The geography of end of life care in Switzerland

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> There is a wide regional variation in the costs and structure of health care use for seriously ill and dying patients.
> Existing studies showed that local capacity is a more powerful predictor of utilization than patient characteristics.
> Little is known about patient- and regional level determinants of end of life care (EOLC) variation in Switzerland.

*To describe regional and temporal variation of
intensity of EOLC in the last 12 months of life
and to identify patient, regional and institutional
characteristics associated with variation.*

Methods:
Health insurance claims data

> Six major health insurance providers

> All deaths among insured 2008-10

> All claims 12 months prior to death

> Swiss adult (19+) residents with complete
  information on age, date of death
  & place of residence

> Aggregated indicators focusing on costs

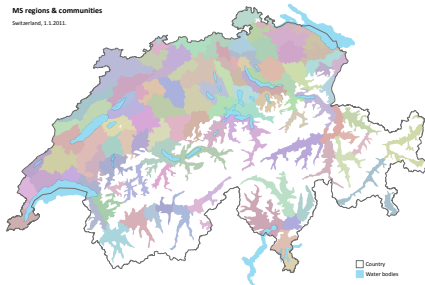# Methods:
Geographical resolutions

MS regions & communities
Switzerland, 1.1.2011.

Country
Community
Water bodies

MS regions & communities
Switzerland, 1.1.2011.

Country
Water bodies

Methods:
Statistical analyses
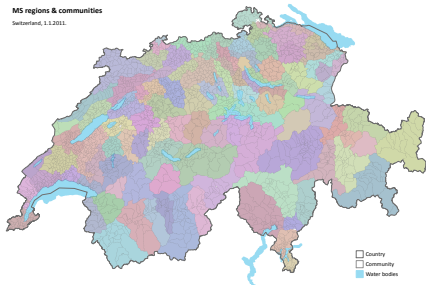
> Multilevel regression (MS region)

> Overall EOLC costs 0-1 months before death
  as outcome

> Three levels of covariates:

  — Individual (age & sex)
  — Regional (Swiss-SEP, urbanicity
     & language region)
  — Institutional (no. of GPs, no. of
     specialists & no. of hospital beds)

> Comparison of variance explained by adjusted
  and unadjusted models
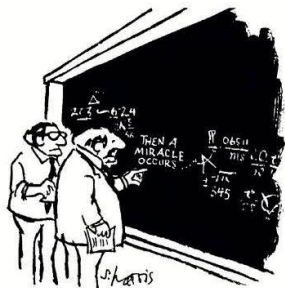
"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Results:
Study population(s)

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3,889,312 Health care bills
354,093 Period specific indicators
118,031 Deceased individuals
106 MS regions

63.9% of all deaths

Results:
Regional variation in EOLC costs

Total cost of services used in the last 12 months of life

Mean total cost of services per insured [x1'000 CHF] 2008-10

- 22.8 - 26.4
- 26.5 - 28.4
- 28.5 - 29.5
- 29.6 - 31.3
- 31.4 - 33.5
- 33.6 - 36.3
- 36.4 - 49.8
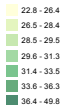
Number of EOLC deaths 2008-10

- 18 - 407
- 408 - 880
- 881 - 1758
- 1759 - 3758
- 3759 - 6968
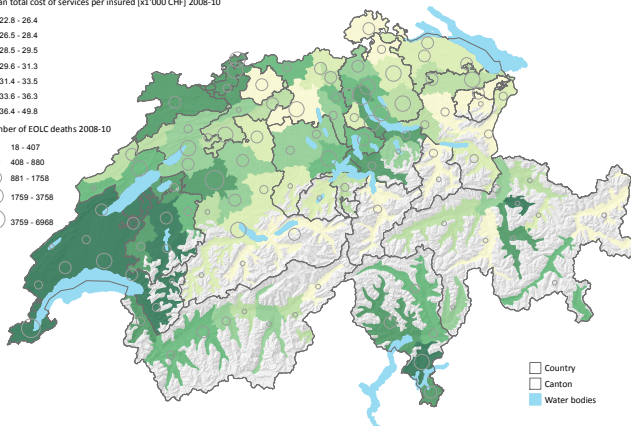
- Country
- Canton
- Water bodies

Results:
Determinants of overall EOLC costs I
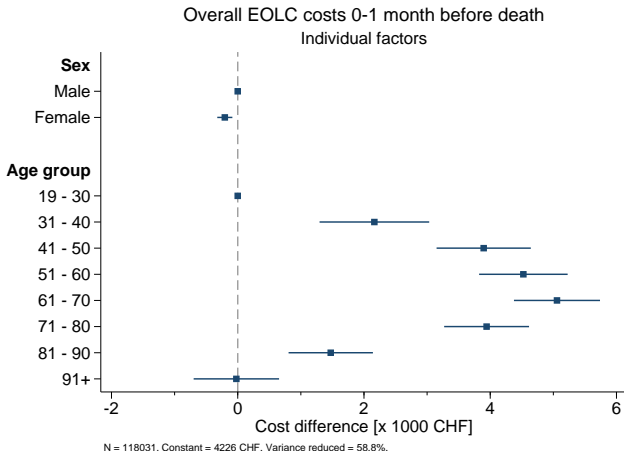
Overall EOLC costs 0-1 month before death
Individual factors
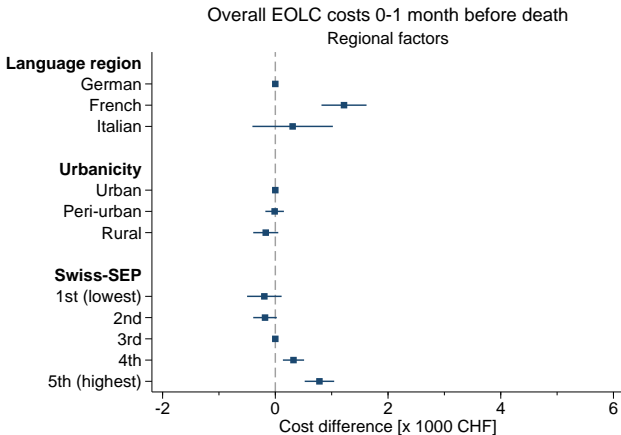
N = 118031. Constant = 4226 CHF. Variance reduced = 58.8%.

**Results:
Determinants of overall EOLC costs II**

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Overall EOLC costs 0-1 month before death
Regional factors

N = 118031. Constant = 4226 CHF. Variance reduced = 58.8%.

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Overall EOLC costs 0-1 month before death
HC supply factors

N = 118031. Constant = 4226 CHF. Variance reduced = 58.8%.
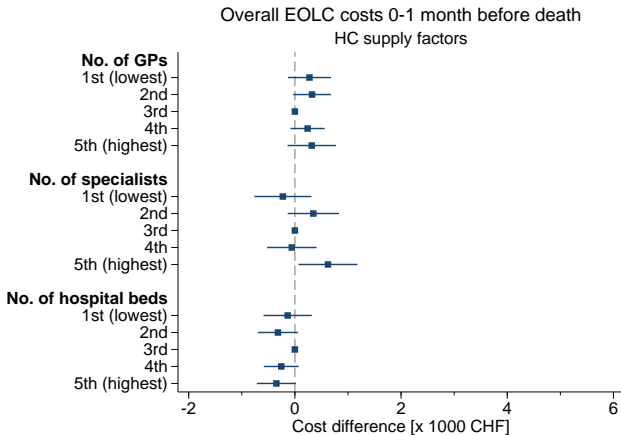
Results:
Regional variation

Total cost of services used in the last 0-1 months of life 2008-10

Predicted deviation from the national mean [x1'000 CHF].

- -1.87 - -1.50 (4)
- -1.49 - -0.75 (21)
- -0.74 - -0.25 (27)
- -0.24 - 0.25 (13)
- 0.26 - 0.75 (18)
- 0.76 - 1.50 (17)
- 1.51 - 4.25 (6)

Unadjusted model.

Country
Water bodies
Canton

Total cost of services used in the last 0-1 months of life 2008-10

Predicted deviation from the national mean [x1'000 CHF].

- -1.87 - -1.50 (1)
- -1.49 - -0.75 (12)
- -0.74 - -0.25 (18)
- -0.24 - 0.25 (42)
- 0.26 - 0.75 (23)
- 0.76 - 1.50 (8)
- 1.51 - 4.25 (2)
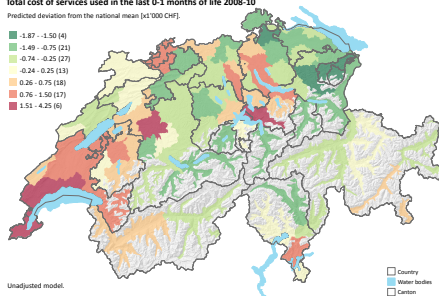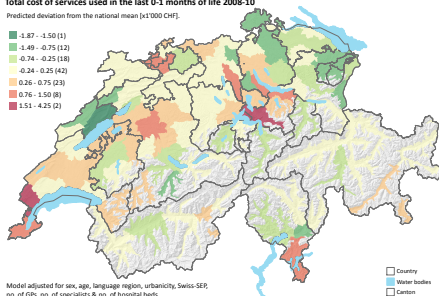
Model adjusted for sex, age, language region, urbanicity, Swiss-SEP,
no. of GPs, no. of specialists & no. of hospital beds.

Country
Water bodies
Canton

Summary:
Main findings

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> Age shows strongest association with overall
  and specific EOLC costs
> Moderate (area-based) socioeconomic gradient
> Little effect of supply measures
> Large regional variation

> No information on cause of death.

> No information on individuals from other insurers and individuals that did not die during study period.

> Exploration of alternative geographies of care supply.

> Use of TARMED points as 'cost' of ambulatory care.
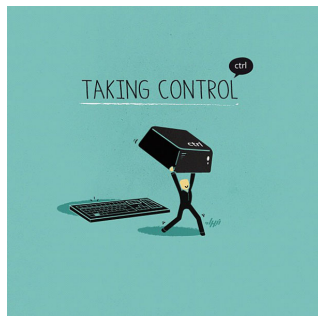
Thank you for your attention!

Results:
Study population

Characteristic	Group	Male		Female		Total	
		No.	Col %	No.	Col %	No.	Col %
Age group	19 - 30	623	1.1%	279	0.4%	902	0.8%
	31 - 40	782	1.4%	455	0.7%	1,237	1.0%
	41 - 50	2,072	3.7%	1,189	1.9%	3,261	2.8%
	51 - 60	4,462	8.0%	2,676	4.3%	7,138	6.0%
	61 - 70	8,900	16.0%	5,256	8.4%	14,156	12.0%
	71 - 80	14,372	25.9%	11,301	18.1%	25,673	21.8%
	81 - 90	18,692	33.7%	26,143	41.8%	44,835	38.0%
	91+	5,630	10.1%	15,199	24.3%	20,829	17.6%
Urbanicity	Urban	16,645	30.0%	21,107	33.8%	37,752	32.0%
	Peri-urban	23,732	42.7%	25,927	41.5%	49,659	42.1%
	Rural	15,156	27.3%	15,464	24.7%	30,620	25.9%
Language region	German	38,933	70.1%	44,013	70.4%	82,946	70.3%
	French	13,750	24.8%	15,108	24.2%	28,858	24.4%
	Italian	2,850	5.1%	3,377	5.4%	6,227	5.3%
Swiss-SEP quintile	1st (lowest)	4,678	8.4%	4,597	7.4%	9,275	7.9%
	2nd	11,281	20.3%	12,247	19.6%	23,528	19.9%
	3rd	15,202	27.4%	17,054	27.3%	32,256	27.3%
	4th	18,036	32.5%	21,689	34.7%	39,725	33.7%
	5th (highest)	6,336	11.4%	6,911	11.1%	13,247	11.2%
Total		55,533	100.0%	62,498	100.0%	118,031	100.0%

Appendix:
Study population - claims

Characteristic	Group	Male		Female		Total	
		No.	Col %	No.	Col %	No.	Col %
Service provider	Primary care	282,590	15.7%	346,694	16.7%	629,284	16.3%
	Specialist	145,630	8.1%	137,260	6.6%	282,890	7.3%
	Community nurse	105,774	5.9%	127,148	6.1%	232,922	6.0%
	Other therapists	25,136	1.4%	31,207	1.5%	56,343	1.5%
	Pharmacy	555,132	30.9%	649,592	31.3%	1,204,724	31.1%
	Diagnostic laboratory	85,230	4.7%	92,417	4.5%	177,647	4.6%
	Acute hospital	396,175	22.1%	329,792	15.9%	725,967	18.8%
	Non-acute hospital	142,619	7.9%	308,555	14.9%	451,174	11.7%
	Other	58,251	3.2%	51,521	2.5%	109,772	2.8%
Total		1,806,194	100.0%	2,083,118	100.0%	3,889,312	100.0%

Appendix:
Representativeness

Coverage of the EOLC data, 2008-10

category		Coverage (95% CI) [N]
Age group		
19 - 30	●	64.9 (64.7, 65.2) [1,389]
31 - 40	●	61.1 (60.8, 61.3) [2,026]
41 - 50	●	58.9 (58.6, 59.2) [5,535]
51 - 60	●	61.2 (61.0, 61.5) [11,658]
61 - 70	●	63.5 (63.2, 63.8) [22,300]
71 - 80	●	63.9 (63.6, 64.2) [40,165]
81 - 90	●	64.2 (63.9, 64.5) [69,849]
91+	●	65.3 (65.0, 65.6) [31,895]
Urbanicity		
Urban	●	61.6 (61.3, 61.9) [61,288]
Peri-urban	●	67.0 (66.7, 67.2) [74,145]
Rural	●	62.0 (61.7, 62.3) [49,384]
Language region		
German	●	62.3 (62.0, 62.6) [133177]
French	●	67.8 (67.5, 68.0) [42,586]
Italian	●	68.8 (68.5, 69.0) [9,054]
Swiss-SEP quintile		
1st (lowest)	●	56.9 (56.7, 57.2) [16,291]
2nd	●	64.2 (63.9, 64.5) [36,660]
3rd	●	67.3 (67.0, 67.6) [47,931]
4th	●	62.4 (62.1, 62.6) [63,707]
5th (highest)	●	65.5 (65.2, 65.8) [20,228]

55 60 65 70
% of all deaths

Dashed line - overall coverage of 63.9%

The coverage of EOLC dataset

% of EOLC patients among all deaths 2008-10

11 - 43
44 - 56
57 - 64
65 - 69
70 - 72
73 - 75
76 - 89

Total number of deaths 2008-10

∘ 101 - 832
∘ 833 - 1804
○ 1805 - 3532
○ 3533 - 6424
○ 6425 - 10598

Country
Canton
Water bodies
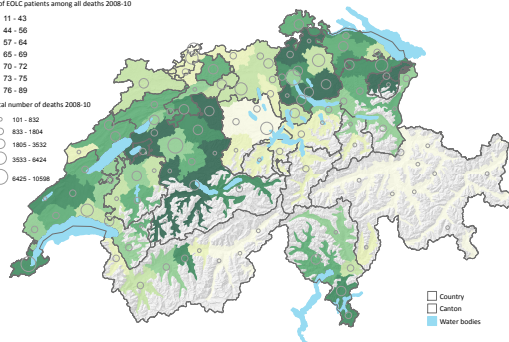
Methods:
Health care supply indicators I

Number of GPs per 10'000 inhabitants

Switzerland 2010

- 4.3 - 6.2
- 6.3 - 6.6
- 6.7 - 7.4
- 7.5 - 7.8
- 7.9 - 8.6
- 8.7 - 9.5
- 9.6 - 14.0

Total population

- 4169 - 34304
- 34305 - 70032
- 70033 - 133117
- 133118 - 259949
- 259950 - 457715

- Country
- Canton
- Water bodies

Methods:
Health care supply indicators II

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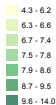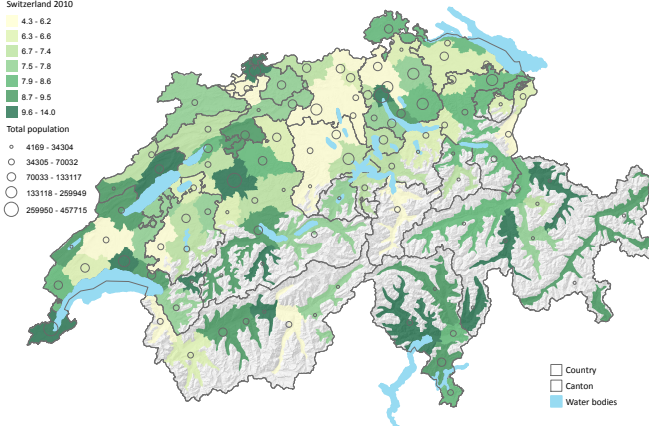
Number of specialists per 10'000 inhabitants

Switzerland 2010

- 0.0 - 2.5
- 2.6 - 3.9
- 4.0 - 5.5
- 5.6 - 7.3
- 7.4 - 9.5
- 9.6 - 13.1
- 13.2 - 28.6

Total population

- 4169 - 34304
- 34305 - 70032
- 70033 - 133117
- 133118 - 259949
- 259950 - 457715

- Country
- Canton
- Water bodies
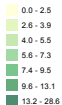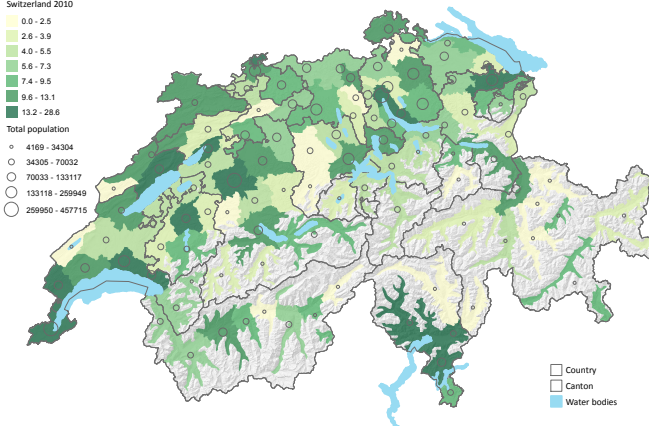
Methods:
Health care supply indicators III

Number of hospital beds per 10'000 inhabitants
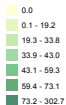
Switzerland 2010

- 0.0
- 0.1 - 19.2
- 19.3 - 33.8
- 33.9 - 43.0
- 43.1 - 59.3
- 59.4 - 73.1
- 73.2 - 302.7

Total population

- 4169 - 34304
- 34305 - 70032
- 70033 - 133117
- 133118 - 259949
- 259950 - 457715

- Country
- Canton
- Water bodies

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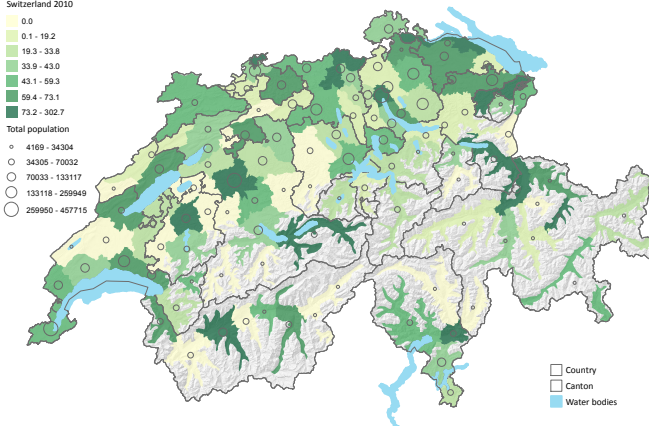
Total EOLC cost during last 12 months of life

Individual level factors

Characteristic		Mean (95% CI) [N]
Sex		
Male		33.3 (33.0, 33.6) [55,533]
Female		32.2 (32.0, 32.5) [62,498]
Age group		
19 - 30		23.5 (20.3, 26.7) [902]
31 - 40		35.6 (32.6, 38.7) [1,237]
41 - 50		40.2 (38.4, 41.9) [3,261]
51 - 60		43.3 (42.1, 44.5) [7,138]
61 - 70		43.6 (42.8, 44.3) [14,156]
71 - 80		36.6 (36.2, 37.1) [25,673]
81 - 90		28.3 (28.0, 28.5) [44,835]
91+		25.6 (25.4, 25.9) [20,829]

20   30   40

Mean cost per insured [x1,000 CHF]

Dashed line - overall mean of 32.7k CHF

Total EOLC cost during last 12 months of life

Regional level factors

Characteristic	Mean (95% CI) [N]
Swiss-SEP quintile	
1st (lowest)	31.1 (30.5, 31.7) [9,275]
2nd	30.6 (30.2, 30.9) [23,528]
3rd	32.3 (31.9, 32.6) [32,256]
4th	33.4 (33.1, 33.8) [39,725]
5th (highest)	36.7 (36.0, 37.4) [13,247]
Urbanicity	
Urban	33.7 (33.4, 34.0) [37,659]
Peri-urban	33.7 (33.4, 34.0) [49,717]
Rural	29.9 (29.6, 30.3) [30,655]
Language region	
German	30.2 (30.0, 30.5) [82,946]
French	39.3 (38.9, 39.8) [28,858]
Italian	35.4 (34.6, 36.2) [6,227]

20   30   40
Mean cost per insured [x1,000 CHF]

Dashed line - overall mean of 32.7k CHF

Total EOLC cost during last 12 months of life

Care supply factors

Characteristic	Mean (95% CI) [N]
GP density	
1st (lowest)	30.3 (29.9, 30.8) [19,320]
2nd	31.9 (31.4, 32.4) [16,654]
3rd	30.3 (29.9, 30.8) [18,698]
4th	30.6 (30.2, 31.0) [26,442]
5th (highest)	37.1 (36.7, 37.5) [36,917]
Specialist density	
1st (lowest)	29.0 (28.3, 29.7) [7,016]
2nd	31.8 (31.2, 32.3) [14,143]
3rd	29.8 (29.4, 30.3) [18,496]
4th	29.5 (29.1, 29.8) [26,944]
5th (highest)	36.3 (36.0, 36.6) [51,432]
Hospital beds	
1st (lowest)	31.4 (30.8, 32.0) [10,629]
2nd	30.9 (30.3, 31.4) [14,802]
3rd	31.9 (31.4, 32.3) [24,391]
4th	34.5 (34.1, 34.8) [36,853]
5th (highest)	32.7 (32.4, 33.1) [31,356]

20   30   40
Mean cost per insured [x1,000 CHF]

Dashed line - overall mean of 32.7k CHF

Appendix:
Determinants of overall EOLC costs across time

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Overall EOLC costs
Across three time periods before death
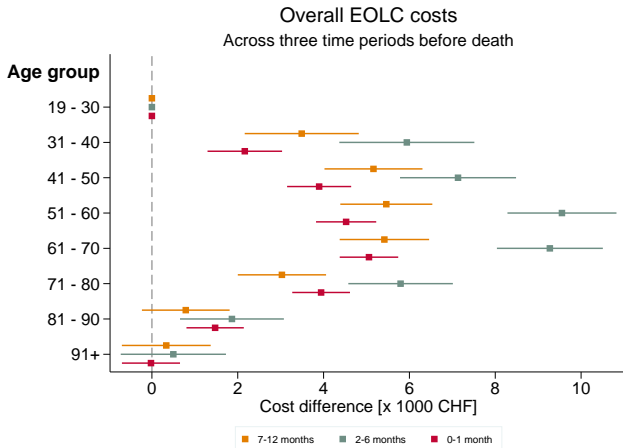
Appendix:
Determinants of specific EOLC costs I

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Specific EOLC costs 0-1 month before death
Individual factors

Cost difference [x 1000 CHF]

■ Acute hospitalizations   ■ Non-acute hospitalizations

Specific EOLC costs 0-1 month before death
Individual factors

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Overall EOLC costs 0-1 month before death
Specific factors