	1.35	(1.25, 1.45)	1.31	(1.17, 1.46)	1.28	(1.17, 1.39)
	Italian	1.16	(0.94, 1.44)	1.43	(1.14, 1.79)	1.09	(0.84, 1.42)	1.28	(0.97, 1.70)
Constant		34.18	(28.81, 40.54)	48.52	(43.25, 54.42)	43.62	(35.86, 53.06)	57.35	(50.00, 65.76)
Variance	*HSA level*	0.00	(0.00, 0.06)	0.01	(0.01, 0.02)	0.00	(0.00, 0.02)	0.02	(0.01, 0.03)
	MedStat level	0.01	(0.00, 0.03)	0.00	(0.00, 0.01)	0.01	(0.00, 0.05)	0.01	(0.00, 0.01)
	Residual	2.18	(2.12, 2.24)	1.32	(1.31, 1.34)	1.59	(1.53, 1.64)	1.08	(1.07, 1.09)

Figure 6. Spatial distribution of the difference in the estimates of deviation from national mean (random effects) between models using cost reimbursed by MHI versus cost adjusted for TARMED differences and cantonal subsidies across 564 regions. Models using adjusted cost were specified in the same way as main model 4 and were adjusted for individual, regional factors and health supply measures (see manuscript for details). Areas in shades of orange have higher values of area specific random effects from models using MHI cost of care as outcome, as compared to estimates from models using adjusted cost.


MHI vs. adjusted cost
(0.050, 0.075]
(0.025, 0.050]
(-0.025, 0.025]
(-0.050, -0.025]
(-0.075, -0.050]
Males, 19-65
No. of regions (N=564)
0
1
560
1
0
2
Males, 65+
No. of regions (N=564)
22
42
415
80
4
1
Females, 19-65
No. of regions (N=564)
HSA
Lake
No data
0
1
549
6
0
8
Females, 65+
No. of regions (N=564)
19
63
392
76
14
0
Estimates from Model 4
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