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Healthy mountains? A look into health and its determinants in the Alpine regions

This contribution provides a statistical description of geographical variation in health and health inequality in the Alpine regions. It uses regional indicators provided by Eurostat and microdata from the Survey of Health, Ageing and Retirement in Europe (SHARE). The results suggest that Alpine regions perform slightly better than non-Alpine regions with regard to some health indicators (e.g., life expectancy). However, pronounced internal variation exists, with some regions of the Alps substantially outperforming relative to the rest of Europe, whereas others are clearly lagging behind. Although it is beyond the scope of this article to attempt a thorough analysis of the causes of this geographical variation, data suggest that this could be accounted for by socioeconomic and institutional factors. The article also documents the existence of social inequality in health because individuals' level of education and occupational status are found to significantly affect perceived wellbeing. Further research is necessary in order to determine the role played by contextual factors, healthcare services and accessibility in shaping health inequality and geographical variation.

Keywords: health, space, Alpine regions, health inequality

1 Introduction

Much research has investigated the link between geographical area of residence and health status (Curtis & Jones, 1998; Marmot & Wilkinson, 2006; Mackenbach et al., 2003, 2008). The existence of geographical variation in health has been validated at different levels: across countries, across regions within countries, across neighbourhoods within cities, and so forth. However, interpreting this geographical variation is not straightforward. On one hand, it could be explained by the fact that individuals are unevenly distributed across space. According to this compositional explanation, the differences observed across areas would be simply accounted for by individual characteristics and related risk factors (Lynch et al., 2004). For example, differences between countries could be explained by the fact that pronounced differences in household income exist across countries. Similarly, differences in mortality and morbidity between neighbourhoods might be explained by the different age distribution of residents. On the other hand, an ecological perspective would point to the existence of contextual effects that operate over and beyond individual risk factors. That is, some places would be "healthier" than others, independent of individual characteristics. Different rates of pollution, availability and funding of healthcare services, poverty rates and the socioeconomic context (Robert, 1999; Marmot & Wilkinson, 2006), as well as a wide range of socio-cultural factors, including the quality of social relations (Uchino et al., 1996; Litwin, 2009), might affect individual health (Costa et al., 1998, 2009; Krieger 2001).

For the purposes of this contribution, it is particularly interesting to look at studies investigating health differentials between mountainous and non-mountainous areas. In this setting, contextual effects could operate through several channels and in different directions. Living in a mountainous area versus a non-mountainous one might exert both positive and negative effects on an individual's health. For example, individuals living in mountainous areas might benefit from a better-quality environment (e.g., less air pollution). In mountain areas, healthy behaviours and lifestyles (e.g., outdoor activities) could also be more frequent compared to non-mountain areas, leading to better health (Bertoncello, 2007). On the other hand, people living in mountain areas often face lower accessibility and quality of care services because they have to travel longer distances to hospitals and hence pay higher costs for medical care, as also emerged from the SPHERA project.[1]

Whether beneficial effects prevail over detrimental ones is essentially an empirical question. Thus far, not much is known about geographical variation in health in the Alpine area and between Alpine and non-Alpine regions. Most empirical studies on the Alpine area are centred around spatial variation in socioeconomic indicators (Pecher, 2012), and studies that specifically focus on health issues are limited to individual national contexts (Lengen, 2007) and localities (Lercher, 1994; ALPNAP, 2007; Costa, 2014).

Within the Alpine Space Programme's 2007–2013 programming period, the SPHERA project served as an opportunity to investigate the spatial distribution of health and to explore the link between spatial planning and healthcare in the Alpine area. As a result, some key critical issues were identified (Zuffada et al., 2015). First, the project emphasised the problem of low availability and low quality of healthcare services in mountain areas, which makes it more difficult to serve new health demands (e.g. age-related ones) in remote areas, giving rise to social inequality in health. The project also made apparent poor awareness of the fact that demographic change in the Alps is a major issue for regional development and spatial planning, and that spatial planning policies could serve as leverage for increasing the wellbeing of the elderly in mountain areas. Policy-wise, interventions aimed at improving healthcare accessibility in remote alpine areas are considered useful for redressing the growing age and social inequality in health.

Building on prior research and on the results of the SPHERA project, this article asks the following questions: a) Do Alpine regions differ from non-Alpine regions with regard to life expectancy and death rates? b) Is there geographical variation in these indicators within the Alpine area? c) How do the Alpine regions compare with non-Alpine regions with respect to selected social and institutional determinants of health? d) Finally, is there evidence of social inequality in health in the Alpine area? To answer these questions, we use both regional indicators provided by Eurostat (and presented in SPHERA) and microdata from the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE allows us to look at a subjective measure of health (self-perceived health), which is particularly relevant considering that wellbeing is an intrinsically subjective feature, as recognised by the World Health Organization in its 1948 definition of health.

The results presented in this article suggest that Alpine regions perform better than non-Alpine regions with regard to some health indicators (e.g., life expectancy). However, noticeable regional variation exists within the Alpine area. Although it is beyond the scope of this article to attempt a thorough analysis of the causes of this geographical variation, data suggest that this could be accounted for by socioeconomic and institutional factors. The article also documents the existence of social inequality in health because individuals' level of education and occupational status are found to significantly affect perceived wellbeing. For the reasons mentioned above, the results presented in this article are to be taken as a mere statistical description of the phenomena at hand and cannot be interpreted in a causal way. Further research is needed in order to disentangle the role played by contextual factors, healthcare services and accessibility.

This article is structured as follows. Section 2 provides an analysis of selected aggregate indicators on health status in Alpine regions in comparison with non-Alpine regions, national averages and the EU average. Section 3 completes the picture with a comparison of a selected set of socioeconomic and institutional determinants. Section 4 presents an analysis of micro-determinants of health and health inequality in the Alpine regions. Section 5 concludes by summarising the main findings and envisaging future areas of research.

2 Health in the Alps

This section examines aggregated health indicators. First, it looks at two overall health indicators: life expectancy and standardised death rate. Second, it examines a selected group of the causes of death (neoplasm, ischemic diseases, alcohol abuse and traffic accidents). Because our main interest is both comparing Alpine and non-Alpine regions and assessing internal

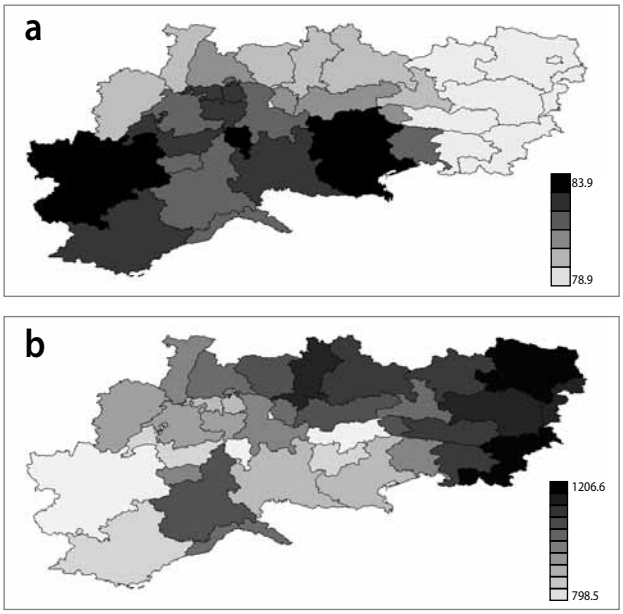

Figure 1: a) Life expectancy in 2010 and b) standardised death rate in 2008–2010 in Alpine regions (source: Eurostat Statistics Database (FBK-IRVAPP calculations based on Eurostat data, 2008–2010).

Note: a) Life expectancy at less than one year, b) Standardised death rate per 10,000 inhabitants, three-year average.

Table 1: Selected health indicators in the Alpine regions and Europe.

Geographical unit	Life expectancy	Standardised death rate				
		Overall	Neoplasm	Ischemic disease	Alcohol	Traffic
	(1)	(2)	(3)	(4)	(5)	(6)
Alpine regions						
Mean	82.0	928.8	264.2	137.8	3.4	7.5
Median	82.1	917.7	261.7	129.3	3.6	6.6
Non-Alpine regions						
Mean	81.0	965.0	256.0	111.5	5.0	7.1
Median	80.8	1,009.3	269.6	136.4	5.2	6.3
National means						
Austria	80.1	1,011.5	268.4	198.1	5.6	7.5
France	81.1	893.6	272.4	61.2	5.0	6.3
Germany	79.8	1,045.0	267.7	166.8	5.6	5.2
Italy	81.5	912.7	275.9	115.8	0.4	7.2
Slovenia	79.0	1,114.9	329.4	122.2	6.2	10.3
Switzerland	82.0	884.0	238.4	122.6	2.9	5.1
EU28	79.3	1,079.5	282.0	153.1	3.0	7.9

Note: Alpine and non-Alpine regions are weighted averages (weighted for the size of the regional population).

Source: Eurostat statistics database (calculations by the Research Institute for the Evaluation of Public Policies, Bruno Kessler Foundation (FBK-IRVAPP) on life expectancy for 2010 and standardised death rate for 2008 to 2010). Data downloaded in March/April 2014.

variation in the Alpine area, our analysis is carried out on different geographical clusters of interest: a) Alpine NUTS-2[2] regions (belonging to Austria, France, Germany, Italy, Slovenia and Switzerland), b) non-Alpine NUTS-2 regions (belonging to the same six countries), c) national averages and d) the EU-28 average. All of these indicators are based on Eurostat data, which allow for comparability of data across geographical units. Unfortunately, most data related to health are only available at the NUTS-2 level, this preventing a more precise definition of the Alpine area, which would be possible with indicators at the NUTS-3 level. Nevertheless, it is emphasised that our empirical definition of the Alpine area coincides with the one adopted by the Alpine Space Programme, which includes all NUTS-2 regions that are even partly crossed by the Alps.

Table 1 compares the first two indicators across the geographical clusters listed. Life expectancy (Column 1) indicates the mean number of years still to be lived by a person under age one if subjected throughout the rest of his or her life to the current mortality conditions (age-specific probabilities of dying). The overall standardised death rate (Column 2) indicates the number of deaths in relation to the total population, having excluded the differences in the age distribution when comparing different populations to account for the fact that most causes of death vary significantly with people's age.

Table 1 shows that Alpine regions have higher life expectancy than non-Alpine regions (82.0 versus 81.0 years) and also score better in comparison to national and EU averages. Although length of life does not imply the status of wellbeing and health, this result could be taken as a first hint that health could be, on average, better in Alpine regions compared to non-Alpine regions of Europe. Such a "health advantage" would also be confirmed when looking at the standardised death rate indicator (Column 2). Alpine regions "perform" better in comparison with non-Alpine regions (928.8 vs. 965.0) and with the EU-28 average (1079.5).[3] However, on both these indicators there is sizeable internal heterogeneity in the Alpine area. As is evident from Figure 1, the south-western regions of the Alpine area seem to perform better than the north-western ones. The top map shows that life expectancy varies from a minimum of 78.9 to a maximum of 83.7 years. The same occurs with the standardised death rate, which varies from 798.5 to 1206.6. Hence, although Alpine regions outperform non-Alpine regions on average, within the Alpine area there are regions that perform at a relatively low level: some Alpine regions perform better and some others worse than the EU28 average.

We now turn our attention to the four causes of death presented in Table 1 (Columns 3–6). The data show that deaths related to neoplasm and heart diseases (which rank among the most frequent causes of death in Europe) are slightly more frequent in Alpine compared to non-Alpine regions. Alpine regions also have lower incidence of deaths related to alcohol but higher incidence of road-accident-related deaths. As before, we also present a visualisation of these indicators throughout the Alpine area. Figure 2 shows that causes of death have a different

Table 2: Selected health determinants in the Alpine regions and Europe.

Geographical unit	Ageing index	Share of medium/ highly educated	Risk of poverty	Material deprivation	Hospital beds	Inhabitants per doctor
	(1)	(2)	(3)	(4)	(5)	(6)
Alpine regions						
Mean	1.23	73.1	16.0	3.0	551.4	275.2
Median	1.27	81.6	16.0	3.6	560.4	272.0
Non-Alpine regions						
Mean	1.24	72.4	29.3	7.5	551.3	348.9
Median	1.49	79.6	25.8	7.3	566.9	325.4
National means						
Austria	1.19	82.5	16.6	4.3	762.9	209.2
France	0.89	70.8	19.2	5.8	642.8	305.6
Germany	1.53	85.8	19.7	4.5	824.8	268.0
Italy	1.44	55.2	24.5	6.9	357.1	255.4
Slovenia	1.18	83.3	18.3	5.9	457.2	411.4
Switzerland	1.11	85.8	17.2	1.7	496.3	262.7
EU28	1.11	72.7	23.7	8.4	538.7	296.1

Note: Alpine / non-Alpine regions are weighted averages (weighted for the size of the regional population).
Source: Eurostat Statistics Database (FBK-IRVAPP calculations on Eurostat data, 2010).

incidence in the Alpine area. In particular, it is confirmed that the eastern part of the Alps also has the highest mortality rate for the four selected causes of death, whereas the southern part displays a higher incidence of neoplasm-related deaths and a lower incidence of deaths related to alcohol abuse.

3 Socio-demographic and institutional determinants of health in the Alps

The geographical differences described in the previous section could be the result of several factors (e.g., different health behaviours, environments and regional or national institutional settings) that cannot be investigated in this article but that could be the object of further studies. Nonetheless, here it is worth looking at some of the demographic, socioeconomic and institutional indicators that are considered important determiners of health (Marmot & Wilkinson, 2006; Franzini & Giannoni, 2010). Table 2 presents an overview of a selected set of indicators. First, Column 1 compares an index of ageing obtained as the ratio of the population sixty-five years old compared to the population under fifteen. No noticeable differences are detected between Alpine (1.23) and non-Alpine regions (1.24) on this index. In contrast, some noticeable differences exist with regard to socioeconomic indicators, such as the share of medium/highly educated (Column 2), the share of households at risk of poverty (Column 3) and the share of households reporting to experience severe material deprivation (Column 4). From this set of indicators, it emerges that, on average, Alpine regions are substantially better off than non-Alpine regions. Although the share of medium/highly educated individuals is virtually the same in Alpine and non-Alpine regions (73.1 and 72.4%, respectively), and also in line with the EU28 average (72.2%), Alpine regions score better on the two indicators of wealth and economic wellbeing. The share of households living in poverty is roughly half that observed in the non-Alpine areas (16.0 versus 29.3%) and substantially lower than the EU28 average (23.7%). Similarly, the share of households facing material deprivation is 3.0% in Alpine regions and 7.5% in non-Alpine regions. Finally, we take into consideration two indicators of healthcare services: the number of hospital beds and the number of inhabitants per doctor (Columns 5 and 6, respectively). Although no noticeable differences are found when comparing the number of hospital beds, a quite pronounced gap seems to exist with respect to the number of inhabitants per doctor, with the Alpine regions showing a quite lower ratio (275.2) compared to non-Alpine regions (348.9) and the EU28 average (296.1).

Figure 3 shows evidence of the internal dispersion of the indicators presented in Table 2. Once again, it is evident that the Alpine area cannot be considered a "monolithic" geographical unit. It is evident that national divides exist. Considering, for example, the educational attainment indicator, Italian regions strikingly underperform other Alpine regions (indeed the share of medium/highly educated in Italy is 55%, well below the EU28 average). Similarly, sharp differences are observable on both the ageing index and on the indicator for number of beds.

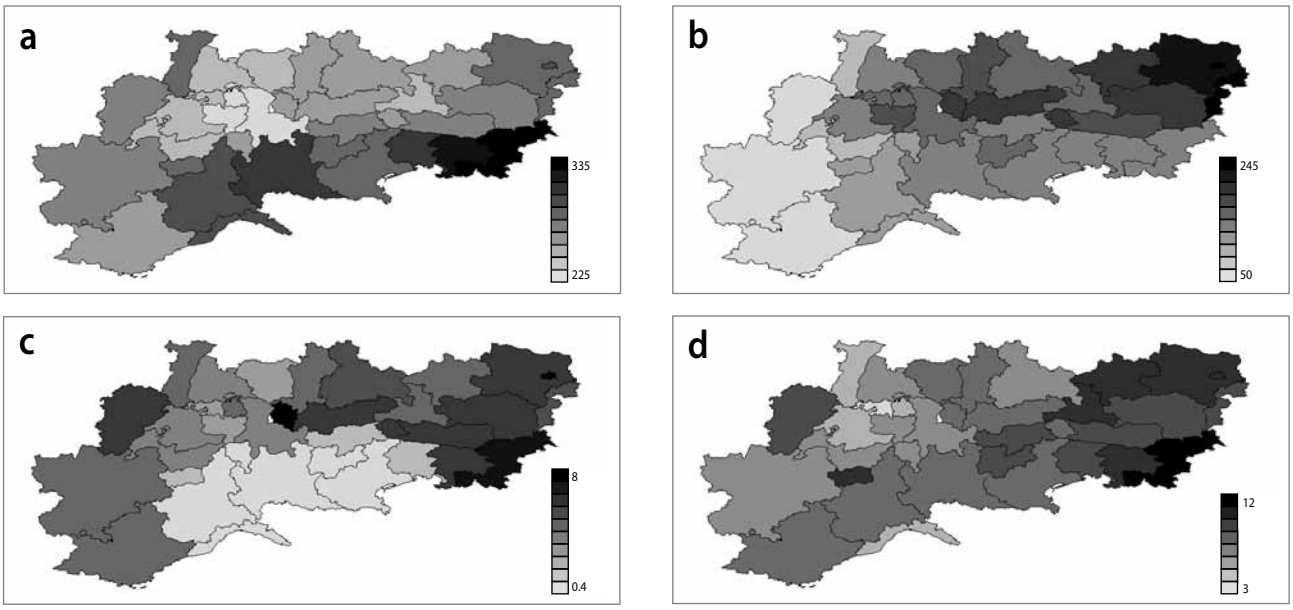

Figure 2: Various causes of death from 2008 to 2010 in the Alpine regions: a) neoplasm, b) ischemic heart diseases, c) mental and behavioural diseases caused by alcohol abuse, d) traffic accidents (source: Eurostat Statistics Database (FBK-IRVAPP calculations on Eurostat data, 2008–2010).
Note: a)–d) Standardised death rates per 100,000 inhabitants, three-year average.

4 Social inequality in subjective health

This section provides a descriptive analysis of health inequality (Marmot & Wilkinson, 2006) in the Alpine regions using individual-level data derived from the SHARE database. In particular, we examine individuals' self-reported health to acknowledge the importance of looking at the subjective dimension of health and wellbeing. SHARE is a cross-national survey administered to individuals over fifty, which covers a wide range of aspects including health, socio-economic status and social and family networks. Our sample is made up of 13,975 individuals.[4] The sample is distributed as follows: 4.5% living in Italy, 5% in Germany, 9.5% in France, 19% in Slovenia, 25% in Switzerland and 36% in Austria. The share of women is somewhat larger, accounting for 56% of the sample. The average age is around sixty-six. Our dependent variable is self-perceived health. Interviewees' responses have five categories: "poor", "fair", "good", "very good" and "excellent". The modal response is "good" (37%); 31% of the sample is reporting to have very good or excellent health, but 32% state that they have fair or poor health.

We analyse self-reported health and its determinants by means of two nested multilevel models that include region random effects. This type of statistical technique is particularly appropriate for jointly studying the role played by individual and contextual effects. More precisely, this modelling technique makes it possible to a) assess between- and within-region variance in self-reported health and b) investigate the role played by individual characteristics on individual health as well as between- and within-region variance in health. For the sake of simplicity, we recode our dependent variable into a dichotomous variable with the value 1 if the respondent declares "good", "very good" or "excellent" health status, and the value 0 otherwise. We apply a linear probability model. The results are substantively unchanged if we use logit or probit models for binary response. Table 3 reports the results of this analysis. Model 1 includes region random effects only and makes it possible to study the variance between and within regions. Model 2 adds individual characteristics and thus makes it possible to study health determinants and inequality.

Model 1 shows that a large part of the sample variance in self-reported health takes place at the individual level (0.203) rather than the regional level (0.010). The intra-class correlation (ICC, i.e., the portion of variance explained at the regional level) is 4.7%.[5] This means that less than 5% of the variance in self-reported health is explained by differences between regions, whereas the remaining 95% is due to individual variation within the regions. This is not surprising because health is primarily an individual condition. However, even if small, the existence of significant between-region variance points to the presence of geographical disparities in health within the Alpine area, confirming what is shown visually in Section 2. Model 2 adds several individual determinants of health. The direct effect of individual factors on perceived health is remarkable. Highly educated individuals report significantly better health: having a degree versus having at most lower secondary

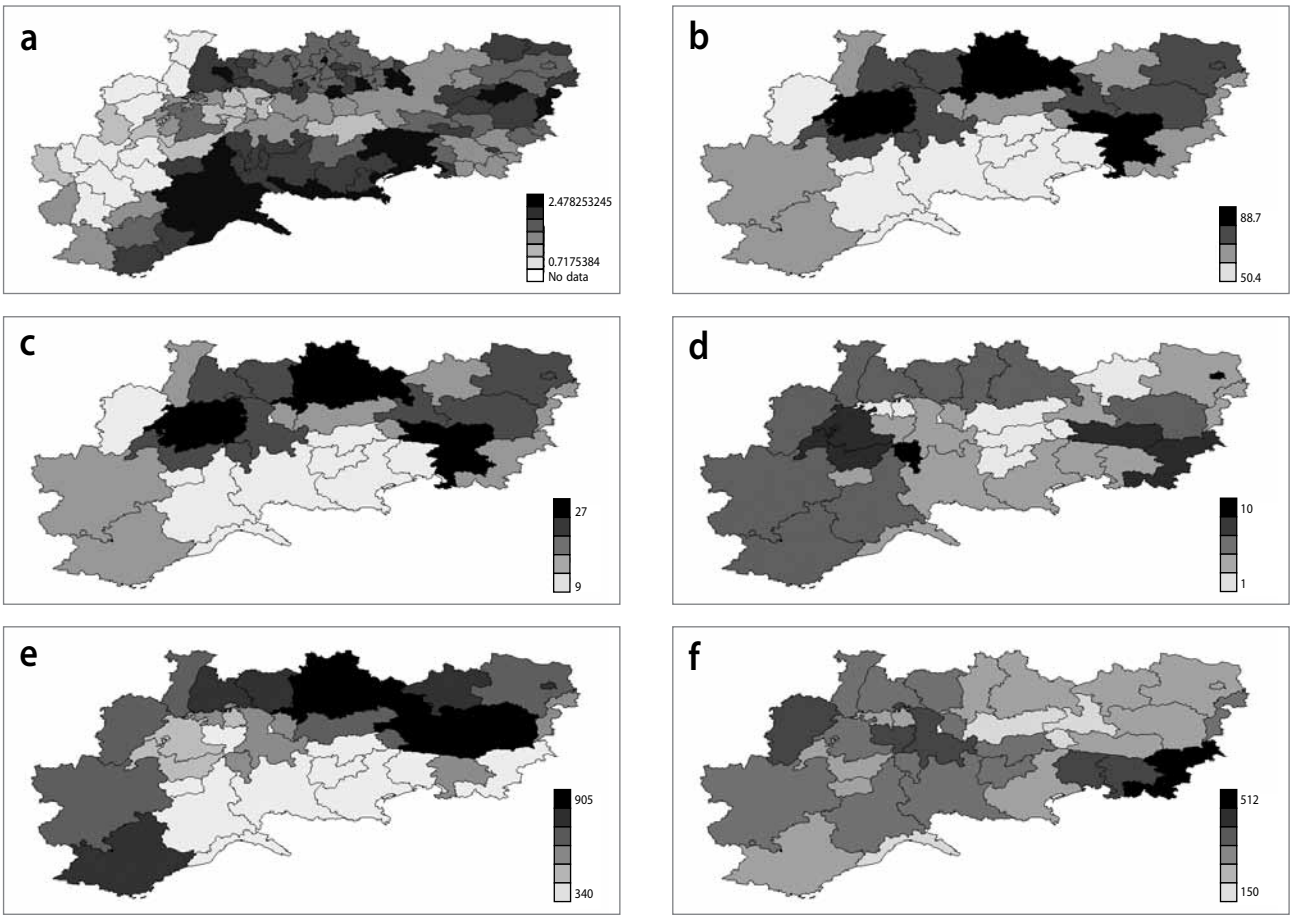

Figure 3: Health determinants in 2010 in the Alpine regions: a) ageing index, b) Share of upper secondary/tertiary educated, c) People at risk of poverty and social exclusion, d) Severe material deprivation, e) Hospital beds, f) Inhabitants per doctor (source: Eurostat Statistics Database, FBK-IRVAPP based on Eurostat data).

Note: a) Ratio of population over sixty-four divided by the population below fifteen, b) Population twenty-five to sixty-four years old with upper secondary or tertiary education, c) Percentage of total population (Germany, France: only national data available), d) Percentage of households reporting material deprivation (economic strain, durables, housing deprivation; Germany, France: only national data available), e) Hospital beds per 100,000 inhabitants, f) Number of inhabitants per doctor.

Table 3: Determinants of self-reported health in the Alpine area.

	Model 1	Model 2
Female (ref. male)		0.03*** (0.01)
Age		−0.01*** (0.00)
Education (ref. primary / lower secondary)		
Upper secondary education		0.10*** (0.01)
Tertiary education		0.16*** (0.01)
Employed (ref. non-employed)		0.09*** (0.01)
Has economic strains (ref. does not have economic difficulties)		−0.17*** (0.03)
Single (ref. lives with a spouse/partner)		−0.04*** (0.01)
Children (ref. does not have children)		0.02 (0.01)
Constant	0.70*** (0.02)	1.02*** (0.04)
Between-region variance	0.010 (0.003)	0.005 (0.002)
Within-region variance	0.203 (0.002)	0.183 (0.002)
Log likelihood	−8,741.44	−8,011.86
N	13,975	13,975

Note: Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

Source: SHARE Dataset (IRVAPP calculations on SHARE data, various waves)

education increases the likelihood of reporting good health by 16 percentage points. Employed individuals and those that say they do not experience economic strains also report significantly better health.

Model 2 also shows that older individuals and those living in single households report more negative health, whereas females report, *ceteris paribus*, slightly higher wellbeing than males. Moreover, as compared to Model 1, ICC is substantially reduced (2.5% vs 4.7%). This suggests that regional variation in health within the Alpine area is partly due to regional composition in terms of individual socioeconomic factors, thus lending partial support to a compositional explanation of geographical variation in health.

5 Conclusion

This contribution expanded on SPHERA Work Package 4 (Zuffada et al., 2015), aiming to shed light on health geographical variation and health determinants in the Alpine area. Although it had a merely descriptive purpose, this work obtained some empirical results that could pave the way for further in-depth studies in the future. First, the Eurostat data aggregated at the regional level point to the existence of a slight health advantage of Alpine regions versus non-Alpine regions, at least when considering life expectancy as an overall indicator of health. This "advantage" could be explained by the better socioeconomic and institutional environment in Alpine regions, but it must also be emphasised that there exists pronounced internal variation, with some regions and parts of the Alps substantially outperforming relative to the rest of Europe, and others clearly lagging behind. Again, it was far beyond the scope of this contribution to attempt an explanation of these patterns, which could be the result of a mix of factors related to regional and national socioeconomic, environmental and institutional settings. Future research should investigate regional variation in health by considering further health indicators and their development over time as well as examine the role played by contextual effects, services and service accessibility in accounting for health levels.

This contribution also pointed out the issue of social inequality in health in Alpine regions. Individual characteristics such as level of education and socioeconomic conditions strongly affect individuals' perceived health and wellbeing. This demands a redefinition of healthcare services in order to accommodate socially differentiated health risks and to counterbalance the role played by socioeconomic status. Empirical studies are in order to establish the extent to which social and geographical inequalities interact. However, it would be of great importance to be able to exploit more geographically disaggregated data because the NUTS-2 level is too broad a definition to both adequately identify the alpine area and the existence of contextual effects on individuals' health and wellbeing.

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Notes

[1] SHERA is a project funded within the Alpine Space Programme aimed at studying the link between spatial planning and health in the Alpine regions. See the contribution by Zuffada et al. in this issue for further details on the project.

[2] The NUTS classification (Nomenclature of Territorial Units for Statistics) is a hierarchical system for dividing up the economic territory of the EU. NUTS2 corresponds to macro-regions.

[3] These results also hold when considering median values (less sensible to outliers) instead of means.

[4] The individuals included in our sample were interviewed either in 2004 (Germany) or in 2011 (Italy, Switzerland, Austria, Slovenia and France). Because the NUTS-2 region identifiers are missing from our 2011 dataset for Germany, the only alternative was to use the 2004 German dataset for more descriptive purposes. However, the distribution of the outcome variables does not significantly change between 2004 and 2011.

[5] The ICC is obtained by dividing the variance between regions (0.010) by the total sample variance (0.10 + 0.203).

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