Old-Age Care Prevalence in Switzerland: Drivers and Future Development

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University of Lausanne

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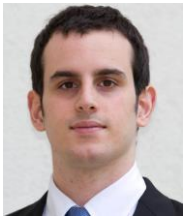
About the speaker



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Structure

1. **Introduction: LTC in Switzerland**
2. Available data and historic prevalence rates
3. Regression models and projections
4. Conclusion

Motivation

- Population aging in high-income countries is one of the most dramatic challenges
  → long-term care (LTC) is predicted to increase in the foreseeable future
- Growing demand for LTC creates a systemic threat for the society:
  - First, the financing of LTC depends upon the development of sustainable schemes in order to alleviate the share paid by households
  - Second, the limited space in existing infrastructures offering LTC will require reorganizing the care system and eventually new constructions
  - Third, the future needs of care are likely to come along with a lack of qualified staff

Our research

- Enhance the understanding of LTC

  (1) Find the main drivers through log-linear regression

  (2) Distinction by frailty levels (mild, moderate, severe) and types of care (at home, in an institution)

  (3) Proposing predictions of the prevalence rates for the next thirty years (from 2014 to 2045)

- Base analysis on a novel comprehensive longitudinal dataset covering the total dependent population in CH over a 20-year period

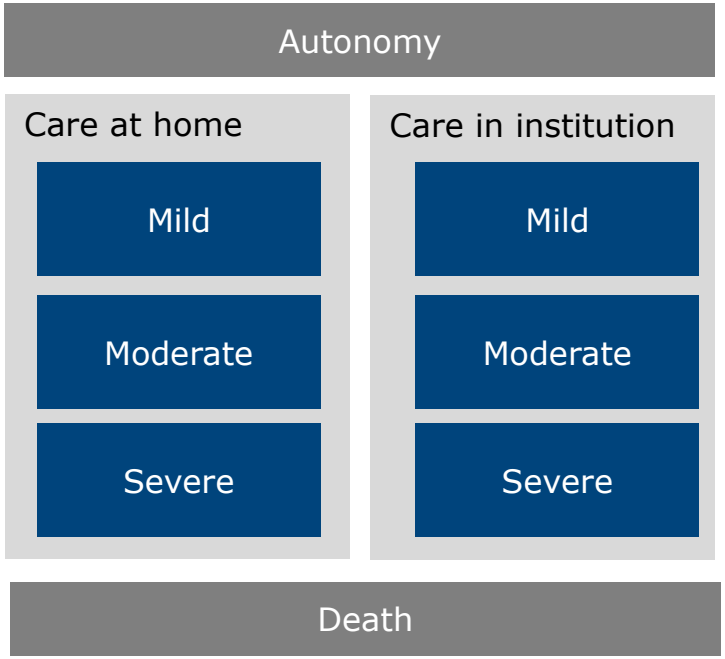
Frailty levels and types of care in Swiss LTC

Three frailty levels

- **Mild dependence**
  need of regular assistance with at least *two* activities of daily living or permanent personal supervision
- **Moderate dependence**
  need of regular assistance with at least two activities of daily living and, in addition, *permanent personal supervision*
- **Severe dependence**
  need of *regular assistance with all the activities of daily living* and, in addition, *permanent care* or personal supervision

Two types of care

- **Ambulatory care**
  nursing and infrastructure
- **Stationary care**
  nursing, assistance, meals, living space



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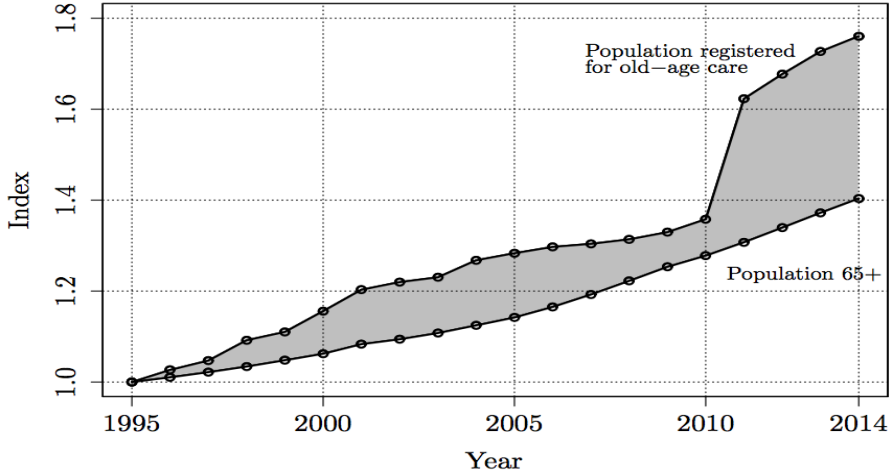
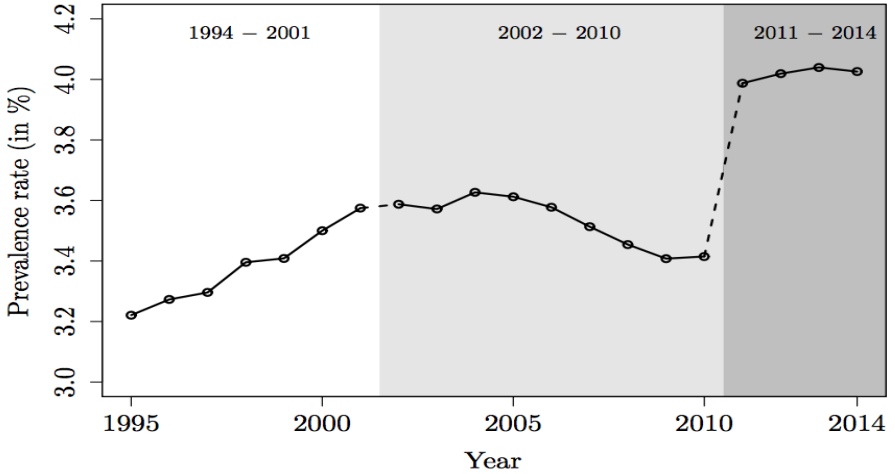
Strong development of the absolute number of dependent elderly in the last 20 years …



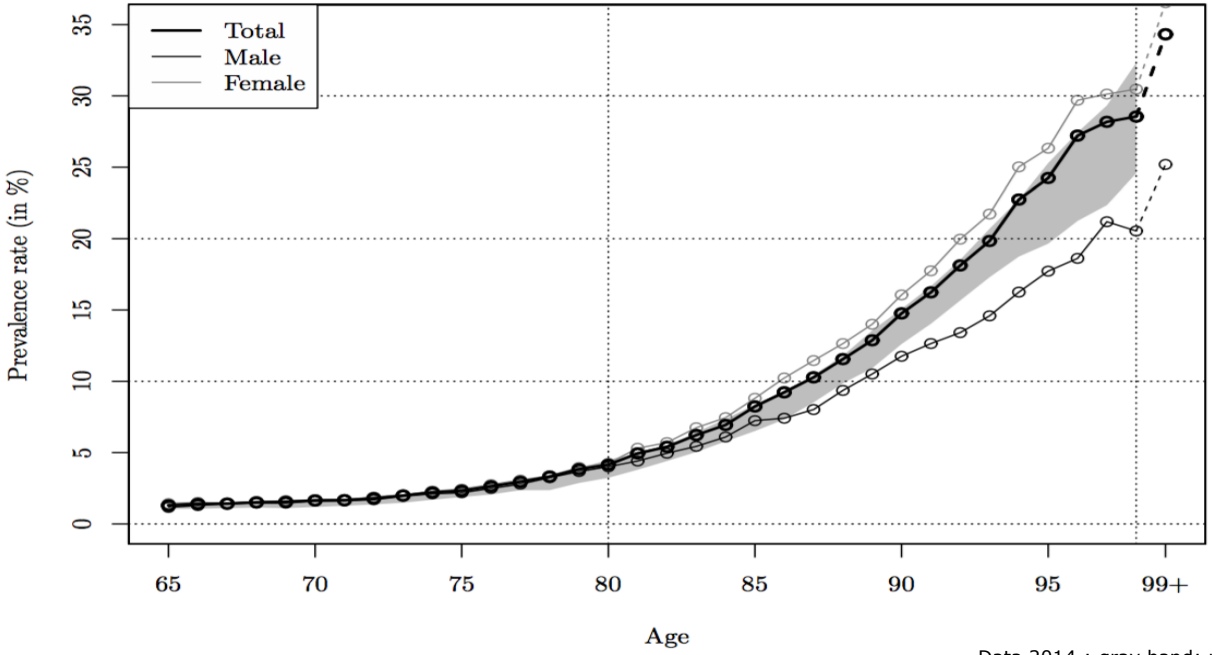


2002: Recognition of dependency at home

2011: Recognition of mild dependency at home

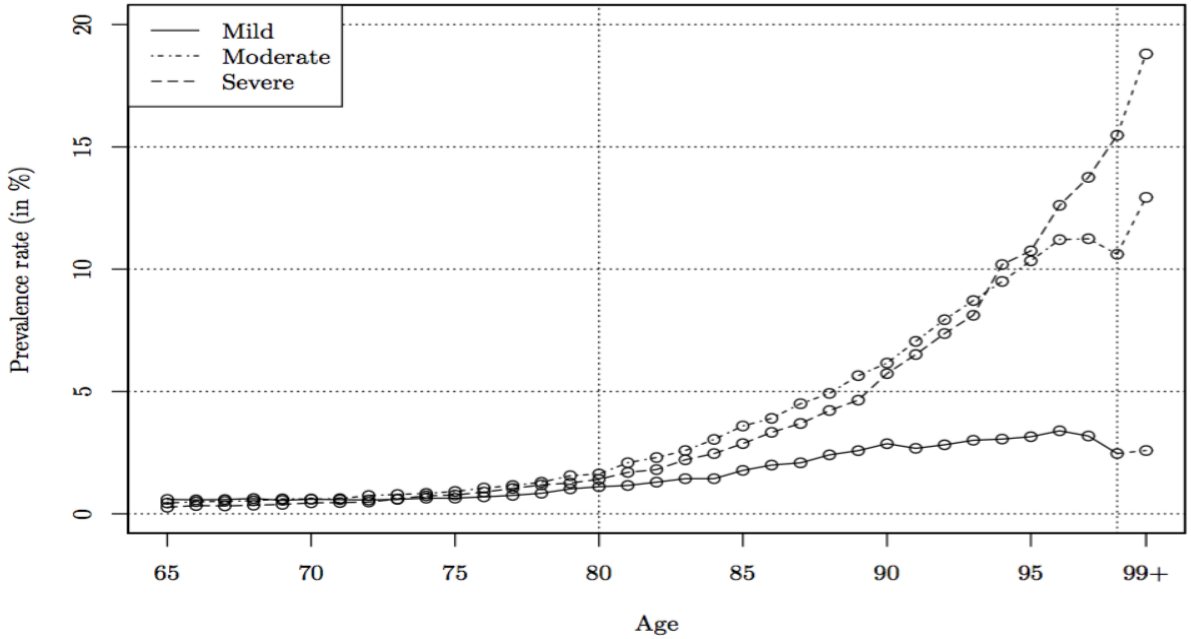
… with constant prevalence rates since 2011

Age and gender strongly influence the prevalence rate



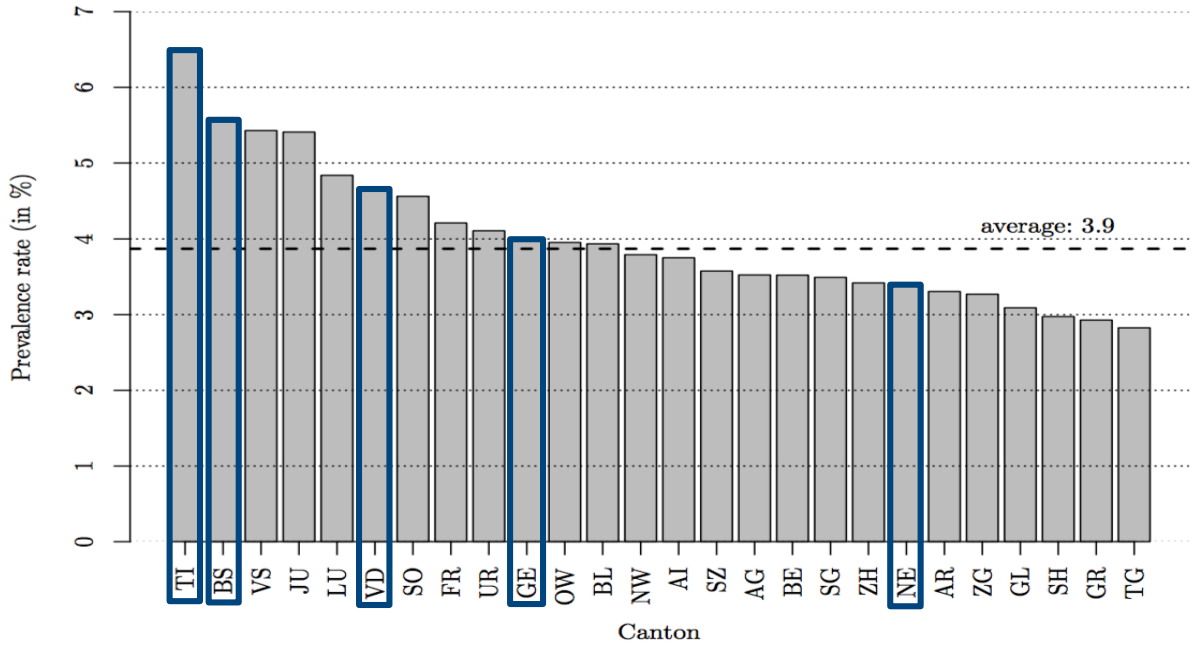
Data 2014 ; gray band: min/max between 1995 and 2014

Prevalence rates by frailty levels



Data 2014

Regional differences appear to be important



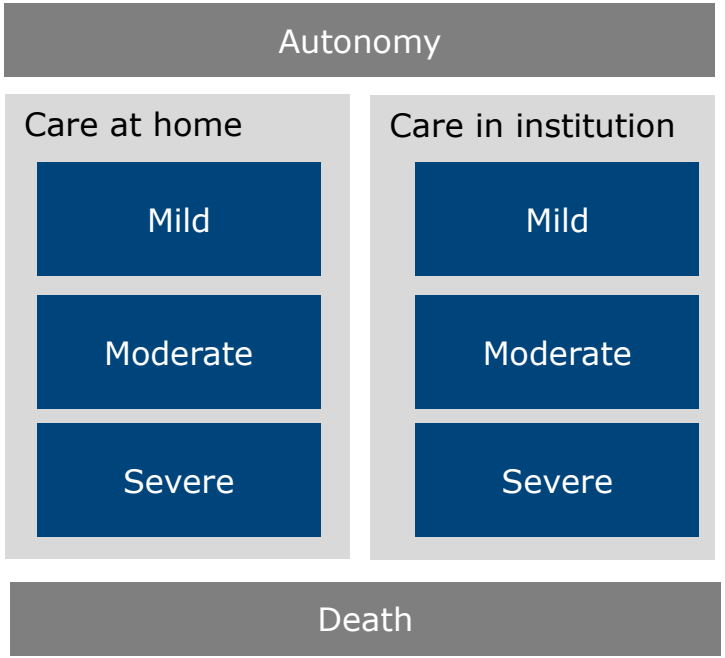
Data 2014

Available data

Comprehensive longitudinal dataset

Longitudinal data records individual paths

- **284’482 individuals** followed
- **342’000 transitions** between the dependency states with **269’082 uncensored** observations
- **212’500 complete paths**
- Period **1995 to 2015** covering the **whole Switzerland**
- Information : Gender, Age
  + Household, Canton, Salary, Nationality
- Cross-sectional data built by aggregation



Statistics on LTC needs and structure

Year		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Population registered for old-age care benefits																					
CCO data	th.	33.5	34.4	35.1	36.6	37.2	38.7	40.3	40.8	41.2	42.4	43.0	43.4	43.7	44.0	44.5	45.5	54.3	56.0	57.8	58.9
FSO data	th.	n.a.	n.a.	n.a.	n.a.	37.8	38.4	39.2	41.4	42.6	42.6	44.1	44.6	45.6	45.7	45.8	44.5	51.1	53.8	55.8	57.4
Distribution by age groups																					
65–79	%	35.0	35.6	36.3	36.2	36.5	36.2	35.4	35.3	34.9	34.4	34.4	34.3	34.5	34.6	35.0	34.9	34.4	34.7	35.0	35.3
80+	%	65.0	64.4	63.7	63.8	63.5	63.8	64.6	64.7	65.1	65.6	65.6	65.7	65.5	65.4	65.0	65.1	65.6	65.3	65.0	64.7
Distribution by gender																					
Male	%	29.0	29.1	29.4	29.6	29.8	30.1	30.2	30.2	30.3	30.3	30.5	30.6	31.0	31.3	31.8	32.2	32.5	33.0	33.3	33.5
Female	%	71.0	70.9	70.6	70.4	70.2	69.9	69.8	69.8	69.7	69.7	69.5	69.4	69.0	68.7	68.2	67.8	67.5	67.0	66.7	66.5
Mean age by gender																					
Male	yr.	78.7	78.7	78.7	78.9	78.9	79.0	79.1	79.2	79.3	79.5	79.6	79.6	79.6	79.5	79.5	79.5	79.8	79.8	79.9	79.9
Female	yr.	83.6	83.6	83.6	83.7	83.7	83.7	83.9	83.9	83.9	84.0	84.0	84.0	84.0	83.9	83.9	83.8	83.7	83.7	83.6	83.6
Linguistic regions																					
German	%	68.7	68.4	68.2	68.2	68.0	67.2	66.8	66.7	66.8	66.7	66.7	66.8	66.7	65.9	65.0	64.8	64.6	64.2	64.3	64.5
French	%	25.3	25.4	25.2	24.8	24.5	25.0	25.4	25.3	25.0	25.0	24.9	24.6	24.7	25.4	26.1	26.2	27.2	27.5	27.5	27.2
Italian	%	6.0	6.2	6.6	7.0	7.5	7.8	7.8	8.0	8.2	8.3	8.4	8.6	8.6	8.7	8.9	9.0	8.2	8.3	8.4	8.3
Distribution by frailty levels																					
Mild	%	5.4	5.6	5.7	5.6	5.7	5.7	5.7	5.7	5.8	5.8	5.9	6.0	6.4	6.8	7.1	7.3	19.0	21.6	23.2	24.1
Moderate	%	31.1	32.4	34.0	35.1	36.5	37.1	38.0	38.9	39.8	40.4	41.4	41.9	42.6	43.2	44.2	45.8	41.2	40.9	41.1	41.0
Severe	%	63.5	62.0	60.3	59.3	57.8	57.2	56.3	55.4	54.4	53.8	52.7	52.1	51.0	50.0	48.5	46.9	39.8	37.5	35.7	34.9
Distribution by types of care																					
At home	%	–	–	–	–	–	–	0.0	0.0	0.0	0.4	0.9	1.8	3.1	4.1	5.2	6.0	18.4	21.6	23.8	25.0
In an institution	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	99.1	98.2	96.9	95.9	94.8	94.0	81.6	78.4	76.2	75.0
Total	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	99.1	98.2	96.9	95.9	94.8	94.0	81.6	78.4	76.2	75.0
Total population																					
65+	th.	1044.3	1055.1	1066.9	1079.8	1094.3	1109.2	1131.1	1142.5	1156.7	1174.3	1192.5	1216.7	1245.2	1276.4	1308.7	1334.3	1365.2	1398.6	1432.7	1465.6
Distribution by age groups																					
65–79	%	73.2	73.4	73.7	73.9	74.1	73.7	72.9	72.6	72.4	72.1	71.8	71.6	71.6	71.6	71.6	71.8	72.0	72.1	72.2	72.1
80+	%	26.8	26.6	26.3	26.1	25.9	26.3	27.1	27.4	27.6	27.9	28.2	28.4	28.4	28.4	28.4	28.2	28.0	27.9	27.8	27.9
Prevalence rates: number of registered old-age care beneficiaries divided by the total population																					
65+	%	3.2	3.3	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.4	3.4	3.4	4.0	4.0	4.0	4.0
Distribution by age groups																					
65–79	%	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.9	1.9	1.9	2.0
80+	%	7.8	7.9	8.0	8.3	8.3	8.5	8.5	8.4	8.4	8.5	8.4	8.3	8.1	7.9	7.8	7.9	9.3	9.4	9.4	9.3

Notes: "n.a" stands for not available data, "0.0" characterizes an entry below 0.1 rounding, and "–" are zero values.

Variables used in the econometric models

Variable	Description
π	Prevalence rates on the total dependent persons
Frailty levels	
π^1	Prevalence rates for midly dependent persons
π^2	Prevalence rates for moderately dependent persons
π^3	Prevalence rates for severly dependent persons
Types of care	
π^a	Prevalence rates for persons being cared at home
π^b	Prevalence rates for persons being cared in an institution

AGE	Age class of the observation: 65–69, 70–74, . . . , 90–94, 95+
GENDER	Gender of the observation: male, female
YEAR	Calendar year of the observation: 1995, . . . , 2014
PERIOD	Time period of the observation: 1995–2001, 2002–2010, 2011–2014
CANTON	Canton in which is located the observation (see Footnote 1)
LING	Linguistic region in which is located the observation: DE, FR, IT

Code	Full name	Linguistic region
AG	Aargau	German
AI	Appenzell Innerrhoden	German
AR	Appenzell Ausserrhoden	German
BE	Bern	German
BL	Basel-Landschaft	German
BS	Basel-Stadt	German
FR	Fribourg	French
GE	Genève	French
GL	Graubünden	German
GR	Grisons	German
JU	Jura	French
LU	Luzern	German
NE	Neuchâtel	French
NW	Nidwalden	German
OW	Obwalden	German
SG	St. Gallen	German
SH	Schaffhausen	German
SO	Solothurn	German
SZ	Schwyz	German
TG	Thurgau	German
TI	Ticino	Italian
UR	Uri	German
VD	Vaud	French
VS	Valais	French
ZG	Zug	German
ZH	Zürich	German

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Estimation of prevalence rates by age, gender, canton: regression models

$$\log \pi_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \sum_k \beta_4^k PERIOD_i^k + \sum_l \beta_5^l LING_i^l + \epsilon_i. \qquad (1)$$

$$\log \pi_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \sum_k \beta_4^k PERIOD_i^k + \sum_m \beta_6^m CANTON_i^m + \epsilon_i. \qquad (2)$$

$$\log \pi_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 YEAR_i + \sum_m \beta_6^m CANTON_i^m + \epsilon_i. \qquad (3)$$

$$\log \pi_i = \beta_0 + \sum_j \beta_1^j AGE_i^j + \beta_2 GENDER_i + \sum_m \beta_6^m CANTON_i^m + \epsilon_i. \qquad (3')$$

$$\log \pi_i^{(s)} = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \sum_m \beta_6^m CANTON_i^m + \epsilon_i. \qquad (4.s)$$

Regression results and analysis by periods

Model	(1)	(2)	(3)	(3)	(3)	(3′)
Period	1995–2014	1995–2014	1995–2001	2002–2010	2011–2014	2011–2014
Intercept	−4.496 *** (.012)	−4.622 *** (.019)	−31.428 *** (5.724)	15.260 *** (3.341)	−8.516 (9.349)	−4.510 *** (.030)
Age (baseline: 65–69)						
70–74	0.265 *** (.012)	0.267 *** (.012)	0.303 *** (.021)	0.272 *** (.016)	0.195 *** (.019)	0.195 *** (.019)
75–79	0.763 *** (.013)	0.763 *** (.012)	0.819 *** (.021)	0.745 *** (.016)	0.702 *** (.019)	0.702 *** (.019)
80–84	1.374 *** (.013)	1.374 *** (.012)	1.423 *** (.021)	1.354 *** (.016)	1.333 *** (.019)	1.333 *** (.019)
85–89	1.967 *** (.013)	1.967 *** (.012)	2.012 *** (.021)	1.959 *** (.016)	1.906 *** (.019)	1.906 *** (.019)
90–94	2.503 *** (.013)	2.503 *** (.012)	2.559 *** (.021)	2.492 *** (.016)	2.428 *** (.019)	2.428 *** (.019)
95+	2.875 *** (.013)	2.874 *** (.012)	2.959 *** (.022)	2.808 *** (.016)	2.869 *** (.020)	2.869 *** (.020)
Gender (baseline: Male)						
Female	0.248 *** (.007)	0.248 *** (.006)	0.279 *** (.011)	0.246 *** (.009)	0.200 *** (.010)	0.200 *** (.010)
Period (baseline: 2011–2014)						
1995–2001	−0.151 *** (.009)	−0.152 *** (.009)				
2002–2010	−0.140 *** (.010)	−0.140 *** (.008)				
Year			0.013 *** (.003)	−0.010 *** (.002)	0.002 (.005)	
Linguistic region (baseline: DE)						
FR	0.155 *** (.008)					
IT	0.425 *** (.018)					
Canton (baseline: ZH)						
AG		0.114 *** (.022)	0.098 * (.041)	0.139 *** (.031)	0.084 * (.037)	0.084 * (.037)
AI		0.165 *** (.022)	0.056 (.042)	0.281 *** (.031)	0.089 * (.038)	0.089 * (.038)
AR		−0.016 (.022)	−0.049 (.041)	0.028 (.031)	−0.060 (.037)	−0.060 (.037)
BE		0.152 *** (.022)	0.270 *** (.041)	0.120 *** (.031)	0.019 (.037)	0.019 (.037)
BL		0.270 *** (.022)	0.346 *** (.041)	0.253 *** (.031)	0.174 *** (.037)	0.174 *** (.037)
BS		0.232 *** (.022)	0.140 *** (.041)	0.262 *** (.031)	0.328 *** (.037)	0.328 *** (.037)
FR		0.476 *** (.022)	0.501 *** (.041)	0.522 *** (.031)	0.327 *** (.037)	0.327 *** (.037)
GE		−0.005 (.022)	−0.041 (.041)	−0.028 (.031)	0.107 ** (.037)	0.107 ** (.037)
GL		0.101 *** (.022)	0.190 *** (.041)	0.123 *** (.031)	−0.106 ** (.038)	−0.106 ** (.038)
GR		0.076 *** (.022)	0.217 *** (.041)	0.056 . (.031)	−0.127 *** (.037)	−0.127 *** (.037)
JU		0.522 *** (.022)	0.658 *** (.041)	0.468 *** (.031)	0.406 *** (.037)	0.406 *** (.037)
LU		0.400 *** (.022)	0.409 *** (.041)	0.409 *** (.031)	0.366 *** (.037)	0.366 *** (.037)
NE		0.053 * (.022)	0.127 ** (.041)	0.014 (.031)	0.010 (.037)	0.010 (.037)
NW		0.023 (.022)	0.091 * (.041)	−0.079 * (.031)	0.133 *** (.037)	0.133 *** (.037)
OW		0.126 *** (.022)	0.080 . (.041)	0.152 *** (.031)	0.148 *** (.037)	0.148 *** (.037)
SG		0.085 *** (.022)	0.118 ** (.041)	0.083 *** (.031)	0.034 (.037)	0.034 (.037)
SH		0.018 (.022)	0.115 ** (.041)	0.011 (.031)	−0.136 *** (.037)	−0.136 *** (.037)
SO		0.233 *** (.022)	0.153 *** (.041)	0.276 *** (.031)	0.275 *** (.037)	0.275 *** (.037)
SZ		0.174 *** (.022)	0.226 *** (.041)	0.157 *** (.031)	0.123 ** (.037)	0.123 ** (.037)
TG		−0.027 (.022)	0.021 (.041)	−0.009 (.031)	−0.152 *** (.037)	−0.152 *** (.037)
TI		0.552 *** (.022)	0.478 *** (.041)	0.605 *** (.031)	0.562 *** (.037)	0.562 *** (.037)
UR		0.311 *** (.022)	0.342 *** (.041)	0.367 *** (.031)	0.127 *** (.037)	0.127 *** (.037)
VD		0.218 *** (.022)	0.345 *** (.041)	0.209 *** (.031)	0.279 *** (.037)	0.279 *** (.037)
VS		0.425 *** (.022)	0.445 *** (.041)	0.386 *** (.031)	0.475 *** (.037)	0.475 *** (.037)
ZG		−0.043 . (.022)	−0.077 . (.041)	−0.050 (.031)	0.030 (.037)	0.030 (.037)
N	7 244	7 244	2 526	3 266	1 452	1 452
Adj. R^2	0.924	0.941	0.932	0.947	0.965	0.965

Regression results by frailty levels and by types of care

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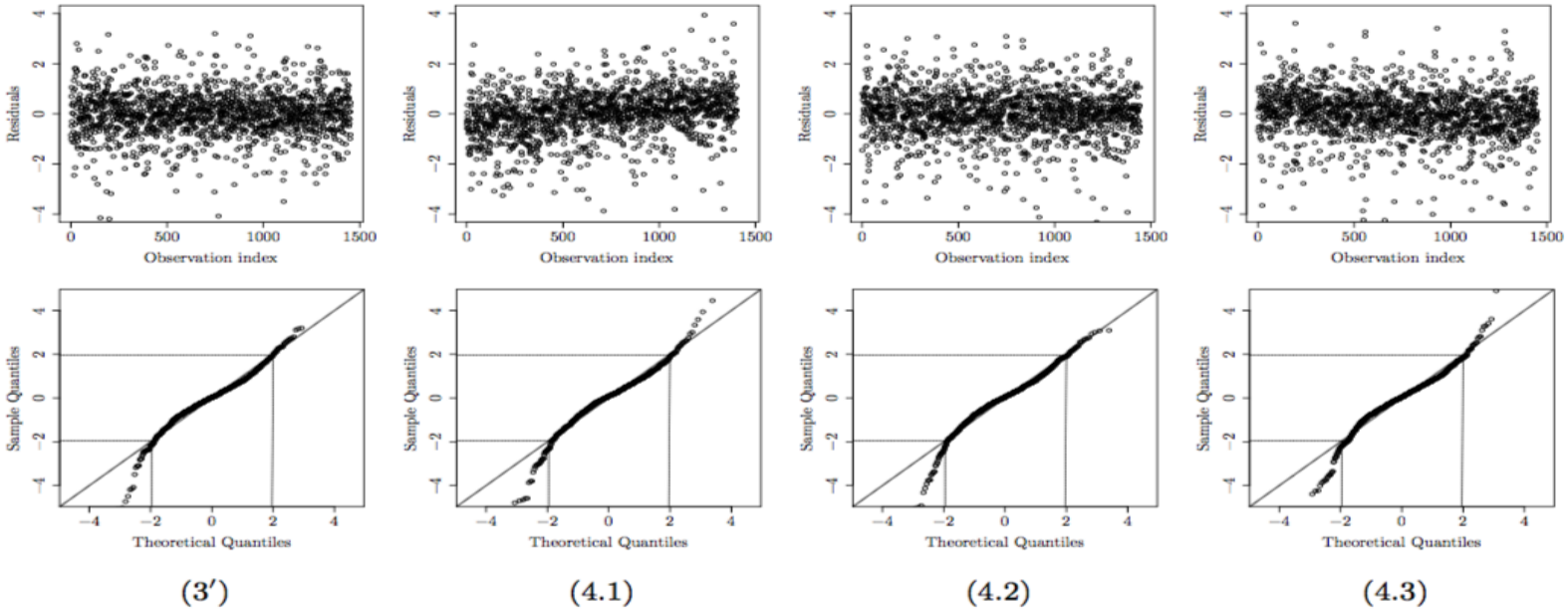
	Frailty level			Type of care	
Model	Mild (4.1)	Moderate (4.2)	Severe (4.3)	At home (4.a)	In an institution (4.b)
Intercept	−5.486 *** (.056)	−5.415 *** (.051)	−5.992 *** (.050)	−5.136 *** (.057)	−5.324 *** (.036)
Age (baseline: 65–69)					
70–74	−0.084 * (.037)	0.260 *** (.026)	0.431 *** (.033)	−0.413 *** (.037)	0.639 *** (.024)
75–79	0.274 *** (.037)	0.747 *** (.026)	1.075 *** (.033)	−0.440 *** (.037)	1.334 *** (.024)
80–84	0.719 *** (.037)	1.467 *** (.026)	1.725 *** (.033)	0.205 *** (.037)	1.957 *** (.024)
85–89	1.149 *** (.037)	2.082 *** (.026)	2.336 *** (.033)	0.706 *** (.038)	2.552 *** (.024)
90–94	1.463 *** (.037)	2.595 *** (.026)	2.904 *** (.033)	1.053 *** (.037)	3.095 *** (.024)
95+	1.500 *** (.039)	2.962 *** (.026)	3.566 *** (.033)	1.100 *** (.039)	3.600 *** (.024)
Gender (baseline: Male)					
Female	0.150 *** (.020)	0.141 *** (.010)	0.244 *** (.017)	0.124 *** (.020)	0.207 *** (.013)
Canton (baseline: ZH)					
AG	0.138 . (.070)	0.039 (.050)	0.088 (.063)	0.174 * (.072)	0.062 (.045)
AI	0.029 (.077)	0.061 (.052)	0.311 *** (.064)	0.130 . (.077)	0.107 * (.046)
AR	−0.168 * (.072)	−0.063 (.050)	−0.003 (.063)	−0.171 * (.074)	−0.012 (.045)
BE	0.211 ** (.070)	−0.091 . (.050)	0.018 (.063)	0.193 ** (.072)	−0.018 (.045)
BL	0.208 ** (.070)	0.204 *** (.050)	0.105 . (.063)	0.287 *** (.072)	0.132 ** (.045)
BS	0.407 *** (.071)	0.275 *** (.050)	0.344 *** (.063)	0.431 *** (.072)	0.307 *** (.045)
FR	0.026 (.071)	0.348 *** (.050)	0.430 *** (.063)	0.112 (.072)	0.357 *** (.045)
GE	0.390 *** (.070)	−0.115 * (.050)	0.181 ** (.063)	0.472 *** (.072)	0.008 (.045)
GL	−0.048 (.072)	−0.225 *** (.051)	−0.131 * (.063)	−0.163 * (.074)	−0.082 . (.046)
GR	0.155 * (.071)	−0.197 *** (.050)	−0.222 *** (.063)	0.191 ** (.072)	−0.184 *** (.045)
JU	0.661 *** (.071)	0.304 *** (.050)	0.336 *** (.063)	0.691 *** (.072)	0.291 *** (.045)
LU	0.285 *** (.071)	0.364 *** (.050)	0.417 *** (.063)	0.363 *** (.072)	0.355 *** (.045)
NE	0.330 *** (.070)	−0.397 *** (.050)	0.187 ** (.063)	0.459 *** (.072)	−0.131 ** (.045)
NW	0.223 ** (.072)	0.172 *** (.050)	−0.160 * (.063)	0.402 *** (.073)	0.005 (.045)
OW	0.171 * (.071)	0.126 * (.050)	0.046 (.063)	0.309 *** (.074)	0.091 * (.045)
SG	−0.008 (.070)	0.009 (.050)	0.087 (.063)	0.023 (.072)	0.041 (.045)
SH	0.215 ** (.070)	−0.289 *** (.036)	−0.229 *** (.063)	0.274 *** (.072)	−0.266 *** (.045)
SO	0.399 *** (.070)	0.277 *** (.050)	0.159 * (.063)	0.463 *** (.072)	0.215 *** (.045)
SZ	0.059 (.072)	0.018 (.050)	0.244 *** (.063)	0.075 (.073)	0.137 ** (.045)
TG	−0.103 (.070)	−0.159 ** (.050)	−0.207 ** (.063)	−0.028 (.072)	−0.209 *** (.045)
TI	−0.134 . (.070)	0.527 *** (.050)	0.820 *** (.063)	−0.018 (.072)	0.620 *** (.045)
UR	−0.054 (.072)	0.060 (.050)	0.227 *** (.063)	0.058 (.074)	0.131 ** (.045)
VD	0.309 *** (.070)	0.191 *** (.050)	0.365 *** (.063)	0.388 *** (.072)	0.258 *** (.045)
VS	0.530 *** (.070)	0.352 *** (.050)	0.551 *** (.063)	0.566 *** (.072)	0.443 *** (.045)
ZG	−0.324 *** (.071)	0.120 * (.050)	0.002 (.063)	−0.268 *** (.073)	0.081 . (.045)
N	1 401	1 442	1 450	1 402	1 450
Adj. R^2	0.767	0.945	0.933	0.744	0.963

OLS hypothesis tests

Residuals for the regression models



Robustness of results: bootstrap analysis

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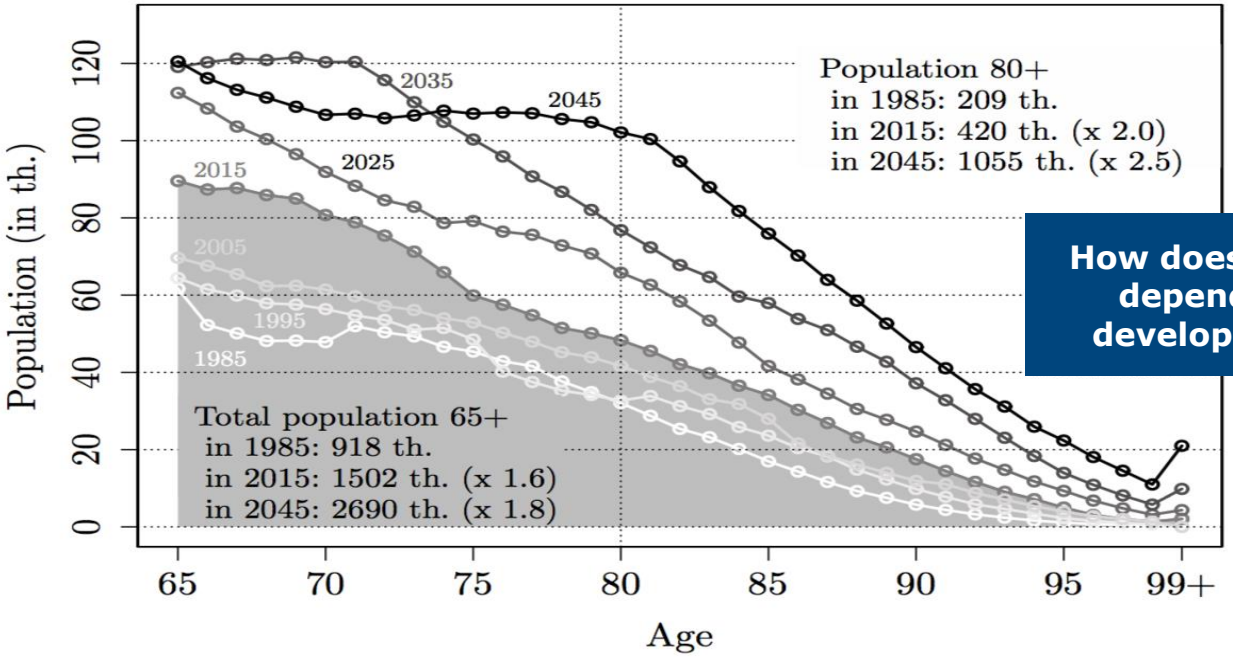
Model	(3′)		(4.1)		(4.2)		(4.3)	
	$q_{2.5\%}$	$q_{97.5\%}$	$q_{2.5\%}$	$q_{97.5\%}$	$q_{2.5\%}$	$q_{97.5\%}$	$q_{2.5\%}$	$q_{97.5\%}$
Intercept	−4.557	−4.466	−5.564	−5.416	−5.464	−5.366	−6.065	−5.922
Age (baseline: 65–69)								
70–74	0.151	0.238	−0.155	−0.014	0.204	0.315	0.361	0.500
75–79	0.663	0.741	0.213	0.336	0.693	0.801	1.010	1.139
80–84	1.296	1.370	0.659	0.778	1.420	1.515	1.664	1.785
85–89	1.870	1.944	1.085	1.213	2.035	2.128	2.276	2.395
90–94	2.387	2.469	1.395	1.532	2.542	2.648	2.835	2.973
95+	2.821	2.917	1.403	1.597	2.902	3.020	3.488	3.644
Gender (baseline: Male)								
Female	0.179	0.220	0.111	0.188	0.114	0.168	0.210	0.278
Canton (baseline: ZH)								
AG	0.035	0.133	0.038	0.236	−0.018	0.095	0.014	0.165
AI	−0.043	0.220	−0.154	0.212	−0.065	0.183	0.138	0.491
AR	−0.144	0.023	−0.312	−0.022	−0.167	0.038	−0.101	0.099
BE	−0.023	0.061	0.134	0.292	−0.136	−0.045	−0.050	0.086
BL	0.130	0.219	0.117	0.302	0.152	0.253	0.020	0.189
BS	0.268	0.388	0.312	0.503	0.213	0.334	0.258	0.431
FR	0.282	0.375	−0.075	0.128	0.293	0.402	0.354	0.504
GE	0.067	0.149	0.299	0.486	−0.169	−0.060	0.107	0.256
GL	−0.175	−0.039	−0.175	0.085	−0.366	−0.090	−0.271	0.002
GR	−0.183	−0.073	0.058	0.256	−0.270	−0.130	−0.321	−0.122
JU	0.338	0.476	0.541	0.776	0.218	0.382	0.227	0.443
LU	0.321	0.411	0.191	0.381	0.316	0.411	0.345	0.489
NE	−0.043	0.062	0.215	0.449	−0.495	−0.306	0.083	0.287
NW	0.051	0.211	0.064	0.379	0.060	0.278	−0.338	0.009
OW	0.068	0.228	−0.015	0.350	0.013	0.229	−0.102	0.191
SG	−0.012	0.081	−0.087	0.074	−0.036	0.054	0.003	0.169
SH	−0.202	−0.070	0.080	0.352	−0.387	−0.193	−0.332	−0.126
SO	0.236	0.315	0.296	0.508	0.222	0.330	0.081	0.239
SZ	0.075	0.172	−0.055	0.172	−0.050	0.086	0.162	0.325
TG	−0.205	−0.099	−0.202	−0.005	−0.225	−0.093	−0.295	−0.120
TI	0.508	0.614	−0.270	−0.007	0.466	0.583	0.742	0.896
UR	0.063	0.190	−0.195	0.086	−0.036	0.152	0.091	0.353
VD	0.235	0.323	0.227	0.394	0.140	0.241	0.283	0.445
VS	0.419	0.533	0.443	0.620	0.300	0.403	0.453	0.645
ZG	−0.029	0.089	−0.459	−0.186	0.035	0.200	−0.119	0.117
S_B	10 000		10 000		10 000		10 000	
N_B	1 452		1 401		1 442		1 450	

Projections

Development of the population in CH

FSO basis scenario A-00-2015



How does the number of dependent persons develop in the future?

Reference scenario (OFS, A-00-2015)

Forecast of LTC prevalence until 2045

Index 2014, regression 2011-2014, population forecast A-00-2015

$$\hat{\pi}_i = \exp\left[\hat{\beta}_0 + \sum_j \hat{\beta}_1{}^j AGE_i^j + \hat{\beta}_2 GENDER_i + \sum_m \hat{\beta}_6{}^m CANTON_i^m\right] \times \overline{\exp(\hat{\epsilon}_i)} \equiv \hat{\pi}_{A,G,C}\,, \quad (5)$$

and

$$\hat{\pi}_i^{(s)} = \exp\left[\hat{\beta}_0 + \sum_j \hat{\beta}_1{}^j AGE_i^j + \hat{\beta}_2 GENDER_i + \sum_m \hat{\beta}_6{}^m CANTON_i^m\right] \times \overline{\exp(\hat{\epsilon}_i)} \equiv \hat{\pi}_{A,G,C}^{(s)}\,, \quad (6.s)$$

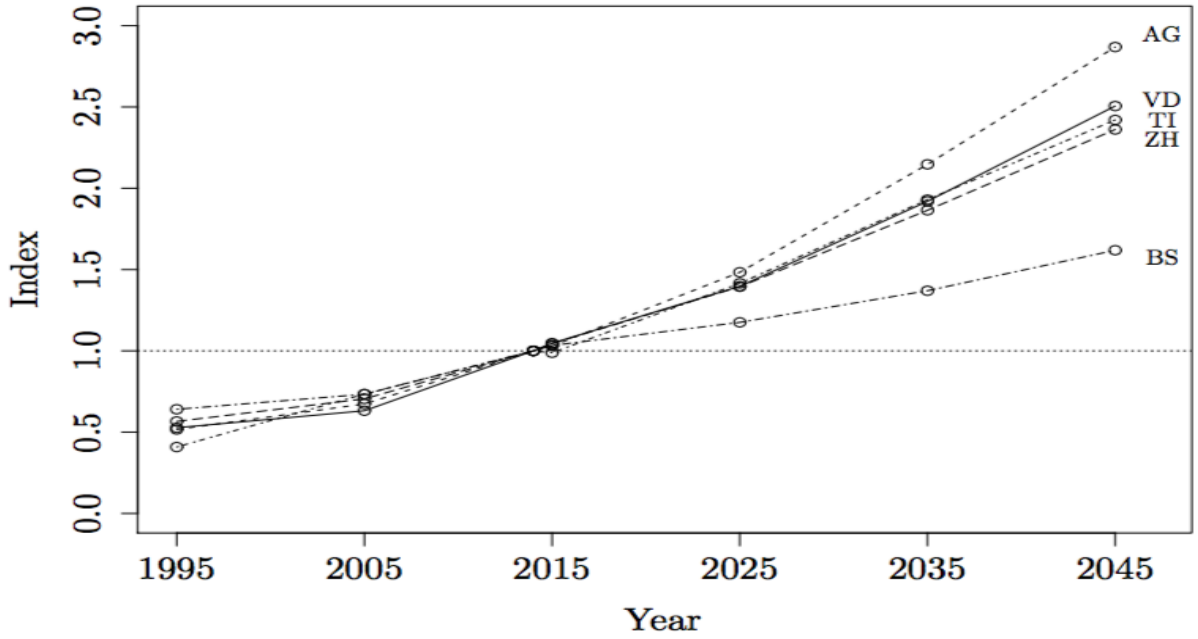
Index in year t		1995	2005	2014	2015	2025	2035	2045
Frailty level								
(1)	Mild	0.13	0.18	1.00	0.95	1.24	1.64	1.98
(2)	Moderate	0.43	0.74	1.00	1.05	1.43	1.97	2.53
(3)	Severe	1.03	1.10	1.00	1.09	1.52	2.10	2.75
Type of care								
(*a*)	At home	–	0.03	1.00	0.92	1.20	1.57	1.86
(*b*)	In an inst.	0.76	0.96	1.00	1.07	1.48	2.05	2.67

Projections by cantons

Index 2014, regression 2011-2014, population forecast A-00-2015

Year t	1995		2005		2014		2015		2025		2035		2045	
	$I_{t,C}$	$S_{t,C}$	$I_{t,C}$	$S_{t,C}$	$I_{t,C}$	$S_{t,C}$	$I_{t,C}$	$\hat{S}_{t,C}$	$\hat{I}_{t,C}$	$\hat{S}_{t,C}$	$\hat{I}_{t,C}$	$\hat{S}_{t,C}$	$\hat{I}_{t,C}$	$\hat{S}_{t,C}$
Cantons														
AG	0.52	(5.87)	0.67	(5.98)	1.00	(6.43)	1.02	(6.37)	1.47	(6.73)	2.13	(7.13)	2.85	(7.45)
AI	0.77	(0.25)	0.88	(0.22)	1.00	(0.18)	1.04	(0.18)	1.43	(0.19)	1.92	(0.18)	2.44	(0.18)
AR	0.77	(0.77)	0.90	(0.70)	1.00	(0.57)	1.04	(0.57)	1.36	(0.55)	1.81	(0.53)	2.27	(0.52)
BE	0.77	(16.22)	0.86	(14.19)	1.00	(12.04)	1.04	(12.16)	1.38	(11.86)	1.87	(11.75)	2.34	(11.49)
BL	0.51	(3.50)	0.70	(3.77)	1.00	(3.95)	1.04	(3.97)	1.41	(3.97)	1.85	(3.80)	2.24	(3.60)
BS	0.65	(4.15)	0.73	(3.67)	1.00	(3.65)	1.02	(3.66)	1.16	(3.06)	1.35	(2.61)	1.60	(2.40)
FR	0.59	(3.33)	0.88	(3.86)	1.00	(3.21)	1.09	(3.40)	1.53	(3.50)	2.25	(3.76)	3.04	(3.97)
GE	0.50	(4.65)	0.62	(4.58)	1.00	(5.34)	1.03	(5.36)	1.38	(5.27)	1.81	(5.05)	2.23	(4.87)
GL	0.92	(0.64)	1.00	(0.55)	1.00	(0.40)	1.04	(0.39)	1.36	(0.38)	1.84	(0.38)	2.38	(0.38)
GR	0.77	(2.59)	0.92	(2.41)	1.00	(1.91)	1.03	(1.92)	1.42	(1.94)	1.97	(1.96)	2.48	(1.93)
JU	0.74	(1.69)	0.74	(1.32)	1.00	(1.31)	1.01	(1.29)	1.34	(1.25)	1.79	(1.22)	2.26	(1.20)
LU	0.56	(5.40)	0.71	(5.30)	1.00	(5.47)	1.05	(5.55)	1.42	(5.50)	1.93	(5.49)	2.57	(5.70)
NE	0.78	(2.56)	0.85	(2.18)	1.00	(1.88)	1.10	(2.02)	1.36	(1.83)	1.75	(1.71)	2.14	(1.64)
NW	0.38	(0.34)	0.51	(0.35)	1.00	(0.51)	0.98	(0.48)	1.53	(0.55)	2.22	(0.58)	2.73	(0.56)
OW	0.51	(0.37)	0.75	(0.43)	1.00	(0.42)	1.00	(0.41)	1.53	(0.46)	2.29	(0.50)	3.03	(0.52)
SG	0.60	(5.29)	0.78	(5.41)	1.00	(5.06)	1.02	(5.03)	1.41	(5.09)	1.95	(5.14)	2.52	(5.18)
SH	0.83	(1.18)	0.96	(1.06)	1.00	(0.81)	1.07	(0.85)	1.44	(0.83)	1.93	(0.82)	2.44	(0.81)
SO	0.44	(2.94)	0.68	(3.60)	1.00	(3.84)	1.02	(3.81)	1.40	(3.84)	1.90	(3.79)	2.44	(3.81)
SZ	0.56	(1.49)	0.70	(1.48)	1.00	(1.53)	1.04	(1.55)	1.56	(1.69)	2.30	(1.83)	3.14	(1.95)
TG	0.64	(2.34)	0.88	(2.51)	1.00	(2.09)	1.04	(2.10)	1.53	(2.26)	2.25	(2.44)	3.06	(2.59)
TI	0.41	(6.01)	0.74	(8.39)	1.00	(8.30)	0.99	(8.04)	1.41	(8.39)	1.91	(8.32)	2.38	(8.10)
UR	0.69	(0.58)	1.01	(0.67)	1.00	(0.49)	0.99	(0.46)	1.36	(0.47)	1.89	(0.47)	2.41	(0.47)
VD	0.53	(9.08)	0.63	(8.45)	1.00	(9.76)	1.03	(9.82)	1.37	(9.61)	1.89	(9.66)	2.46	(9.85)
VS	0.40	(3.96)	0.58	(4.49)	1.00	(5.64)	0.99	(5.41)	1.43	(5.77)	2.06	(6.07)	2.68	(6.18)
ZG	0.38	(0.73)	0.54	(0.80)	1.00	(1.08)	1.02	(1.07)	1.53	(1.18)	2.19	(1.23)	2.85	(1.25)
ZH	0.57	(14.07)	0.70	(13.63)	1.00	(14.13)	1.03	(14.13)	1.37	(13.84)	1.84	(13.54)	2.33	(13.40)
Linguistic regions														
DE	0.61	(68.71)	0.75	(66.73)	1.00	(64.56)	1.03	(64.67)	1.40	(64.38)	1.91	(64.20)	2.44	(64.20)
FR	0.53	(25.28)	0.67	(24.88)	1.00	(27.14)	1.03	(27.29)	1.40	(27.24)	1.94	(27.48)	2.50	(27.70)
IT	0.41	(6.01)	0.74	(8.39)	1.00	(8.30)	0.99	(8.04)	1.41	(8.39)	1.91	(8.32)	2.38	(8.10)
Whole country														
CH	0.57	(100.00)	0.73	(100.00)	1.00	(100.00)	1.03	(100.00)	1.40	(100.00)	1.92	(100.00)	2.45	(100.00)

Important regional differences can be observed



Backtesting of the forecasts

Cantons								*Linguistic regions*	
AG	−0.67	GE	−0.68	OW	−4.40	UR	−3.54	DE	+0.22
AI	−0.22	GL	−0.23	SG	−1.28	VD	+0.47	FR	+0.68
AR	+3.02	GR	+3.02	SH	+5.85	VS	−5.10	IT	−4.10
BE	+1.65	JU	−2.90	SO	−1.55	ZG	−2.92	*Whole country*	
BL	+1.00	LU	+1.66	SZ	+0.55	ZH	−0.13	CH	−0.02
BS	+0.04	NE	+11.78	TG	+0.19				
FR	+8.77	NW	−8.62	TI	−4.10				

Structure

1. Introduction: LTC in Switzerland
2. Available data and historic prevalence rates
3. Regression models and projections
4. **Conclusion**

Conclusion

Regression

- Age, gender and canton of residence are significant factors in determining the needs of care: female persons of higher ages present higher prevalence rates
- The distinction in two series of models shows that the age and the gender distinction have larger influence on the prevalence rates for both the severely dependent persons and the ones being cared for in an institution. Furthermore, we find similarities between mildly dependent persons and persons cared for at home
- Therefore, the major part of persons in moderate and severe dependency receives care in an institution while mildly dependent persons only require home-based care

Forecast

- Our forecasts imply a serious increase of the demand in LTC over the next thirty years (2045)
- By considering the canton of residence, we identify different clusters. For example, the increase in dependent elderly is higher in rural cantons (x 2.6) than in urban cantons (x 2.4)
- By considering the level of dependency, our model predicts higher increase in severely dependent than in mildly dependent. We find a similar relation between persons cared for in an institution than persons cared for at home

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