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Happiness and Health in Europe: A Multivariate Multilevel Model

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Abstract Most studies of well-being use happiness or health as a single outcome. They either explain happiness in terms of health (and other factors) or conversely explain health in terms of happiness. Moreover, only a few studies include contextual explanations of well-being. This study investigates the individual, regional and national covariations in happiness and health. In doing so, we use multivariate multilevel model to explain happiness and health. We study 47 countries across Europe using the 2008 European Values Study. The problem of missing data has been solved using multilevel multiple imputation. We find that the determinants of both happiness and health are quite similar. At individual, regional and national levels, happiness and health are positively correlated. Being married, being educated, and being affluent are positively associated with being happy and being healthy. Conversely, individual unemployment and regional unemployment rates are negatively associated with happiness and health

Keywords Happiness · Health · Multivariate multilevel model · Europe

Introduction

The growing interest in the study of happiness and health can be seen in a number of studies across the social sciences, such as sociology and psychology (Diener and Biswar-Diener 2008; Argyle 2001; Kahneman et al. 1999), social epidemiology (Kawachi et al. 1999), economics (Frey and Stutzer 2002; Bruni and Porta 2007; Layard 2005; Graham 2009), politics and public policy (Lane 2000).

Happiness and health, as two important indicators of well-being, need to be addressed by academics and policy makers for at least two reasons: first, from an individual perspective, Argyle (2001) argued that happy people seem to be more productive and creative than those who are unhappy. Second, from a societal perspective, happiness and health are considered to be successful indicators of a nation's

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development. This argument follows Sarkozy's commission in 2008 to shift GDP as a successful indicator of a country's development and to include quality of life indicators (happiness and health) as important measurements of a country's development.

In the literature, most studies treat health or happiness as a single outcome (Graham 2009; Subramanian et al. 2005, for review). They either explain happiness in terms of health (and other factors) or conversely health in terms of happiness. However, it is important to study happiness and health simultaneously for two reasons. First, both happiness and health are often subjectively elicited. They are neither neurologically measured (happiness) nor clinically measured (health). As a subjective perception, health assessment may involve affect (happiness) and happiness assessment may involve the consideration of health. Second, some have argued that happiness and health can be treated as independent and dependent variables for each other (Blanchflower and Oswald 2004; Graham 2008).

The present research has uncovered three studies (Oshio and Kobayashi 2010; Eikemo et al. 2008b; Subramanian et al. 2005) that constitute an exception in the literature in that they examine the determinants of both happiness and health simultaneously. Subramanian et al. (2005) examined the covariation of health and happiness among communities in the United States. Eikemo et al. (2008b) used data from the European Social Survey 2002 and 2004, investigating how happiness and health correlate across countries in Europe. We extend Subramanian's study by adding one higher level in multivariate multilevel model. Moreover, we expand upon Eikemo's study by introducing regional factors for explaining happiness and health.

This paper aims to examine the individual, regional and national covariations in health and happiness. Since the paper analyses individual respondents nested in regions and countries, a three-level model is appropriate. In addition, two individual outcomes (happiness and health) are explained simultaneously; for this reason, multivariate multilevel model for the analysis is most suitable. The problem of missing data is an issue at both the regional and individual levels. Because the structure of the data is multilevel, we use multilevel multiple imputation method.

Our analysis suggests that happiness and health are positively correlated. Happier people tend to be healthier, and vice versa, even after controlling for individual, regional and national covariates. Social capital, marital status, education and household income are among the important covariates that are positively associated with both happiness and health. Individual unemployment, disability, regional unemployment rates and national income inequality are negatively associated with health and happiness.

This paper is organised as follows: first, the determinants of happiness and health are identified based on previous studies. The data and method used in this study are then described, including the construction of the covariates. In the penultimate section the results are presented and discussed. Lastly, the paper concludes with theoretical and methodological implications for future researchers and policy makers.

Happiness and Health: The Joint Outcomes

Previous studies suggest a strong correlation between happiness and health (e.g. Graham 2008; Argyle 1997). The relationship between the two may suffer from the

problems of endogeneity, causality or self-selection. Instead of dealing with the issues presented by endogeneity problems, this paper uses a different approach to examine the association between happiness and health.

The relationship between happiness and health is left open in the framework of the present research: it presumes neither that happiness determines health nor the reverse. When asked about their happiness, respondents may have considered their state of health implicitly and subjectively. Conversely, when asked about their health, respondents may have implicitly and subjectively considered their happiness. The two are therefore correlated. In our analysis, we anticipate that both are mutually constitutive (Diener and Seligman 2004). In modelling terms, we have both as bivariate outcomes to be explained, and both covary.

Subramanian et al. (2005) examined simultaneous explanation of both happiness and health. Their study investigates individual determinants and the community level covariation in health and happiness. Using the 2000 Social Capital Benchmark Survey which involved 21,572 individual respondents living in 36 communities in the United States, they applied a multivariate multilevel model. The findings suggest that both health and happiness are determined by relatively similar factors: income, education and marital status. After controlling for all covariates of health and happiness, the results show that the residual correlation between health and happiness is positive and significant. This indicates that individuals who are healthy are likely to be happy as well. This study gives an understanding of how to treat health and happiness jointly, providing evidence that health and happiness are positively associated. However, this investigation covers communities in the United States. Different areas may have different features in examining the association between health and happiness.

Following Subramanian et al. (2005), Eikemo et al. (2008b) examined the covariation of health and happiness in European countries using the 2002 and 2004 European Social Survey. Using multivariate multilevel model, this study provides evidence that poor health and unhappiness are related to both demographic and socioeconomic indicators in Europe. Eikemo et al. (2008b) concluded that people who report poor health tend to report unhappiness as well which supports the findings of Subramanian et al. (2005). Although the result gives evidence of the correlation between health and happiness among Europeans, the study uses country as level 2 in multilevel model. Since countries may contain variations in health and happiness, it is important to include areas that are smaller than countries, such as regions or neighbourhoods. An investigation taking more geographical areas into account can more precisely estimate the relationship between health and happiness.

Determinants of Happiness and Health

Several studies demonstrate that the determinants of happiness and health are relatively similar (Oshio and Kobayashi 2010; Subramanian et al. 2005). However, their associations with happiness and health can be different when both are explained simultaneously. Gender, for example, has been identified as an important predictor for happiness and health. At the same time, though, gender appears to predict both positive and negative outcomes. Oswald (1997) noted that women are more likely to be happy, but Subramanian et al. (2002) women were less likely to be healthy than men.

Age is an important covariate in the prediction of happiness and health; like gender, different studies have shown it to affect happiness and health in different directions. According to Argyle (2001), the association between age and happiness is slightly positive: older people are likely to be happier than younger people. However, others have shown a u-shaped relationship between age and happiness (Blanchflower and Oswald 2008; Clark 2003) – in other words, that people tend to be happier when they are younger and older than when they are middle-aged. The association between age and health is, likewise, rather complex. Song and Lin (2009), using a sample from Taiwan, demonstrate a negative association between age and self-reported health. Similarly, Eriksson et al. (2001), using samples from Sweden, found that age has a negative correlation with health. In contrast, a weak positive association between age and health is shown by Subramanian et al. (2005) using the United States samples from the 2000 Social Capital Benchmark Survey.

Education may be one of the most important and consistent determinants of happiness and health. As a human capital indicator, this covariate predicts well-being status; a number of studies have also investigated the relation between education and happiness (Diener et al. 1993; Stutzer and Frey 2008; Diener 2000). The suggestion is that education is positively correlated with well-being. In contrast however, Clark and Oswald (1994) reported a negative relation between the two. Due to changing aspirations and expectations of higher income among more educated people, the resulting unmet expectations may drive the negative correlation between education and well-being. Previous studies found that the association between education and health is mixed. Subramanian et al. (2005) showed that education is strongly correlated with both happiness and health. Kunst et al. (2005) examined the relationship between education and health; they found that in Scandinavian countries, education has no significant correlation with health.

The association between marital status and happiness is reported in some studies (Argyle 2001; Stutzer and Frey 2006). Since married people benefit socially and emotionally from the support their spouses bring, being married is positively associated with happiness, while being widowed and being separated is associated with decreased happiness. Moreover, Stutzer and Frey (2006) posited that married people tend to encourage commitment, which in turn benefits their happiness. Diener and Biswar-Diener (2008) argued that there are other factors involved, and that any benefits accruing from marriage depend on the partners' personalities and the context of their lives. Using longitudinal data spanning 17 years, Stutzer and Frey (2006) concluded that happier singles are more likely to marry but that married people are no happier than singles. This evidence suggests that, in contrast to the findings reviewed above on the relationship between marriage and happiness, it is happiness that causes marriage rather than vice versa.

Marriage can have positive associations with health. Social support provided by a partner in a marriage may benefit individual health. As can be seen from previous research, social support has been identified as strong predictor of self-rated health (e.g. Song and Lin 2009). The study finds that marital status has a positive relationship with self-rated health. Subramanian et al. (2005) similarly found that married people are likely to be healthier.

Companionship and social relationships are determinants which are consistently associated with happiness. Empirical studies within and across countries repeat the

same result, namely that family solidarity and friendship are strong predictors of well-being (Lane 2000; Argyle 2001). Social capital and relationships are important predictors of health. Studies have found a positive association between them. Mansyur et al. (2008), using data from 45 countries, found that social capital is positively associated with health. Subramanian et al. (2002) also demonstrated that trust, a measure of social capital has a positive correlation with self-rated health.

The relationship between social class and well-being has been investigated by Haring et al. (1984). By conducting a meta-analysis of American studies, the researchers show that social class has greater association with life satisfaction than does income. Social position may also explain health, as argued by Marmot and Wilkinson (2006), according to whom health follows a social gradient: higher social positions have a positive association with health.

Unemployment has been recognised as an important predictor for both unhappiness and ill health. Previous studies point out that unemployment is strongly and negatively associated with happiness (Clark and Oswald 1994; Oswald 1997). Being unemployed has severe and long-lasting negative impacts on well-being, and these must be interpreted in terms much broader than loss of income; there are significant non-pecuniary effects as well. Being unemployed also has a negative relationship with health, as demonstrated in a study using the Canadian National Population Health Survey (Cott et al. 1999). Similarly, Ahs and Westerling (2005) conducted a study using several cross sectional data from the Swedish Survey of Living Conditions in the periods 1983–89 and 1992–97. They found unemployment to be negatively associated with self-rated health in both periods.

The effect of income has become a major factor in the debate surrounding explanations of happiness. Easterlin (1974) showed that personal income has a positive association with happiness, but that, as GDP grows over time, happiness fails to follow. This has become known as the Easterlin paradox. However, several studies examining this paradox have produced inconsistent and contradictory results. Veenhoven (1991), for example, found that people living in poor, war-torn and isolated countries are likely to be unhappy, whereas Diener et al. (1993) reported that in the US, income generates similar levels of happiness in both poorer and richer areas. As does the Easterlin paradox, this indicates that income in different areas does not produce different levels of happiness.

In relation to health, Subramanian et al. (2005) found that income has a positive impact on health. It shows that poor people are four times more likely to report poor health status than those who are better off financially. Likewise, Oshio and Kobayashi (2010), using data obtained from a nationwide survey in Japan, concluded that people with a higher income are more likely to be healthy than those with a lower income. These data indicate that income inconsistently predicts happiness but consistently predicts health. Mackenbach et al. (2005) showed that having higher income is associated with better self-assessed health in all countries, especially among individuals in the middle income range.

Some contextual covariates that affect happiness have been identified: regional per capita GDP, income inequality and area unemployment rates. The correlation between GDP and happiness has been investigated by Easterlin (1974) and Veenhoven (1991). More recent studies have found GDP to be positively associated with health (Oshio and Kobayashi 2010; Huijts et al. 2010; Subramanian et al. 2005). Using individual data

from the European Social Survey of 2002, 2004, and 2006, Huijts et al. (2010) concluded that countries' per capita GDP is positively associated with self-rated health.

With regard to unemployment, findings show that this economic indicator has a negative association with both happiness (Frey and Stutzer 2002) and health (Dorling 2009; Jin et al.,1995). Frey and Stutzer (2002) argued that unemployment rates in an area may increase residents' fear that crime and social unease may rise. Moreover, Di Tella et al. (2001), using data from 12 European countries gathered from 1975 to 1991, showed that being unemployed reduces life satisfaction. Cummins et al. (2005) investigated the relationship between neighborhood material conditions and self-rated health. Using cross sectional data from the Health Survey for England and the Scottish Health Survey, they found that living in a neighbourhood with a high unemployment rate is associated with poor self-rated health. Jin et al. (1995) reviewed 46 studies from the period 1980–1990, finding there to be a negative association between unemployment and health.

In relation to income inequality and happiness, Alesina et al. (2004), using data from the General Social Survey (1972–1997) and the Eurobarometer Survey Series (1975–1992), concluded that in general, individuals have a lower level of happiness when income inequality is high. This finding held for both Europeans and Americans. Nevertheless, the relationship between inequality and happiness is more marked in Europe than in America. Similarly, Oshio and Kobayashi (2010), using samples from a nationwide survey in Japan, examine the relationship between income inequality, happiness and health. The results suggest that income inequality is negatively associated with both happiness and health.

In predicting health, income inequality presents conflicting results. Some have argued that income inequality negatively affects health (Marmot and Wilkinson 2006). Wilkinson and Pickett (2009) proposed the spirit level hypothesis: countries with greater income equality tend to enjoy higher levels of well-being. However, others have found there to be no correlation (Lorgelly and Lindley 2008; Gravelle and Sutton 2009). The present paper adopts the view of Marmot and Wilkinson (2006) to some extent: that certain aspects of area income distribution, particularly income inequality, affect health inequality.

Living in a welfare state can explain happiness and health. Lapinski et al. (1998) examined three welfare states type and found no statistical difference in terms of well-being. Similarly, Veenhoven (2000) concluded that there is no significant difference in well-being among welfare states. However, Di Tella et al. (2003) demonstrated that living in a welfare state is positively associated with well-being. As providers of unemployment benefits, the situation created by welfare states can contribute to the maintenance of individuals' well-being. Eikemo et al. (2008a) found there to be a slight difference among welfare states in terms of self-reported health. Their results indicated that individuals living in Scandinavian and Anglo-Saxon welfare states tend to have better self-rated health in comparison to those living in southern and eastern European welfare states.

To summarise, a number of consistent findings have arisen from previous research in terms of covariates of happiness and health. Social capital, marital status, income and income inequality have been consistent factors in this regard. By contrast, other covariates such as gender and age have different tendencies to predict happiness and health.

This paper seeks to answer three questions: 1) To what extent do happiness and health correlate after controlling some covariates that affect both? 2) To what extent do individual covariates affect happiness and health? 3) To what extent do contextual covariates influence happiness and health?

Data and Methods

This paper uses data from the 2008 European Values Study (EVS) which included 60,232 individual respondents in 47 countries across Europe. The purpose of the EVS is to increase the understanding of the ideas, beliefs, preferences, attitudes, values and opinions of citizens from across Europe. The EVS is a large-scale survey to measure and understand European values. It provides data in a number of categories related to well-being: happiness, health, social participation and trust (European Values Study 2008).

Dependent Variables

To measure happiness and health, we use the questions available in the EVS. Happiness is assessed by the question: "Taking all things together, would you say you are: very happy, quite happy, not very happy or not at all happy?". Health, as measured by self-rated health, is assessed by the question: "All in all, how would you describe your state of health these days? Would you say it is: very good, good, fair, poor or very poor?".

The methodological challenge in terms of the use of subjective measures of happiness and health is ensuring these measures' reliability to measure happiness and health. From previous research on happiness studies, it is clear that subjective measures of happiness have a high correlation with objective measures (e.g. Helliwell and Putman 2004. These results are also found in studies of self-rated health. Subjective measure of health has high correlation with objective measure of health (Huisman et al. 2007; Idler and Benyamini 1997).

The Covariates

The covariates used in this study are gender, age, education, marital status, employment status and household income. We use a dummy variable to measure gender (1 for female, 0 for male). Education is measured by the highest level of education attained by respondents, ranging from pre-primary education to the second stage of tertiary education.

Marital status is captured using dummy variables for in union, widowed, and divorced, with never married as the reference group. Another measure of socioeconomic covariation is employment status, differentiated as retired, homemaker, student, unemployed, and disabled. These are used as dummy variables with employed/self-employed as the reference group.

Aslam and Corrado (2012) argue that one of the most suitable groupings in Europe to deal with data available in Europe is the NUTS (Nomenclature of Territorial Units for Statistics) system of regional classification or regions. There are two main reasons

for this. First, regions seem to have similar cultural and geographical characteristics that result in individual clustering across countries. In addition, Veenhoven (2009) posits that institutional variations across regions within nations tend to be similar. Therefore, identifying these smaller areas within nations may have better understanding of well-being. Second, Rampichini and D'Andrea (1997) suggest that regions should be considered as the macro-level since individuals living in a region have a relatively similar socioeconomic, political and cultural environment. To control regional factors, we use data such as regional per capita GDP and unemployment rates, while to control national factors, we use the Gini Index and welfare states classification.

Analytic Strategy

Because the present research treats subjective happiness and subjective health symmetrically, it enables the interpretation of parallel correlates of happiness and health in the literature. For example, various ways in which aspects of social capital can affect health have been distinguished in the literature. At the same time, the emphasis on companionship and employment status as important correlates of happiness is apparent.

Multivariate multilevel model is appropriate for this study because it deals with a multilevel setting (that is, individuals nested in regions) and explains two outcomes simultaneously (Goldstein 2011). This model corresponds to a schema in which individual outcomes (such as happiness and health) are explained by determinants at both the individual, regional and national level determinants. More specifically, multivariate multilevel model is able to indicate the results whether the effect of covariates on happiness and health can be compared (Snijders and Bosker 2011). Although this study follows the majority of studies on European comparative research in using multilevel model, unlike most of them it explains two outcomes simultaneously.

The problem of missing data is common in the survey. Several types of techniques have been developed to deal with this problem such as listwise deletion, pairwise deletion, mean imputation, regression imputation and stochastic regression imputation. The problem arising from these imputation methods, with the exception of pairwise deletion, is that the standard errors they produce are too small (van Buuren 2012). To overcome this problem, Rubin (1987) offered a technique called multiple imputation. Multiple imputation is particularly useful because it separates the solution of missing data problems from the solution of complete data problems. At the first stage, it solves missing data problems and at the second one, it solves complete data problems. More specifically, multiple imputation consists of three steps. First is the imputation of data with plausible values, resulting in the creation of 10 complete data sets. Second is the analysis of each imputed dataset using the complete-data method. The third step entails combining the results of the analyses, adjusting for the additional uncertainty due to imputation (Enders 2010; Little and Rubin 2002). To calculate the final result, Rubin's rule is applied.

In the 2008 EVS, a large amount of data is missing. For example, 10,740 of 60,232 respondents (17.83 %) did not share their income. When matched with contextual data, missing data pertaining to regional level variables appear in terms of regional unemployment rates (22.22 %) and GDP (33.62 %). Since the structure of the data is multilevel, standard multiple imputation may not be appropriate. Carpenter and

Kenward (2013) suggest the use of multilevel multiple imputation in the case of data that is multilevel by nature. Single-level multiple imputation may result in bias estimation if it used for multilevel data; to avoid such a bias, multilevel multiple imputation is used.

Results

Table 1 presents the descriptive statistics. The latest version of the European Values Study 2008 consists of 67,786 respondents, but this study restricts the sample to respondents aged 15–70. This restriction decreases the sample to 56,899 respondents. Of the respondents, 55 % were female, while 45 % were male. Overall, respondents assess their happiness and health as above average or 3.05 and 3.85 respectively. In terms of social capital indicators, respondents were not actively engaged in voluntary association with a mean of 0.9 in which scores ranged from 1 to 15. With regard to

Table 1 Descriptive statistics

	Mean	SD	Min	Max
Happiness	3.05	0.68	1	4
Health	3.86	0.89	1	5
Trust	0.30	0.47	0	1
Memberships	0.90	1.51	0	15
Female	0.55	0.49	0	1
Age	43.9	14.9	15	70
Education	3.13	1.29	0	6
In union	0.56	0.49	0	1
Widow	0.06	0.23	0	1
Separated	0.10	0.30	0	1
Professional	0.26	0.44	0	1
Intermediate	0.09	0.29	0	1
Homemaker	0.08	0.27	0	1
Student	0.07	0.26	0	1
Unemployed	0.06	0.25	0	1
Disabled	0.02	0.13	0	1
Household income	7.16	0.98	5	9.3
Regional unemployment rate	8.7	4.01	2.1	26.2
Regional GDP	10.2	0.9	7.35	13.2
Gini index	32.4	6.31	23	50.8
Traditional values	0.41	0.65	−1.53	1.86
Continental	0.24	0.42	0	1
Liberal	0.12	0.33	0	1
Rest of Europe	0.55	0.49	0	1
Respondents	56,889			
Regions	350			
Countries	47			

generalised trust, 30 % of respondents indicated that they were trusting of other people. As an indicator of social companionship, 56 % of respondents were married, 10 % of them were separated, and only 6 % of respondents were widowed. In terms of welfare states, 24 % of respondents lived in continental countries, 12 % of them lived in liberal countries and 55 % of respondents lived in central and eastern Europe.

Figure 1 shows a spatial distribution of happiness across regions in Europe, and it demonstrates that happiness varies within each country. Sweden, for example, shows different levels of happiness across its regions: happiness levels in southern areas tend to be higher than those in the nation's north. Similarly, in the UK happiness levels vary from the north to the south: regions of Highlands and Islands, Cumbria and Essex (along with Autonoma de Ceuta in Spain) are among the happiest regions in Europe. Regions of Bolzano in Italy, Rheinhessen-Pfalz in Germany and the Algarve in Portugal are among the least happy regions of Europe.

Figure 2 shows a spatial distribution of self-rated health in regions across Europe, which also varies across regions within countries. Spain, for example, has regions with varying levels of self-rated health, as does France. In the UK, regions of Northern and Eastern Scotland and the Highlands and Islands, as well as Southern and Eastern Ireland, are among the healthiest regions in Europe. Meanwhile, the regions of Rheinhessen-Pfalz in Germany, Algarve in Portugal, Zahodna Slovenija in Slovenia and Bolzano in Italy are among the least healthy.

Comparing the results from the two maps, we find that happiness and health appear to correlate in some regions. The Highlands and Islands in the UK is among the

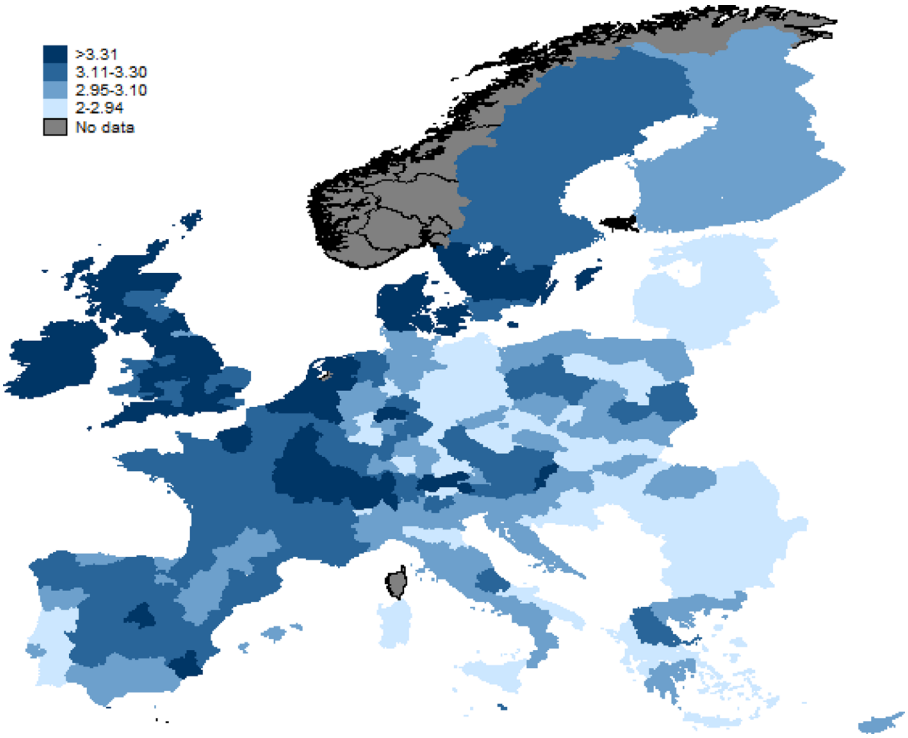

Fig. 1 Spatial distribution of happiness across regions in Europe

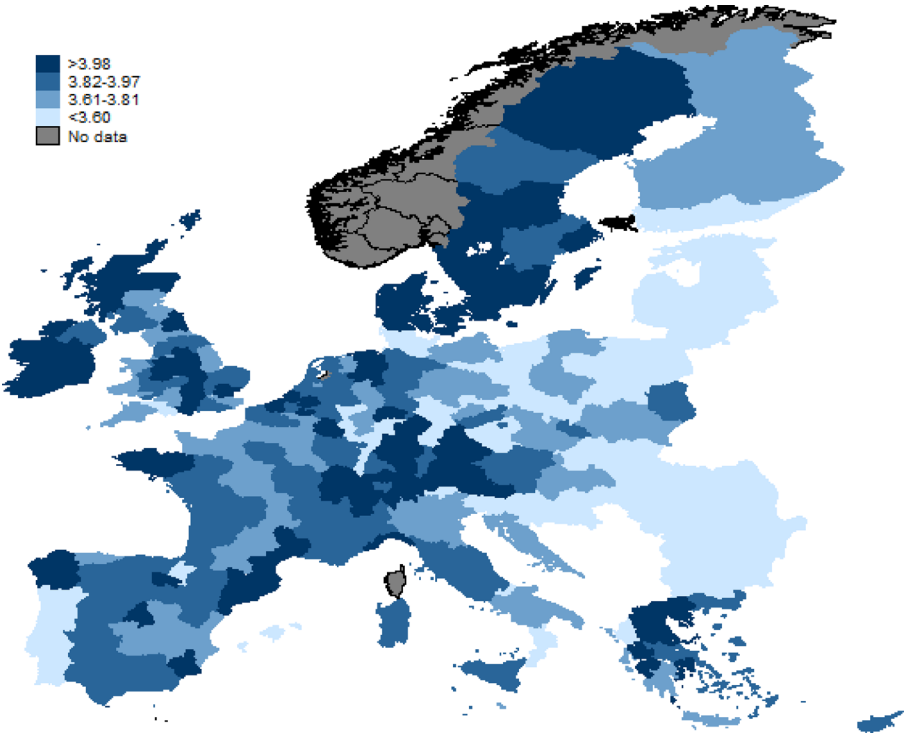

Fig. 2 Spatial distribution of self-rated health across regions in Europe

happiest regions in Europe and it is also the healthiest; the regions of Rheinhessen-Pfalz in Germany, Algarve in Portugal and Bolzano in Italy are both the least happy and the least healthy regions in Europe.

Table 2 presents the results of multivariate multilevel model of happiness and health for individuals and regions across Europe. The table shows that the residual correlation between happiness and health is positive and significant (0.334). Both happiness and health tend to have similar covariates. The two covariates have a consistent positive association with both happiness and health: trust (0.094 and 0.139) and income (0.081 and 0.119). Other covariates (i.e. age, widowhood, separation, never married status, unemployment and disability) have consistently negative relationships with both happiness and health.

From the indicators of social capital, the results show that trust is positively associated with happiness and health. Joining a voluntary association is positively associated with both happiness and health. Family and social ties are likewise shown to be important determinants for happiness and health. Being in a union has a positive effect on happiness but not on health. However, a widowed individual is likely to be less happy and less healthy than one who is married. A similar result can be seen among those who are separated and those who have never been married; these statuses have significant negative associations with happiness but appear to be insignificant determinants for health.

As two standard demographic covariates, gender and age reveal different patterns in explaining happiness and health. Gender has different patterns in predicting happiness

Table 2 Multivariate multilevel happiness and health

	Happiness coeff. (s.e.)	Health coeff. (s.e.)	Happiness coeff. (s.e.)	Health coeff. (s.e.)
Constant	3.076(0.033)‡	3.794(0.042)‡	3.352 (0.101)‡	3.972 (0.144)‡
Trust			0.094 (0.006)‡	0.139 (0.008)‡
Memberships			0.009 (0.002)‡	0.008 (0.002)‡
Female			0.028 (0.005)‡	−0.083 (0.007)‡
Age			−0.026 (0.001)‡	−0.024 (0.002)‡
Age2			0.000 (0.000)‡	0.000 (0.000)‡
Education			0.024 (0.003)‡	0.051 (0.003)‡
In union			0.193 (0.008)‡	0.030 (0.010)‡
Widow			−0.115 (0.013)‡	−0.111 (0.017)‡
Separated			−0.065 (0.011)‡	−0.030 (0.014)
Professional			0.022 (0.007)‡	0.049 (0.009)‡
Intermediate			0.024 (0.010)‡	0.045 (0.013)
Homemaker			0.052 (0.000)‡	−0.056 (0.000)‡
Student			0.212 (0.001)‡	−0.045 (0.000)‡
Unemployed			−0.124 (0.009)‡	−0.084 (0.011)‡
Disabled			−0.221 (0.021)‡	−0.888(0.027)‡
Household income			0.081 (0.004)‡	0.119 (0.005)‡
Regional unemployment rate			−0.006 (0.002)‡	−0.006 (0.003)‡
Regional GDP			−0.001 (0.004)	0.006 (0.012)
Gini index			−0.005 (0.002)‡	−0.005 (0.003)‡
Traditional values			−0.075 (0.030)‡	−0.049 (0.043)
Continental			−0.117 (0.062)	0.084 (0.092)
Liberal			0.012 (0.076)	0.110 (0.111)
Rest of Europe			−0.229 (0.065) ‡	−0.138 (0.094)
Variances at individual level	0.407	0.760	0.372	0.622
Variances at regions level	0.009	0.012	0.006	0.008
Variances at country level	0.047	0.074	0.010	0.023
Regional ICC	1.9 %	1.5 %	1.6 %	1.2 %
National ICC	10.2 %	9.5 %	2.6 %	3.5 %
Individual residual correlation	0.387		0.334	
Regional residual correlation	0.614		0.524	
National residual correlation	0.825		0.494	

Significance †:5 % ‡1 %

and health. Women tend to be happier than men, but they do not tend to be healthier. Age has a negative association with happiness, but quadratic age has a positive association, indicating that age has a u-shaped relationship with happiness. In terms of health, the results of the present study are consistent with prior research showing a negative association between age and health.

One of the important correlates of happiness and health is education. This correlate has positive associations with both outcomes. This result is similar to most previous

studies on both happiness and health. However, this finding contradicts that of Oswald (1997), who posited a negative association between education and happiness.

In terms of employment status, being a homemaker has a negative association with health but not with happiness. The results suggest that being disabled has a negative association with both happiness and health. Unemployed people seem to be unhappy and unhealthy compared to those who are employed or self-employed.

Household income is a positive and significant predictor for both happiness and health, with the effect of household income on health being slightly greater than its effect on happiness (0.119 compared to 0.081). This result provides evidence that income is important for happiness and health.

In terms of contextual factors, regional unemployment rates and national income inequality are negatively associated with happiness and health. Moving to the values held in particular, traditional values have a negative association with happiness. With regard to living in welfare states, there is a variation in explaining happiness and health. Living in continental states is less happy but healthier than living in welfare states. Meanwhile, living in the rest of Europe has a negative association with both happiness and health.

Individual, regional and national variances are significant, meaning that happiness and health can be explained by variations in individual, regional and national factors. We find that the regional intra-class correlation for happiness is 1.6 %, while for health it is 1.2 %. The national intra-class correlation for happiness is 2.6 %, while for health it is 3.5 %. These results indicate that both happiness and health are more attributable to individual variations than to regional and national variations. Comparing the two contextual factors, happiness and health are more attributable to national variations than to regional variations. However, regional variations are non-negligible.

Discussion and Conclusion

This paper aims to investigate the individual, regional and national covariations in happiness and health. The main finding of this study is that happiness and health are strongly and positively correlated. We find the individual residual correlation to be 0.334, while the regional residual correlation is 0.524 and the national residual correlation is 0.494. These results support the findings of previous studies by Subramanian et al. (2005) and Eikemo et al. (2008b). Happier people tend to be healthier, and vice versa. This result vindicates our use of multivariate multilevel model. In addition, this result confirms that residual correlation at the contextual level is greater than that at the individual level, indicating that there is a need to explore unobserved factors which affect happiness and health at the regional and national level than the individual level.

Happiness and health tend to be identical, and thus move simultaneously, because they are determined by similar factors. Specifically, most covariates have similar pattern in explaining happiness and health. This finding also confirms the results of Oshio and Kobayashi (2010) showing that the socioeconomic factors contributing to both happiness and health are relatively similar in direction. The results suggest that happiness and health are mostly explained by similar covariates: association membership, trust, education, income, unemployed, regional unemployment rate and national income inequality. These results confirm previous studies regarding the relationship among social capital, companionship, happiness and health (Subramanian et al. 2002;

Helliwell et al. 2013). The importance of trust on happiness may stem from the fact that trustful people tend to have a positive outlook to other people. Being married or in a partnership is an important factor for predicting happiness. As has been argued by Argyle (2001) and Lane (2000), social relationships (including marriage and friendship) are the most significant predictors of happiness. This finding confirms previous studies about social support and its relationships with happiness and health.

Income is a positive predictor of both happiness and health. The proposition that 'money does buy happiness' has been examined in this study and the finding confirms that income is indeed important for happiness and health. However, at regional levels, regional GDP has no significant relationships with either happiness or health.

Unlike the majority of studies of happiness and health that use the country level as level 2, this study uses region as level 2 and country as level 3. We observe that in each country, happiness and health vary across regions. This finding is deserving of further study, because information about regions can provide a better understanding of both happiness and health. The effects of regional and national factors on happiness and health are apparent. The variation in the measures of happiness and health is attributable to regional and national levels. The findings suggest that the variations between countries are larger than the variations between region, meaning that the country level is more attributable in explaining happiness and health than the regional level. However, regional variations cannot be neglected. This extends previous findings that conclude that the country level contributes about 5 % of variations in happiness and health (Eikemo et al. 2008b). This paper provides a significant contribution in that it accounts for the variations in happiness and health at the regional level in Europe.

The main limitation of this research is that it uses cross-sectional data and as such cannot capture change over time at either the individual, regional or national level. It is recommended that future research make use of panel data on individuals and regions. This will increase understanding and provide a detailed explanation of changes in happiness and health over time. Moreover, since the relationship between happiness and health may suffer from the endogeneity problem, future research can address this issue.

Despite these limitations, this paper provides evidence that happiness and health are correlated, even after controlling for standard covariates. The residual correlations show that happiness and health are more correlated at regional and national levels than at the individual level. Covariates at regional levels between happiness and health tend to be similar. The implication for policy makers is that maintaining happiness and health should be addressed jointly both at regional and national levels.

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