What does Eurostat's Labour Force Survey tell us about health and health inequalities in the EU-25?

Stefano Mazzuco* and Marc Suhrcke**

12 August 2009

*Department of Statistics, Padova University, Via C. Battisti 241, 35121 Padova, Italy
email: mazzuco@stat.unipd.it
**School of Medicine, Health Policy and Practice, University of East Anglia, Norwich, UK
email: m.suhrcke@uea.ac.uk

Introduction

Finding appropriate data on morbidity and ill-health (as opposed to mortality) for a large set of European countries remains a challenge for researchers, as there are very few data sources providing a comparable set of such health indicators. There is a particular challenge in finding surveys that combine both relevant health information and socioeconomic indicators in a way that would allow analyses of relevant socioeconomic patterns, determinants or consequences of health. The recent SHARE survey is certainly an exception to the rule but it is only focussed on the population over 50 years, and to date only has had two rounds. Another interesting data source is provided by the EU-SILC, a “new edition” of the European Community Household Panel. This survey data is representative of the entire population of European Union countries and provides some (though not very detailed) information on health status as well as a reasonable coverage of socioeconomic data. Due to the recent switch from the ECHP to the new EU-SILC format, there is, however, a discontinuity in the survey design as well as the questionnaire, which means that longitudinal analysis over a larger number of years cannot be carried out (yet). Moreover, the ECHP survey was limited to 8 years and covered only a maximum of 15 countries.

In this paper we make use of a different and newly available source of survey information: Eurostat’s Labour Force Survey (LFS). To the best of our knowledge this data has not yet been comprehensively exploited for any health related purpose. The LFS is a harmonised collection of data coming from all the Labour force surveys conducted in the EU-25 countries. The final result is an impressively huge database with a unique coverage across countries and years: for many countries data is available from 1983 up to 2004.[1] To the best of our knowledge no other European wide survey offers this degree of coverage both time- and country-wise. The LFS is also characterised by a large variety of socioeconomic indicators, even if the focus is on those that relate more specifically to the labour market[2]. The main disadvantage for our purposes is that the information on health is rather limited and mainly related to a series of dimensions of sickness absence from workplaces or from being employed in the first place.[3] Despite the potential drawbacks, and in light of the absolute scarcity of cross-country European household surveys that can be used for the analysis of socioeconomic aspects of health (or even of health per se), we consider the LFS as too promising a source to ignore, even if the information on health is limited to the sickness absence dimension. We also draw comfort from the fact that sickness absence is in fact regularly being used in the public health literature as a health proxy (Kivimäki et al 2003).

The fundamental question that arises of course, and that we seek to explore in the present paper is just what, if anything, do we learn from the LFS data about health and about the socioeconomic

[1] The LFS data has been available to us at the time of analysis up to the year 2004. Very recently additional survey years have become available, up until 2007.

[2] Another unique feature of the survey is that in many countries and years the survey was carried out more than once a year – a feature that offers opportunities as well as challenges: while it in principle allows for the analysis of seasonal, cyclical patterns that go unnoticed in the standard annual data, but at the same time, it is not immediately clear how to arrive at the “right” annualised value of any given indicator.

[3] A further, perhaps minor disadvantage could be that responses on health questions in a survey that is dominated by non-health issues differ from responses to health questions in a primarily health survey. Respondents in the former case may consider the health questions being of minor importance and hence might not answer with similar attention and effort.

distribution of health. This is a far from trivial issue, since sickness absence data cannot readily be interpreted as unbiased health information. As the economics literature on the subject amply demonstrates (see e.g. Osterkamp & Röhn, 2007; Frick and Malo, 2005; Bonato and Lusinyan, 2004), sickness absence rates respond heavily to incentives set by the social security system in any given country and are unlikely to exclusively reflect health aspects: holding other factors constant, in particular the true level of health, the more “generous” the social protection system is, the more likely workers are to claim sickness absence. The task then becomes that of purifying the reported sickness absence data from such possible distortions. We thus construct a set of health indices taking into account this source of bias. Provided that absenteeism is induced by the generosity with which sickness leave is granted, weighting the health indices with a measure of this generosity index would, at least partly, net out the spurious effect of absenteeism on sickness absence data. In doing so we can build on the efforts of other researchers who, without being specifically interested in health, have attempted to measure the degree of generosity embedded in a country’s social security system (see e.g. Scruggs, 2006).

If we succeed in creating one or several unbiased and thus comparable health indices in this way, this would allow us to say something about health in Europe for a uniquely large set of countries over a large number of years. Taking one step further, it will then also be interesting to not only look at average health comparisons across countries and time, but also at socioeconomic inequalities in health within countries. The issue of bias generated by any country’s social security system is likely to be less relevant if we measure socioeconomic inequalities within a given country. We will follow the guidelines provided by O'Donnel et al (2008) for our measurement of the socioeconomic inequalities in health. A growing amount of work exists trying to assess the pattern and trends of health inequalities across countries in Europe (Mackenbach et al 2008), but the degree of comparability over time and between countries in these data may be constraint by their use of data from often different surveys. This problem can be overcome with the help of the European LFS data.

The paper is organised as follows: in section 2 we briefly review the relevant, related previous literature on sickness absence. In section 3 the Eurostat's Labour Force survey is described in detail, and the relevant health questions in the survey are presented. Moreover we describe our proposed health indicators derived from these questions; in section 4 we provide some cross-county tables and figures based on our proposed indicators and compare them with other macro correlates, e. g. self-reported health from other surveys. The comparison will show that the LFS based health indicators, if left unchanged, are inadequate for measuring “true” health. In section 5 we first describe how we have attempted to purify the LFS-based health indicators from their assumed bias. We also compare the revised health indicators with the original ones and with the previously cited macro-correlates. Section 6 is devoted to results from measuring the socioeconomic inequalities. Finally, section 7 concludes exposing future research needs and possibilities.

Related literature

There are at least two distinct branches of literature that need to be taken into account when trying to interpret sickness absence data as a proxy for health status: the labour economics literature and the public health literature. Somewhat surprisingly, these two branches appear to have largely ignored each other so far. At the risk of over-simplifying, on the one hand the economics literature views and analyses sickness absence exclusively as a reflection of incentives and hardly makes any link at all between sickness absence and health status (see e.g. Ichino & Riphahn 2005, Rae 2005 or Holmlund 2004). By stark contrast, the relevant public health literature that deals with sickness absence considers it entirely as a health proxy, without worrying much or at all that the sickness absence data might be distorted by incentives set through the social security system in place (see e.g. Kivimäki et al 2003 or Christensen et al. 2008).

There are some notable exceptions to the neglect of the health dimension of sickness absence in some of the economics literature. Bonato & Lusinyan (2004), for instance try to explain country level sickness absence rates across a sample of 18 European countries. While they find that incentives explain a large share of the cross country variation, they also find a significant conditional role for life expectancy (as a proxy of health) in that countries with higher life expectancies have lower sickness absence rates.[4]

More encouraging evidence in favour of the potential utility of sickness absence as a health indicator comes from the public health literature. For instance, Kivimäki et al. (2003) have shown that the rate of certified sickness absence was an even more powerful predictor of mortality than established self-reported health measures and available medically diagnosed measures of specific conditions. Christiansen et al (2007) have examined the socioeconomic distribution of sickness absence rates and have found similar gradients as when using other health variables.

In the present paper we seek to combine the insights from both areas of research. We adopt from the public health literature the aspiration to interpret sickness absence as a potential measure of health, while we adopt from the economics literature the insight that reported sickness absence rates also reflect other factors unrelated to health that therefore need to be “removed” in order to arrive at the health content of sickness absence figures.

[4] Osterkamp & Röhn (2007) also seek to explain cross-country differences in sickness absence rates in industrial countries but do not take health into account as a potential explanatory factor. Frick & Malo (2005) also explore differences in sickness absence rates across and within European countries albeit using micro data. They find a significant role for work related health problems to impact on sickness absence, controlling for institutional factors.

Description of the data

The Eurostat's Labour Force Survey represents a source of data which is unique for its cross-country and time coverage. Since 1983 Eurostat started to collect Labour Force Surveys microdata from several EU countries: Belgium, Denmark, France, Greece, Ireland, Italy, Luxembourg, and Netherlands. Data from other countries became available after their EU entry (e. g., Austria, Sweden, and Finland since 1995) so that data for 25 EU member states are provided, together with Norway and Iceland, with some exceptions: data for Germany is only available since 2002, and data for Malta and United Kingdom are not present[5].

Only the first or the second quarter of the LFS are made available from 1983 to 1997. Subsequently data from all quarters have become progressively available. Eurostat maintains that "the degree of comparability of the EU Labour Force Survey results is considerably higher than that of any other existing set of statistics on employment or unemployment available for Member States" (Charlier and Franco, 2001). However, comparability over time and across countries remains a challenge: the reference period may change for a given country as well as the sampling designs and the order of the questionnaire. Moreover, since 1998 the transition to a continuous quarterly survey (where the reference weeks are spread uniformly throughout the year) has not been completed simultaneously by all member states. This generates an inevitable break in the time series statistics for each single country that may limit the degree of comparability again.

The main focus of the LFS is, not surprisingly, the labour market. However in several parts of the questionnaire respondents are indirectly asked about their health status. In particular, they are asked about reasons for not having worked in the reference week, for having worked less than usual, for working part-time, for not having sought a job and for not being available to work, if a job were immediately found, for having left the last job (see Table 1). In the questionnaire several alternative reasons are listed, one of which being "own illness, injury or temporary disability".

Table 1: Questions regarding health issues in the EU LFS questionnaire

Question	**Reference population**
Reason for not having worked at all though having a job	Working population
Main reason for hours actually worked during the reference week being different from the person's usual hours	Working population
Main reason for leaving last job or business	Inactive population with a job episode ended at most 8 years before interview
Main reason for not being available to start working within two weeks if work were found now	Inactive population
Main reason for working part-time	Part-time working population
Main reason for not seeking employment during previous four weeks	Inactive population

[5] UK data have been made available after the results of a disclosure study have come out very recently. Therefore in the dataset analysed by us the UK data could not be included.

Based on these variables we constructed several health indicators, building on the work of Campostrini and Bellini (2000). We do, however, standardise the indicators by age, in order to take into account differences in age structure between countries and over time. One way of standardising by age is to sum up the age-specific rates, thus constructing an indicator that is similar to the total fertility rate. The formula is as follows:

$$R = \sum r_x \qquad (1)$$

where R is the final rate, r_x is the age-specific rate and x the age. Moreover, the indicators are computed separately for men and women. Table 2 describes how age-specific rates have been defined. The age for all indices is 15-64, given that most of them are not relevant for individuals out of working age.

Table 2: Health indicators defined on the basis of EU LFS health questions

Indicator	Numerator	Denominator
TIW Temporarily Inability to Work (not working in the reference week due to illness, injury or temporarily disability)	Number of persons not having worked in the reference week, though having a job, because of health problems)	Number of persons having a job
TRWA Temporary Reduction in Working Ability (absenteeism due to illness, injury or temporarily disability)	Number of persons having worked less than usual due to illness, injury or temporarily disability	Number of persons having a job
CRWA Continued Reduction in Working Ability (part-time work due to illness, injury or temporarily disability)	Number of persons working part-time due to illness, injury or temporarily disability	Number of persons having a job
EAP Exclusion from Active Population (retirement due to illness, injury or temporarily disability)	Number of persons having left their last job because of health problems	Number of not working people who had a job in the previous eight years
PIW (first version) Permanent Inability to Work (not seeking a job due to illness, injury or temporarily disability)	Number of persons not working and not seeking a job because of own illness or disability	Number of not working people
PIW (second version) Permanent Inability to Work (not seeking a job due to illness, injury or temporarily disability)	Number of persons not working and not available to start working immediately because of won illness or incapacity	Number of not working people

Note: All the indicators are age-specific. The overall index is then calculated using formula (1)

We can use each of these indicators separately, but we can also use them collectively to construct a synthetic health index. The latter is obtained as a weighted average of some of the indicators listed in table 2**.** The weights are defined in a way that more importance is given to indicators that affect a higher size of the total population. For instance, those who did not work at the time of the interview but had a job in the previous eight years may be a small fraction of the population with respect to working people. It should be noted that only the second version of PIW indicator is used to compute the Total Health Limitation Index (henceforth THLI), since the first version cannot be calculated for some years, and the TIW indicator has not been used as we found it is much more related to the degree of absenteeism rather than to health status . (see section 5).

One possible limitation of this set of indices, and particularly of the synthetic one, is that we have no information on the severity of health problems they refer to. We assume that a temporary inability to work may be caused by a cold or a flew whereas a continued reduction of working ability is likely to be originated by a more serious health issue so a higher weight should be given to the latter indicator and a lower to the former. However, while this may be plausible, we have no way of testing this assumption. That said, it is also to be borne in mind that we do not really have any other "true" health indicator that could serve as our benchmark in the present case. One might expect that mortality or life expectancy could serve as legitimate proxies for true population health, but then again we also know that life expectancy only varies to a very small extent between developed countries, while morbidity – which is our focus here – is (possibly much) less than perfectly correlated with mortality. Thus, the question remains of what a perfect benchmark is.

A first look at the data

Table 3: Health limitation indices (standardized by age) for European countries. Men, 2004

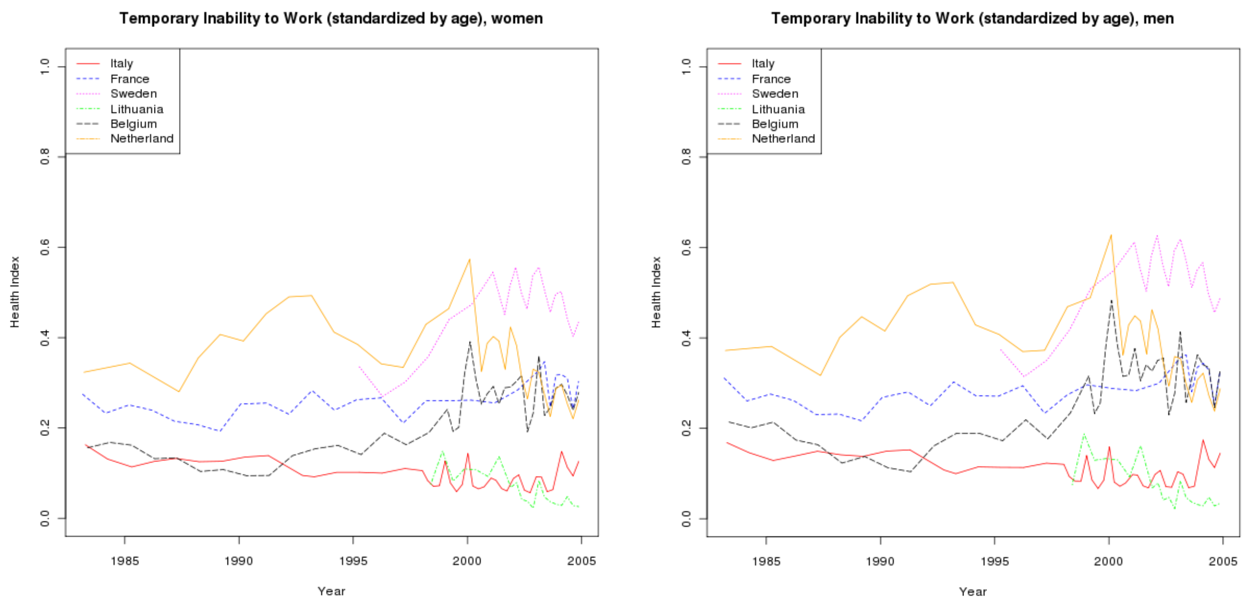
	TIW	CRWA	TRWA	EAP	PIW2	THLI
Austria	0.126	0.036	0.028	1.844	1.640	0.470
Belgium	0.334	0.035	0.048	1.548	0.319	0.327
Denmark	0.208	0.056	0.087	1.301	0.303	0.372
Germany	0.159	0.040	0.024	1.036	0.704	0.301
Greece	0.007	0.008	0.006	0.947	0.185	0.118
Spain	0.301	0.009	0.021	1.554	0.608	0.314
France	0.329	0.040	0.041	0.837	0.140	0.204
Ireland	0.152	0.026	0.021	1.722	0.014	0.127
Italy	0.131	0.028	0.049	0.637	0.269	0.174
Luxembourg	0.197	0.015	0.002	2.018	NA	NA
Netherlands	0.273	0.048	0.098	1.506	0.023	0.274
Portugal	0.187	0.094	0.018	1.563	0.070	0.260
Finland	0.270	0.023	0.055	1.469	0.308	0.334
Sweden	0.497	0.192	0.175	0.620	0.000	0.363
Iceland	0.129	0.000	0.058	2.708	0.111	NA
Norway	0.510	0.134	0.109	3.418	1.184	0.505
Czech Republic	0.350	0.075	0.022	2.065	1.286	0.438
Estonia	0.102	0.049	0.011	1.732	0.317	0.351
Hungary	0.173	0.090	0.012	2.138	1.581	0.561
Lithuania	0.048	0.052	0.003	1.553	0.234	0.242
Latvia	0.062	0.057	0.018	1.661	0.683	0.365
Poland	0.179	0.188	0.010	1.414	0.542	0.479
Slovak Republic	0.103	0.070	0.013	0.926	0.173	0.247
Slovenia	0.262	0.000	0.082	0.697	0.162	0.153
Cyprus	0.189	0.067	0.067	2.307	0.557	NA

Table 4: Health limitation indices (standardized by age) for European countries. Women, 2004

	TIW	CRWA	TRWA	EAP	PIW2	THLI
Austria	0.118	0.066	0.016	1.155	0.919	0.383
Belgium	0.273	0.099	0.031	1.292	0.183	0.270
Denmark	0.191	0.094	0.104	1.515	0.277	0.511
Germany	0.135	0.083	0.029	0.808	0.615	0.266
Greece	0.006	0.009	0.005	0.495	0.098	0.069
Spain	0.248	0.010	0.017	0.800	0.328	0.214
France	0.310	0.150	0.038	0.757	0.155	0.262
Ireland	0.136	0.015	0.018	1.273	0.035	0.092
Italy	0.113	0.069	0.036	0.572	0.279	0.181
Luxembourg	0.184	0.047	0.008	1.214	0.983	0.232
Netherlands	0.253	0.108	0.148	1.878	0.094	0.402
Portugal	0.153	0.160	0.024	1.373	0.159	0.310
Finland	0.246	0.034	0.089	1.049	0.217	0.316
Sweden	0.446	0.350	0.310	0.866	0.000	0.607
Iceland	0.100	0.000	0.071	2.969	0.093	NA
Norway	0.450	0.137	0.196	3.876	1.086	0.667
Czech Republic	0.317	0.124	0.031	1.311	0.899	0.491
Estonia	0.055	0.041	0.007	1.212	0.209	0.274
Hungary	0.167	0.100	0.015	1.764	1.577	0.501
Lithuania	0.048	0.029	0.000	1.073	0.029	0.165
Latvia	0.044	0.038	0.033	0.636	0.563	0.292
Poland	0.160	0.245	0.010	1.054	0.514	0.447
Slovak Republic	0.092	0.068	0.023	0.806	0.140	0.246
Slovenia	0.247	0.000	0.080	0.290	0.052	0.091
Cyprus	0.169	0.078	0.089	1.141	0.531	NA

With seven health indicators for 25 countries, separated into males and females, for many years, the reader will forgive us for not displaying all possible tables in the main text.
Therefore, we first show the values of indices only for 2004 (Tables 3 and 4). We then add some graphical illustrations of trends over time for each indicator by gender (Figures 1-7) for what we consider as a representative sub-set of countries. Figure 1 starts by showing the trend for the Temporarily Inability to Work index (TIW) for a sample of countries.

Figure 1: Trend over time of TIW index for some European countries



We take Italy, France, Sweden, Lithuania, Belgium and Netherlands to represent the entire sample of EU countries. Italy represents Mediterranean countries, France the Western- Central countries, Sweden the Scandinavian ones, Lithuania the Eastern Europe countries, Belgium and Netherlands the Central Europe. We chose these countries also because the relatively good quality of data (e.g. Germany was not chosen since it only provides data for 2004). Interestingly, the TIW index shows some counter-intuitive patterns over time and across countries. First, it might seem odd that the index is higher (and hence the health status lower) in Netherlands and Sweden than in Lithuania – an issue we shall return to below. Second, one might expect – on the basis of overall mortality trends and assuming there is a positive (if imperfect) correlation between mortality and non-fatal illness – that ill health prevalence has decreased (and hence health improved) throughout the period. However, for some countries, such as Belgium and Sweden we observe an increasing trend whereas TIW decreases for Netherlands and Lithuania and remains approximately stable for the remaining countries. It should be borne in mind that TIW index measures the short-term prevalence of sickness absence from work. Hence, it is likely that in most of the cases the health issues generating absence from work are of ordinary nature (e.g. flew, colds). Such relatively common and generally far from life-threatening diseases are unlikely to be too closely related to mortality and thus the counter-intuitive and mixed trend picture may be less surprising than upon first intuition. A third, no less surprising feature of Figure 1 is the much increased fluctuation of the trend, starting around the year 2000 in those countries that switched to sub-annual reporting of data. This suggests that there is seasonal fluctuation in health status (as there is in indicators of economic activity) that goes completely unnoticed in the commonly used annual data. The precise nature and explanation of this seasonality is likely to be a worthwhile target for future research. (We return to this issue briefly further below.)

The same pattern applies to the Temporary Reduction in Working Ability index (TRWA) in Figure 2, which measures a temporary reduction of working hours for health reasons. However, prevalence is lower compared to TIW, but we still observe that Netherlands and Sweden curves dominate the others. Netherlands' curve is on the same level of other countries until 1992, after which its TRWA index suddenly rises and drops again[6] to approximately the same level as Belgium, Italy, and France. Sweden, instead, is constantly far higher than the other countries. Note that the figures for France are not available until 1999. It is also interesting to note that the TRWA index figures show a gender difference, being prevalence of men averagely lower than that of women. This did not appear in the trend of the TIW index (Figure 1).

Figure 2: Trend over time of TRWA index for some European countries

The CRWA index measures the continued reduction in working ability, i.e., the prevalence of those working part-time due to health problems. We might expect that health problems forcing people to reduce *permanently* their working time are more serious than those forcing people to temporary absence (TIW) or to a reduction in working hours (TRWA). As expected the level of CRWA is systematically lower than those of TIW and TRWA. Yet, also in this case, Sweden's and Netherlands' curves are far higher than others but it should be borne in mind that part-time jobs are much more supported in the Netherlands and in Scandinavian countries than in the rest of Europe, a feature that may help explain the gap as in the case of the above temporary health indicators.

[6] This rise and drop is likely an effect of a structural change in the survey design and/or the questionnaire. It will be soon explored whether this is the case.

Figure 3: Trend over time of CRWA index for some European countries

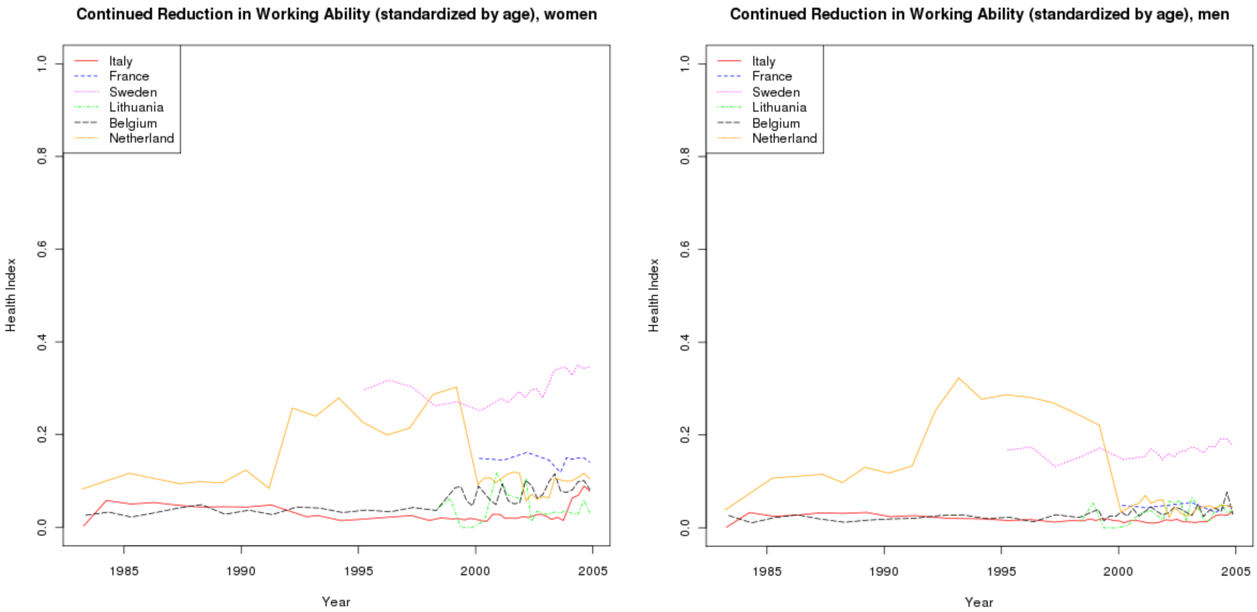
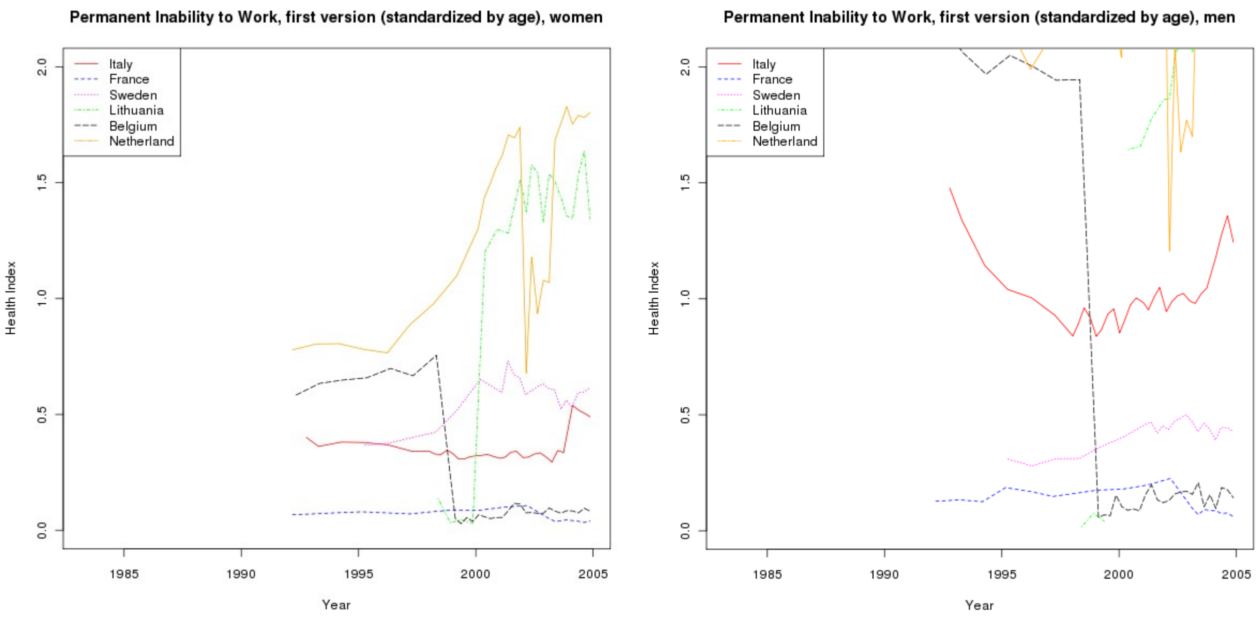


Figure 4 report the trends in the Exclusion from Active Population index (EAP), capturing those who retired because of illness, injury or temporary disability. In principle, one would expect that prevalence of this kind of health problems is even lower than those measured by TIW, TRWA, and CRWA. In practice, the index is far higher than the others. This is explained by the fact that the denominator of EAP index different from that of other indices, and in some cases can be very small.

Figure 4: Trend over time of EAP index for some European countries

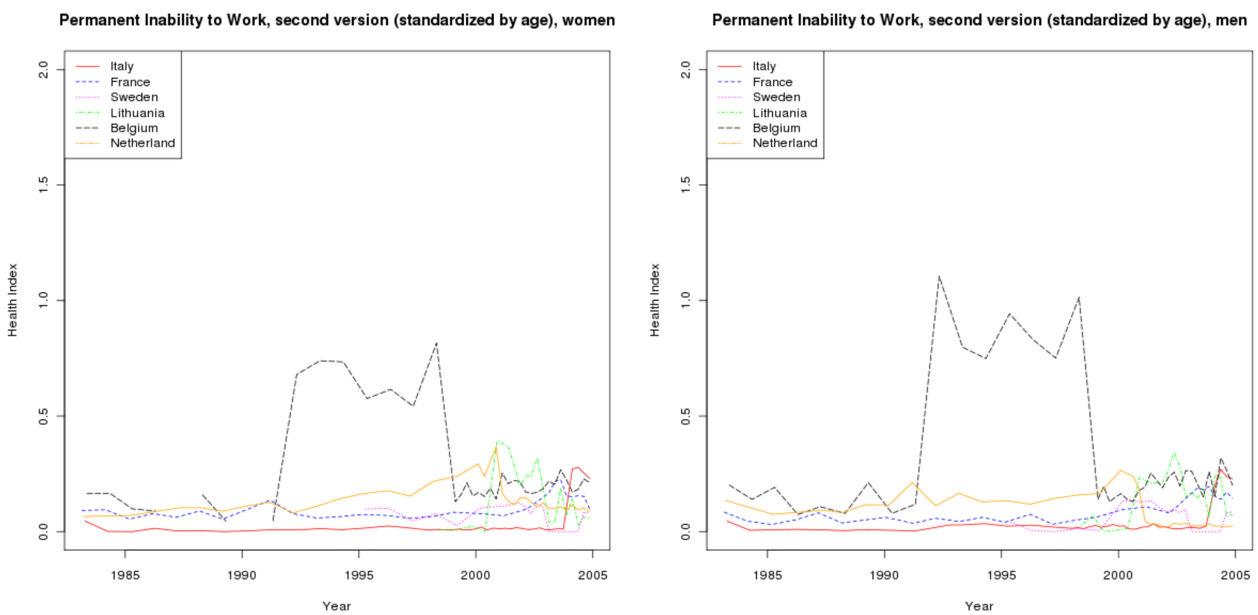
Apart from this, we note that this index is extremely variable. In Italy, for example, we observe a substantial drop in 1992, probably as a result of a pension reform implemented in that year. Here Sweden has approximately the same level as France and Lithuania, with a peak in year 2000 and 2001, whereas the Netherlands has the highest level of retired due to health issues.

Figure 5: Trend over time of PIW index for some European countries



Looking at Figure 5, we note that PIW index Permanent Inability to Work (not seeking a job due to illness, injury or temporarily disability) is also highly fluctuating (see, for example, the curve for Belgium) and, for this reason, difficult to interpret. Moreover, the index is unavailable until 1992. Given the pitfalls of this index, we will not use it to create the total health index, whereas we will use the second version of PIW, which is far less variable and available for all years, based on declared availability of respondents to start a job were it found immediately. Apart from a strange dip showed by Belgium, the curves of PIW2 are much more stable. Interestingly, we see an increasing trend, particularly in France. However the level is quite low, so that this index is going to have a small influence on the general health index.

Figure 6: Trend over time of PIW2 index for some European countries



Finally, we look (Figure 7) at the Total Health Limitation Index, which is a weighted average of TIW, TRWA, CRWA, EAP, PIW2, and the weights are proportional to the population share on which the indicator is defined.

Figure 7: Trend over time of THLI index for some European countries

Do the numbers presented in the above figures represent an accurate picture of adult health status, especially of morbidity? This is of course hard to judge in the absence of a comparable objective morbidity measure. It remains, however, surprising how consistently the Scandinavian countries, that generally can be found at the top of most international health rankings, fare worse than the new EU member countries from Eastern Europe – countries that are otherwise not known for a superior health performance (see also the numbers in Tables 3 and 4). One way of assessing the usefulness of the above numbers as health proxy could be the comparison to self reported health data from other surveys, in particular due to chronic disease. As a benchmark for comparison we selected the information on the share of adults (aged 18+) who have any long-standing illness or disability that limits their activities in any way, as provided from the European Quality of Life Survey 2003.[7] As Figure 8 shows, while there is a significant positive correlation between THLI and self reported chronic illness, the correlation is rather low. The correlation is even lower when we compare the THLI with mortality indicators such as the log of the standardised mortality ratio (Figure 9) or the log of life expectancy at age 15 (Figure 10). We thus suspect that as proposed by the economics literature on the issue of sickness absence, other factors are at work that affect how people choose or report sickness absence. (Of course also the self reported chronic illness is not a genuine benchmark here, as we do not know how much of a bias underlies those numbers. But despite the well documented existence of a bias in self reported health, these indicators have been shown to act as very reliable predictors of mortality. [Ferraro and Farmer 1999].)
Interestingly, men show a lower correlation between THLI and the other health proxies, so if there is a bias it could be the case that this bias is particularly pronounced among men, perhaps because

[7] This survey is owned by the European Foundation for the Improvement of Living and Working Conditions. For more details see http://www.eurofound.europa.eu/areas/qualityoflife/eqls/2003/eqls.htm.

men remain more active on the labour market and are therefore more exposed to the incentives exerted by the "generosity" of the social security system.

Figure 8: Scatter plot of Total Health Limitation Index and prevalence of self-reported chronic illness

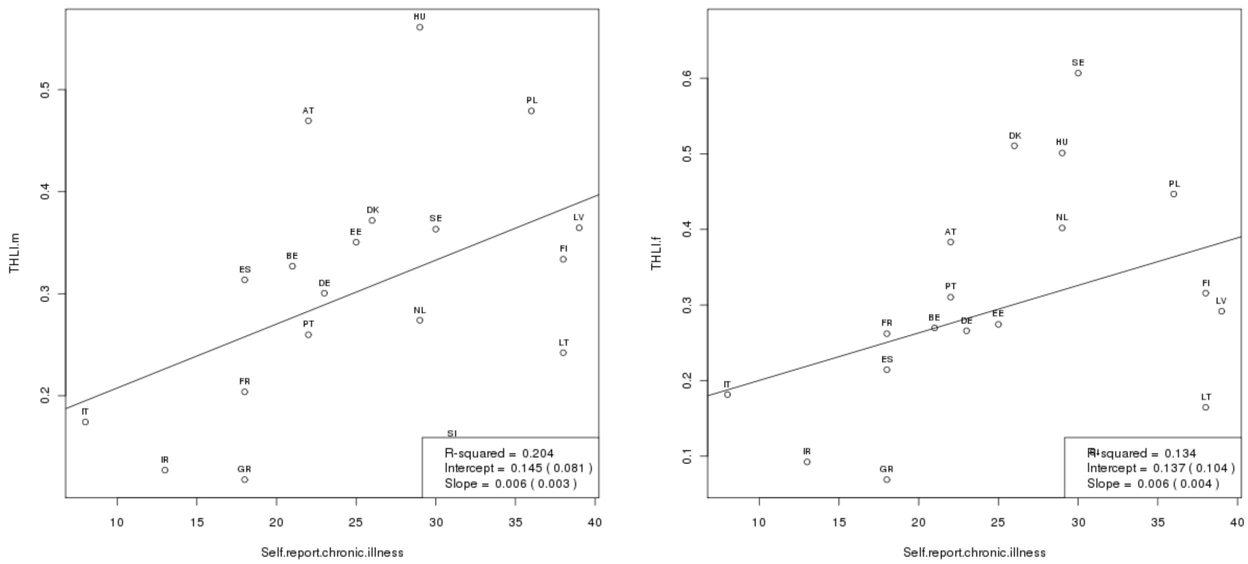


Figure 9: Scatter plot of Total Health Limitation Index and log of Standardised Mortality Ratio

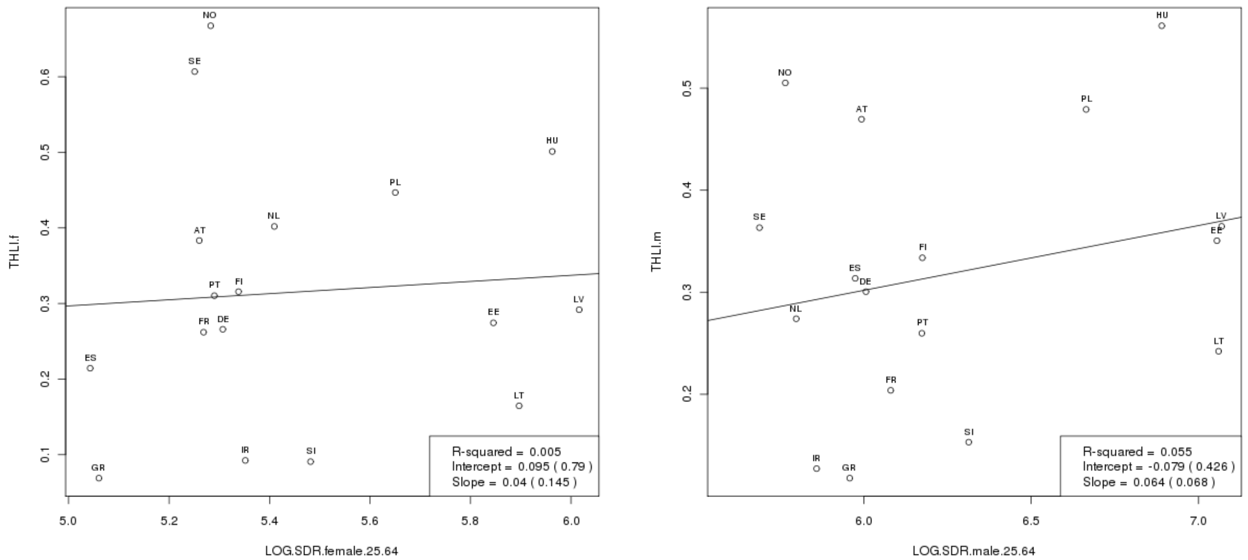
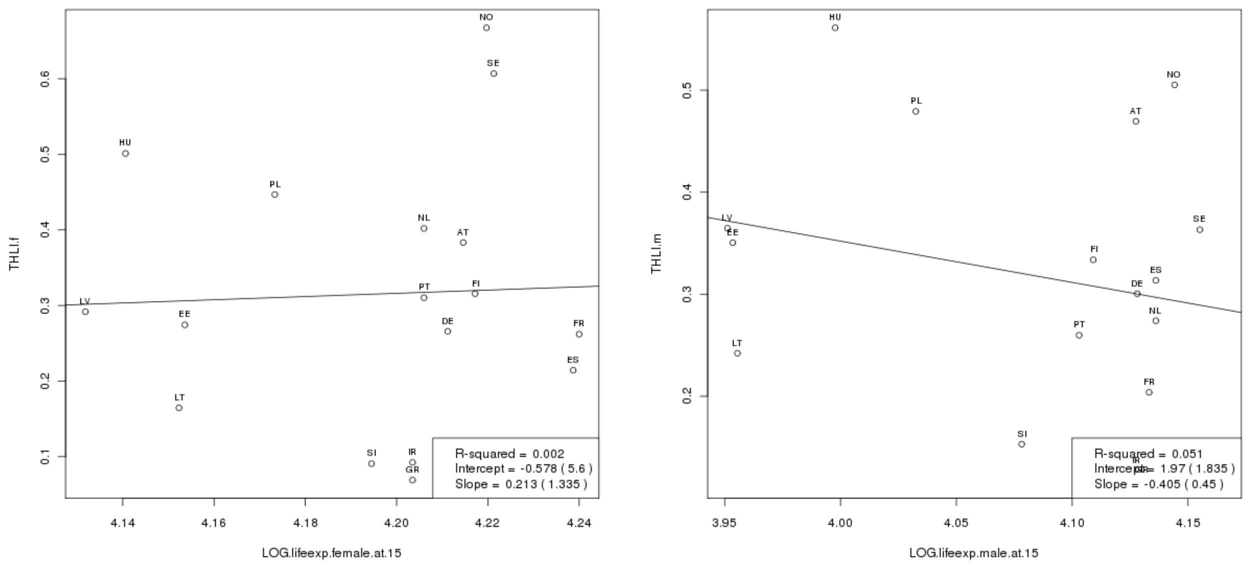


Figure 10: Scatter plot of Total Health Limitation Index and log of Life Expectancy at 15



As alluded to in the introduction, there is evidence in the literature of systematic bias in sickness absence related data. Part of the evidence comes precisely from Sweden, where welfare generosity is recognised to be “larger” than in other countries (see e.g. Henrekon and Persson, 2004 and Johansson and Palme, 2002). Northern European countries in general are well-known for the generosity of their welfare systems, including sick leave policies, and this may provide an explanation for the results exposed above. Using time-series data, Henrekon and Persson (2004) find that, in Sweden, reforms that entailed more generous compensation for sick leave tend to be associated with permanent increases in total sick leave per person employed and vice versa.

A second look at the data

The descriptive analysis above clearly shows that the indicators we defined need to be "purified" somehow. The location of the Scandinavian countries displaying fairly high sickness absence rates is particularly striking in light of the otherwise very favourable health indicators those countries are known for. As we argued before, this is likely to be a spurious effect of a different degree of absenteeism across countries that is likely driven by a higher level of "generosity" with which sick leave is granted. So if we could measure this degree of "generosity" we would expect to be able to net out this spurious effect of absenteeism. (As we focus only on the elimination resulting from this specific bias, we cannot be certain to eliminate any other possibly existing bias.)

Measuring the degree of "generosity" of a social security system is fraught with difficulties. Often this has been measured by the level of social expenditures, thereby ignoring some of the more subtle incentives as laid out in any relevant legislation. Fortunately we can build on a body of literature that has already undertaken serious efforts at measuring what is not easily measurable. Osterkamp and Rohn (2007) defined a "generosity index" as an unweighted sum of seven variables on sick leave: waiting period, self-certification, total maximum duration of payment, employer maximum duration of payment, employer amount of payment, sickness fund amount of payment, external proof. Not surprisingly, Sweden and Norway have the highest levels of generosity, confirming our argument. However the information provided by Osterkamp and Rohn is not entirely sufficient for our purposes: the index was calculated only for a small number of countries and for the period from 1996 until 2002. A broader generosity index has been defined by Scruggs (2006) that took into account income replacement rate (including sickness replacement rate), social insurance coverage and recipients. An index of "expected welfare benefit" is calculated as the product of the replacement rate and the coverage rate summed over three programmes (unemployment, sickness and pensions). This was done for 18 OECD countries and for each year between 1972 and 2002. This index is therefore a good candidate to be used to purify our health indices but it does not cover all the countries and years that we have in our database. Therefore, we tried to impute the missing values of the generosity index using a reasonable set of proxies as follows. Eurostat database offers some information on country "Public expenditure on labour market policies". In particular, three type of expenditures are potentially useful proxies of welfare generosity: 1) "Labour market services", which includes all interventions where the main activity of participants is job-search related; 2) "Out-of-work income and maintenance and support" refers to interventions providing financial assistance for individuals who, for different reasons, are not working temporarily or permanently; 3) "Early retirement" refers to interventions supporting people who retire in advance. In Table 5, we show results from a non-linear regression between the Scruggs' generosity index and these variables. The fit is not perfect but satisfactory (R-squared is 0.71) so the parameters estimated can be used with some degree of confidence to impute the value of the Generosity index where it is missing[8].

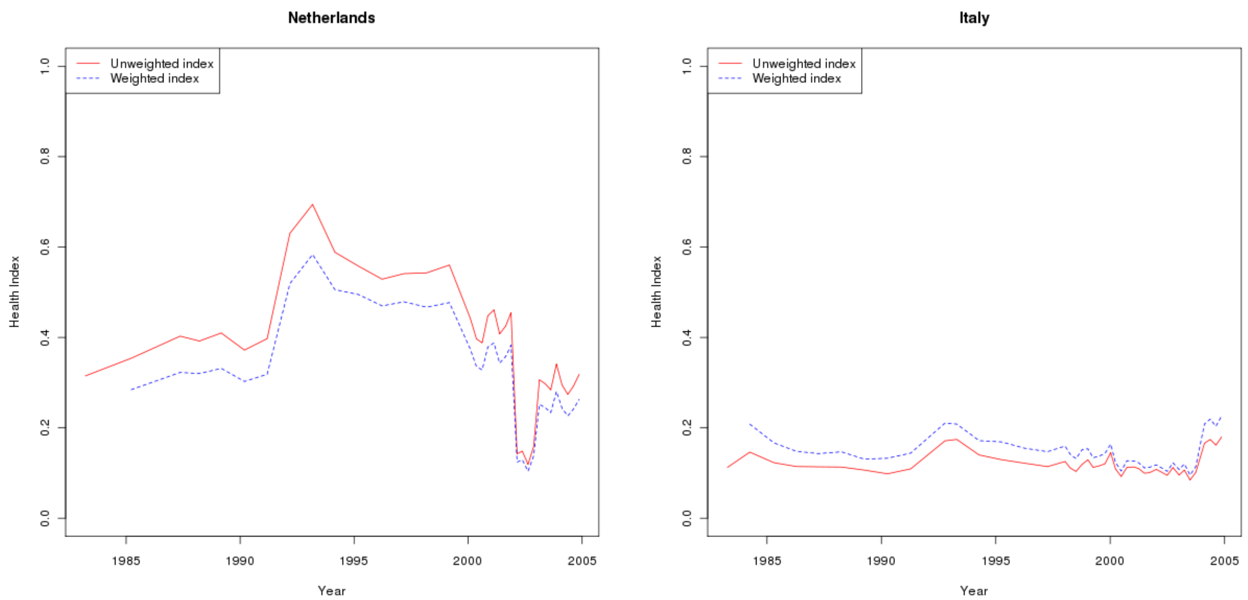
[8] The goodness of fit is rather good with the exception of Eastern European countries, for which the predicted value of generosity index is sensibly larger than the original value (when it is available). Therefore, we rescaled the predicted values in order to have an index which magnitude is consistent with Scruggs' original index.

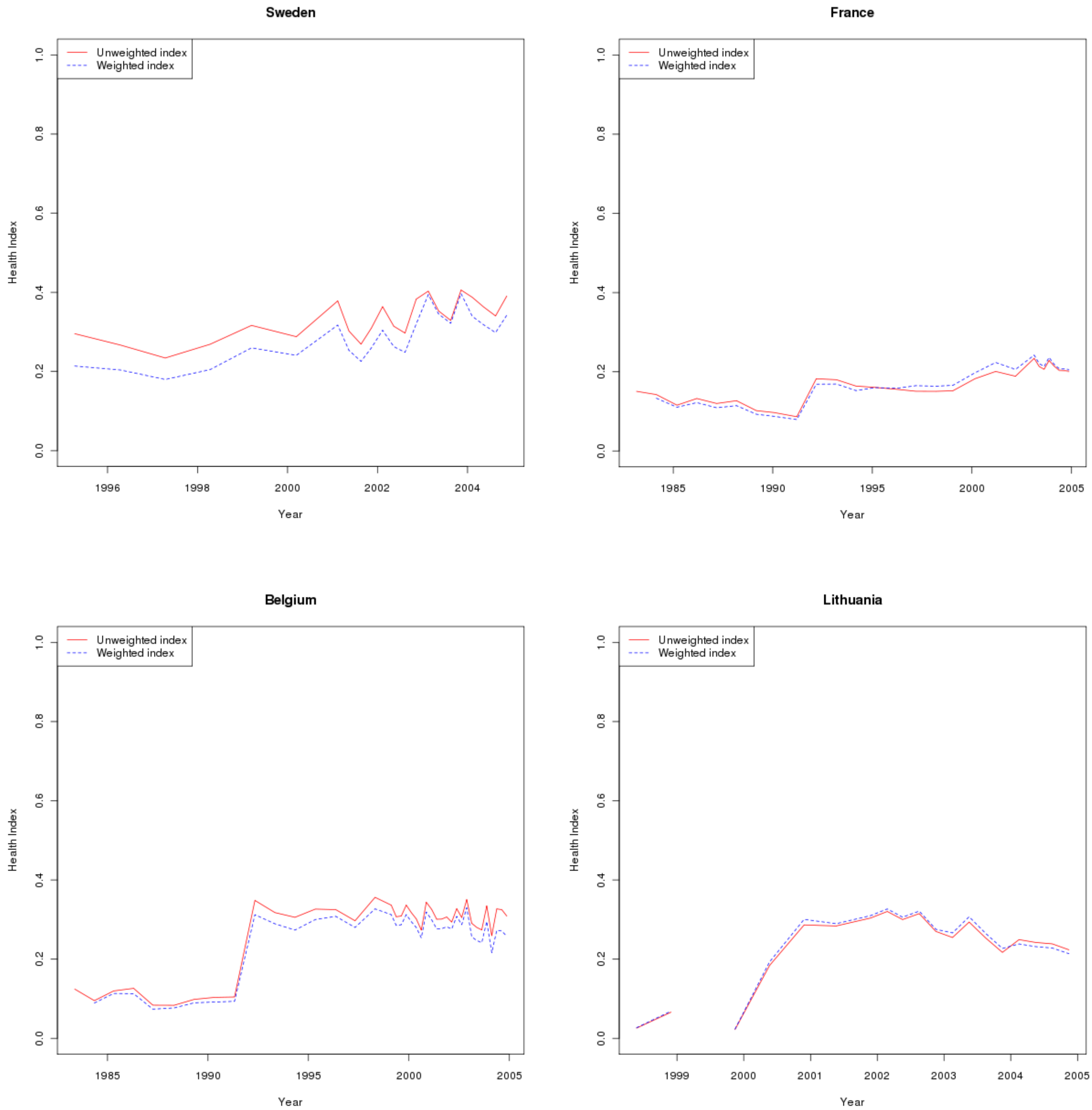
Table 5: Results of generalized additive model for generosity index

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-148.192	100.821	-1.470	0.144
OutOfWork, node 1	-111.094	13.291	-8.358	0.000 ***
OutOfWork, node 2	23.638	3.09681	7.633	0.000 ***
OutOfWork, node 3	-44.012	8.637	-5.096	0.000 ***
Early Retirement, node 1	1.924	4.310	0.447	0.656
Early Retirement, node 2	-22.831	3.534	-6.460	0.000 ***
Early Retirement, node 3	-2.175	2.045	-1.064	0.289
Year	0.1079	0.0506	2.135	0.035 *

After having calculated the generosity index for all countries and years, this has been used to weigh the indices defined above: countries with a high level of generosity are given an (inversely proportional) small weight, while countries with a low level of generosity are given a high weight. In order to see how the weights affected the indices, we report in Figure 11 the trend of one of them (namely, the THLI for men) before and after weighting, for the same countries considered in Figures 1-7. The graphs clearly document that the health limitation was overestimated in Sweden and Netherlands because of the generosity of welfare system and underestimated in Italy. France, Belgium and Lithuania indices are barely modified by the weights. It should be noted that, even after having weighted the indices, Scandinavian countries are still those with the highest level of sickness. This might suggest that the indices has not been totally purified by the spurious effect of generosity. Once again though, in the absence of an objective benchmark, it remains hard to know what the “true” level of the health index should be.

Figure 11: Comparison of Total Health Limitation Index (males), before and after weighting with the inverse of generosity score, for several countries



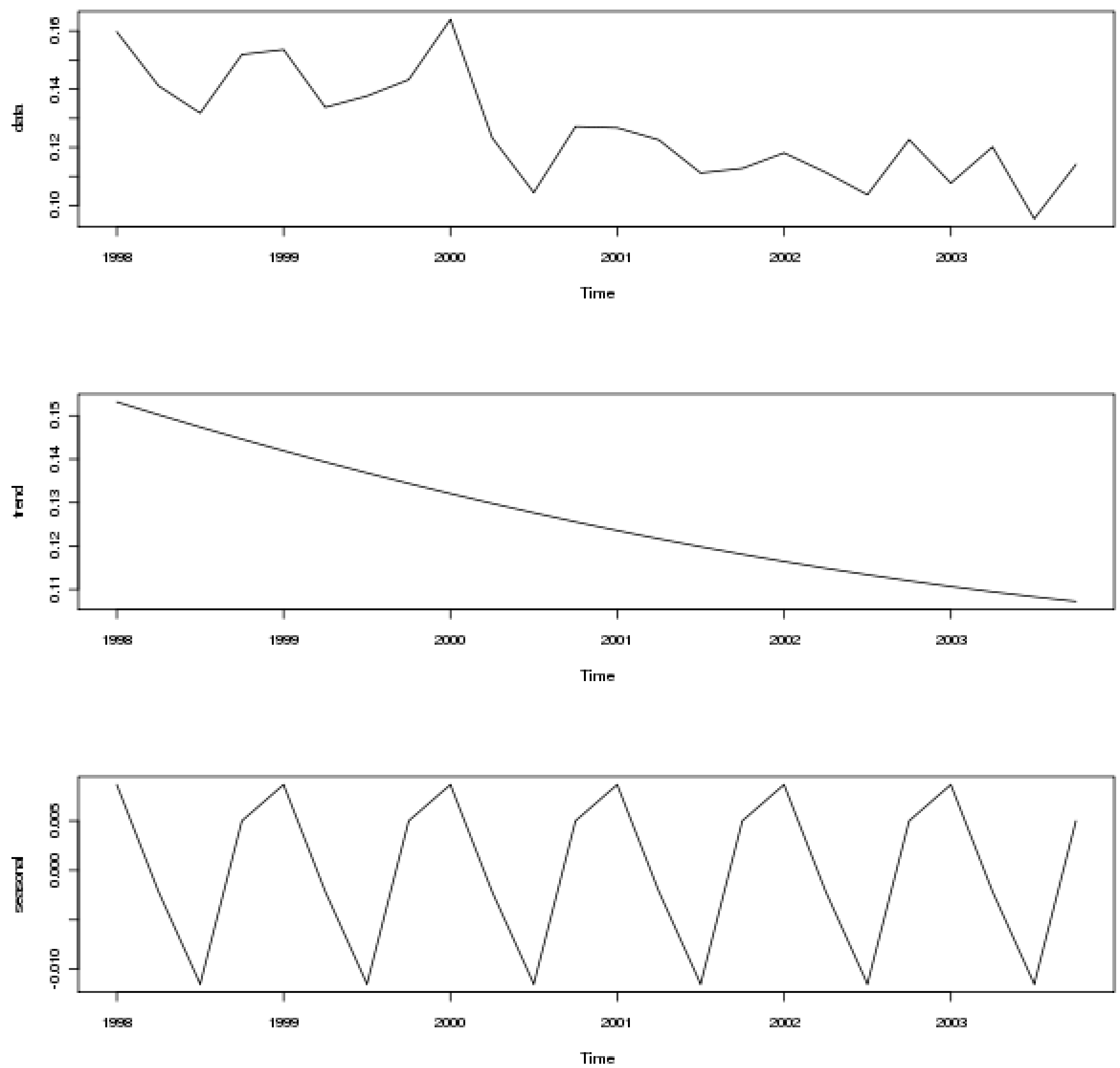


Another interesting feature we noticed in the un-weighted indices was the increasing trend over time for some countries (Belgium and Sweden). This feature is even reinforced after weighting, with the new index increasing over time (meaning that health has deteriorated) also for France, now, whereas the sickness level is approximately constant in Italy and Lithuania. Netherlands has a first phase in which the trend is increasing and a second one in which it is slightly decreasing.

A comment on the seasonality of the data

A common characteristic of Figures 1-8 is the marked fluctuation of the health indices for all countries, starting in 1998, the year in which data became available for all quarters, allowing for sub-annual variation to be measured at all. In order to better understand both what the actual trend has been and what precise pattern of seasonality is at work, the actual observed time series can be decomposed into (1) its long term trend and (2) its seasonal component.[9] This is illustrated in Figure 12 for the example of Italy, using the overall health index THLI.

Figure 12: Decomposition of THLI index time series, Italy, 1998-2003, Men.



9 The decomposition has been done assuming and additive model with a quadratic specification of the trend component. Moreover from the time series available we only used data until 2003 as for Italy there is a shift of THLI index in 2004 (see Figure 7) that would have confounded the trend estimation. This shift is probably due to the fact that in 2004 the data collection of LFS in Italy changed dramatically, passing from a quarterly to a continuous survey. Other changes (e. g. from CAPI to CATI interviews) can have determined the shift.

The first panel in Figure 12 shows the actual time series data, the second one shows the "de-seasoned" trend, and the third one shows exclusively the seasonal component. It turns out that after having been deseasoned, the time series trend is clearly descending, indicating a meaning an increasing health improvement over time – if we assume that health is correctly measured by the THLI index. The seasonality is of the following nature: the higher value of the index is in the first and the last quarter (the 7th and the 46th week) while THLI is lower in the other quarters (the 20th and the 33rd weeks of the year). It may not be surprising to see a (cyclical) decline in health in winter and an improvement in summer. This also broadly follows the typical sub-annual variation in economic activity (which declines in winter and improves in spring and summer), but it may well have to do with the seasonal variation in climate rather than national economic cycles. Some economic literature has examined how health responds to economic cycles (see e.g. Ruhm 2000), using, however, only annual data. The counter-intuitive, but fairly consistent finding from that literature has been that health improves during economic downturns while it deteriorates during economic booms. We can only note that at least in the case depicted in Figure 12 our findings at the sub-annual level contradict those previous findings. It is, however, beyond the scope of this paper to explore this point in detail. Suffice to flag that upon preliminary inspection the seasonal pattern does vary by health indicators and by country, thereby further supporting the need for more research.

Socioeconomic inequalities in health

Taking one step further, we are also interested in looking at what can be said on socioeconomic inequalities in health within countries on the basis of the EU-LFS data. The issue of health inequality is increasingly a concern both in developed and developing countries (Marmot, 2005). Arguably, the issue of bias generated by the country's social security system that we had to grapple with (without overwhelming success) in the previous section, is less relevant when measuring socioeconomic inequalities *within* a given country. More specifically, the two major relevant questions we want to address is

(1) which countries have the highest inequality level (and which one the lowest) and
(2) whether inequality has increased in the last years, as some research suggests.[10]

We will follow the guidelines provided by O'Donnel et al (2008) for measuring socioeconomic inequalities in health. More specifically, we construct a health inequality index following the formula

$$C(v) = 1 - \frac{v}{n\mu} \sum_{i=1}^{n} h_i (1 - R_i)^{v-1} \qquad (2)$$

where n is the sample size, h_i is the ill-health indicator for individual i, μ is the mean level of ill health and R_i is the fractional rank in the living standard distribution of individual i.
This index is an extended version of the concentration index, the latter being twice the area between the concentration curve and the line of equity. Conventionally, the index is constructed so that it takes a negative value when ill health is disproportionally concentrated among poor. The parameter v is an inequality-aversion parameter when $v = 2$ we have an ordinary concentration index.

Therefore, we need an appropriate indicator of living standard in order to calculate the concentration index in (2). Unfortunately, the EU LFS does not provide us with income variables, nor do we have other asset indicators. We do, however, have different versions of educational attainment (following the ISCED[11] classification) and occupational status that we can rely on in measuring socioeconomic status (SES). As the size and evolution of health inequalities results may well be sensitive to the well-being proxy used in the index calculations we make an effort to check the robustness of our main findings through the application of different SES indicators.

While the use of the available education variable is fairly straightforward in that it follows an obvious ordinal pattern, occupational status is less easily converted into an ordinal well-being indicator. In order to use occupational category as a proxy of well-being we transformed it into an ordinal variable. There are three possible choices of ordinal transformation of ISCO categories, namely ISEI (International Socio-Economic Index of Occupational Status), SIOPS (Standard International Occupational Prestige Scale) and EGP (Erikson and Goldthorpe's class caterories).

[10] See e.g. Mackenbach (2006).

[11] ISCED (*International Standard Classification of Education)* is an international classification standard of education created by UNESCO. Several levels of ISCED classification have been generated and the higher the level, the more detailed is the classification. The EU – LFS provides us with ISCED1D classification (with three categories, “low”, “medium”, high”) and ISCED2D classification (with 6 categories)

SIOPS is a prestige measure of occupational status, generated from the popular evaluation of occupational standing; ISEI comes as a socio-economic scale, created by computing a weighted sum of socio-economic characteristics (usually education and income) of each position; EGP differ from previous two scales because of its discrete nature (SIOPS and ISEI are scores, EGP is a classification into 11 ordered categories). We use the scales calculated by Ganzeboom and Treiman (1996).

Overall we have thus measured socioeconomic health inequalities with with five possible proxies of well-being, two based on education (ISCED1D and ISCED2D classification) and three based on occupation (EGP, SIOPS, and ISEI). In order to avoid an explosion of the paper's length, we focus on the results obtained with EGP, knowing that – as we have tested – SIOPS and ISEI produce perfectly consistent results. Similarly, the results we obtained for EGP indices are consistent with those obtained using education as a proxy of well-being.

Tables 6 (for men) and 7 (for women) provide an answer to the first question – where are the biggest (or lowest) health inequalities – focusing on four LFS based health indicators (TIW, CRWA, TRWA and THLI): From this ranking we cannot draw a straightforward geographic pattern: many Eastern European countries show a high inequality but the highest level is found in Portugal. The level of health inequality in Finland, for instance, is close to that of Estonia. The lowest inequality level is found in Belgium and Austria. Luxembourg, by contrast, has one of the highest inequality levels. Interestingly, the ranking of women is a bit different from that of men. Luxembourg, for instance, has a relatively low inequality among the women population in contrast with what we find among men.

Table 6: Inequality of several health indices in European countries. Men, second quarter of 2004

	TIW	CRWA	TRWA	THLI
Austria	-0.298	-0.011	-0.107	-0.037
Belgium	-0.253	0.231	-0.171	0.023
Denmark	-0.480	-0.432	0.076	-0.229
Germany	-0.186	-0.425	-0.124	-0.263
Greece	-0.007	-0.173	-0.202	-0.180
Spain	-0.133	-0.005	-0.070	-0.079
France	-0.255	-0.282	-0.293	-0.323
Ireland	-0.178	-0.108	-0.147	-0.182
Italy	-0.189	-0.400	-0.114	-0.194
Luxembourg	-0.473	-0.315	-0.840	-0.402
Netherlands	-0.199	-0.373	-0.042	-0.101
Portugal	-0.183	-0.738	-0.673	-0.695
Finland	-0.531	-0.410	-0.308	-0.325
Sweden	-0.236	-0.241	-0.270	-0.297
Iceland	-0.362	0.000	-0.450	NA
Norway	-0.334	-0.237	-0.145	-0.114
Czech Republic	-0.081	-0.234	-0.453	-0.234
Estonia	-0.311	-0.090	-1.306	-0.394
Hungary	-0.186	-0.150	-0.190	-0.152

Lithuania	-0.389	-0.315	0.663	-0.315
Latvia	-0.199	-0.098	-0.628	-0.188
Poland	-0.195	-0.462	-0.418	-0.438
Slovak Republic	-0.354	-0.487	-0.188	-0.492
Slovenia	0.046	0.000	-0.232	-0.227
Cyprus	-0.608	-0.213	-0.133	NA

Table 7: Inequality of several health indices in European countries. Women, second quarter of 2004

	TIW	CRWA	TRWA	THLI
Austria	0.059	-0.085	0.227	0.011
Belgium	-0.111	-0.029	0.256	0.106
Denmark	-0.086	-0.013	-0.259	-0.109
Germany	-0.024	-0.161	0.270	0.021
Greece	-0.301	-0.424	-0.074	-0.170
Spain	-0.125	-0.307	-0.186	-0.301
France	-0.165	-0.238	-0.137	-0.182
Ireland	-0.112	-0.346	0.169	-0.214
Italy	-0.239	-0.334	-0.203	-0.320
Luxembourg	-0.337	-0.180	0.511	-0.046
Netherlands	-0.077	-0.241	0.080	-0.018
Portugal	-0.106	-0.655	-0.191	-0.377
Finland	-0.336	-0.370	-0.225	-0.238
Sweden	-0.203	-0.340	-0.043	-0.147
Iceland	0.013	0.000	-0.202	NA
Norway	-0.045	-0.307	-0.101	-0.180
Czech Republic	-0.170	-0.315	-0.269	-0.275
Estonia	-0.618	-0.750	-1.275	-0.779
Hungary	-0.230	-0.333	-0.151	-0.356
Lithuania	0.069	-0.962	NaN	-0.962
Latvia	-0.258	0.454	-0.538	-0.095
Poland	0.133	-0.527	-0.317	-0.494
Slovak Republic	-0.084	-0.600	-0.229	-0.441
Slovenia	0.040	0.000	-0.176	-0.176
Cyprus	0.092	-0.304	-0.156	NA

Figure 13: Health Inequality index, Italy

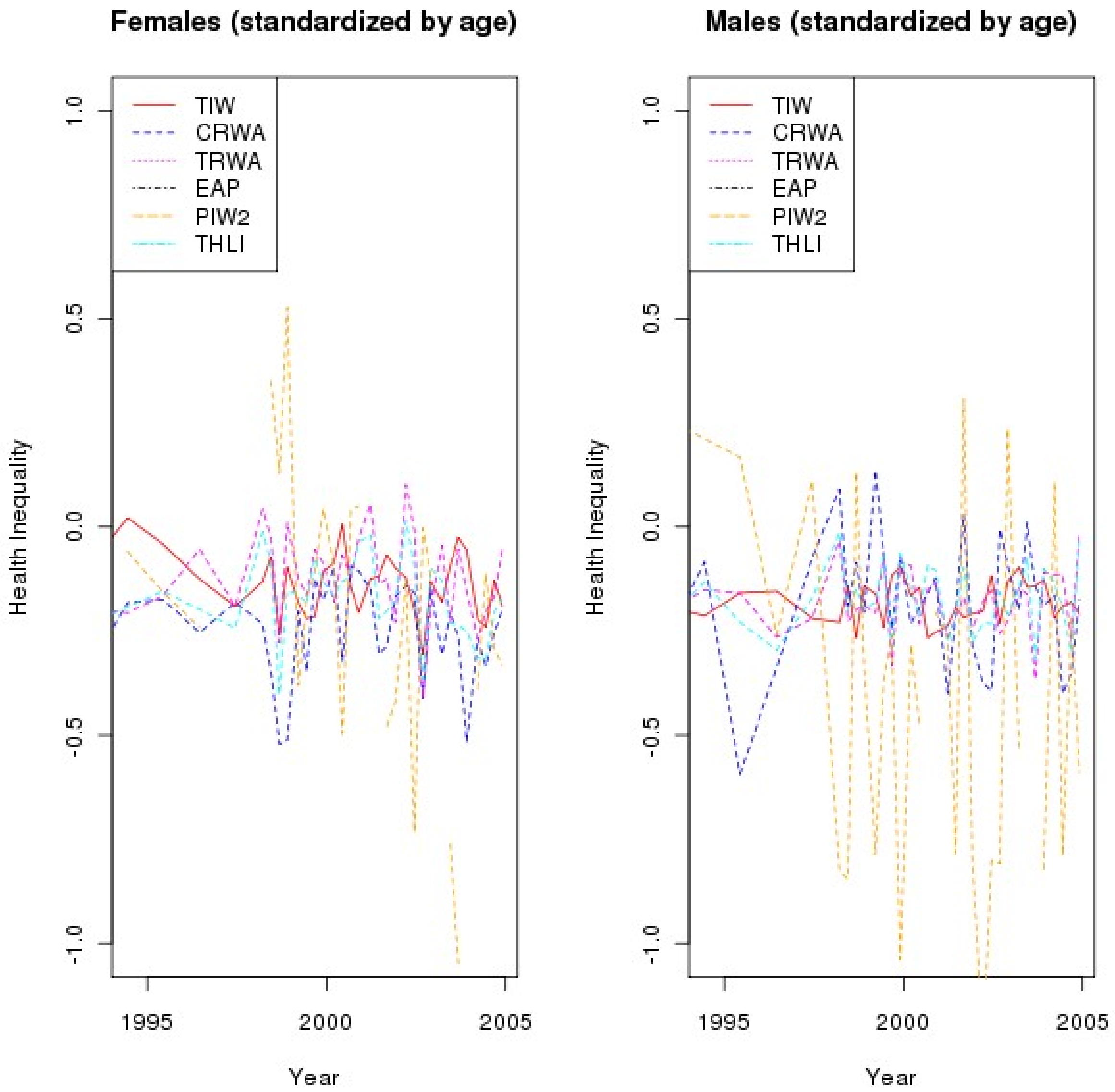


Figure 13 attempts to answer the second question – how have health inequalities evolved over time? – by looking at the example of Italy, for all six health indicators. While the overall trend in the health inequality indices appears to be decreasing (implying that the concentration of ill health among the poorest has increased between 1993[12] and 2004) it is almost impossible to distil the time trend upon mere visual inspection due to the very marked fluctuations, which again start when the survey data is available at sub-annual intervals.

Hence, not only the average health indices, but even the distribution of the health indicators within a country underlies a seasonal pattern. To be better able to detect the trend as well as the shape of the seasonal pattern, we again perform a decomposition analysis. Figures 14 and 15 illustrate the decomposition of CRWA indices for Italy (by gender).

It turns out that health inequalities have on average been increasing for men. For women the pattern

[12] The inequality index cannot be calculated for years between 1983 and 1992 because the proxies of well-being are not reported.

is less straightforward: the curve increases (and hence health inequality decreases) until 2001, and it decreases thereafter. The seasonality component seems to indicate that, during one year, the highest level of inequality occurs in the second quarter (averagely on the 14th week) for both women and men. Interestingly, this does not correspond to the quarter in which the seasonality is at the highest level for average CRWA index (which is the first one, when the seasonality of inequality is at the lowest level). Thus there is not a straightforward link between average health seasonality and health inequality seasonality. It implies that over the health responses to the seasonal cycle differ by socioeconomic groups. There is again a potential parallel to the above-mentioned literature that has looked at the association between business cycles and health using annual data. While the literature generally only looks at how average population health responds to either economic up- or down-turns, selected papers have tried to shed light on distributional health effects of those cycles (see a.g. Kondo et al 2008; Edwards 2008; Valkonen et al 2000). This (rather scarce) literature tends to confirm the differential health response across socioeconomic groups.

It is important to note that the pattern found for CRWA in Italy is not replicated in the same way by the other countries. While it would be interesting to analyze more in-depth all the seasonal components of all countries for al health indicators, doing so would be beyond the scope of this paper.

Figure 14: Decomposition of CRWA inequality time series, Italy, 1999-2004, Women.

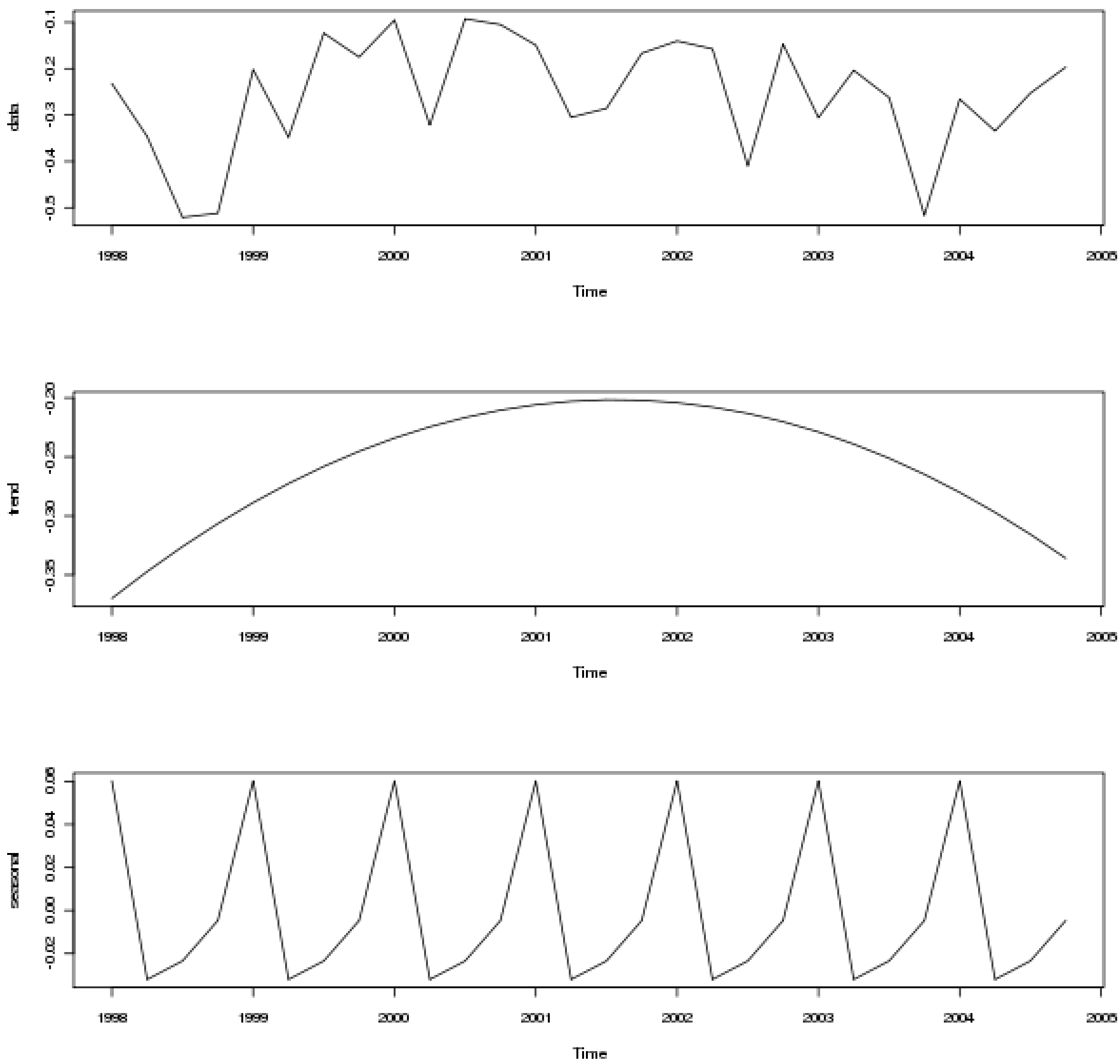
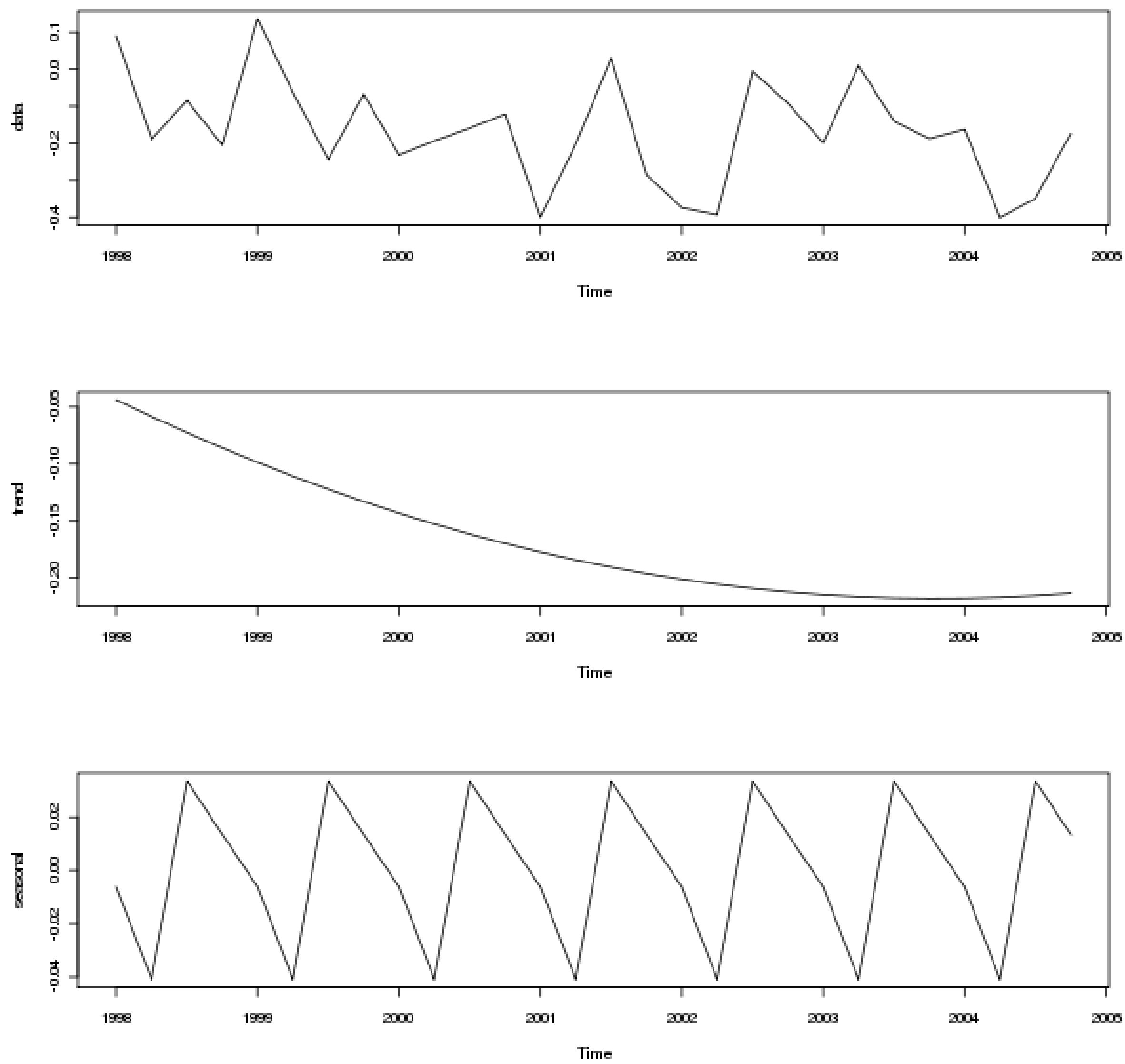


Figure 15: Decomposition of CRWA inequality time series, Italy, 1999-2004, Men.



Trade-offs between average health and health inequalities?

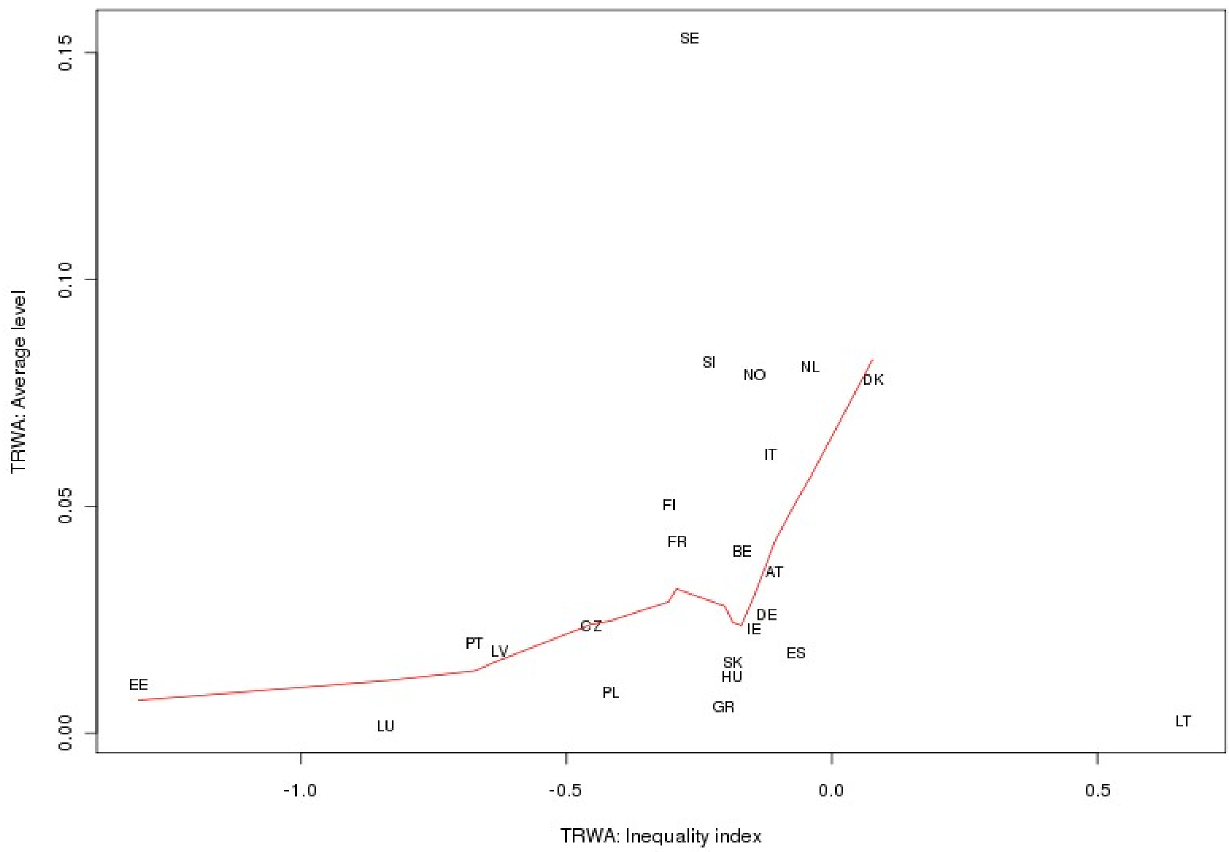
Thus far we have looked at average health and its distribution separately. There is, however, reason to believe that there may be a trade-off (Bommier and Stecklov, 2002). This is important when considering what policy objectives to set in any given country. If a trade-off exists, difficult decisions will have to be taken of how the two worthwhile objectives of improving average population health and reducing health inequalities will be weighed against each other (Wagstaff 2002).

Figure 16 shows a scatterplot comparing the average level of purified TRWA with its inequality index. Given the way in which the health indicator and the inequality index are defined – the higher TRWA the lower health, and the higher the inequality index the more pro-poor the distribution – we would expect to see a positive linear relationship, if there was indeed a trade off. This is not overwhelmingly confirmed in this specific example, the trade-off is not widely confirmed but we notice a slight positive correlation between the two measures[13]. However it should be borne in mind that this pattern is not stable across the different health indicators used here. For other indices, such as TIW and CRWA the trade-off between inequality and average level is even harder to detect. The same applies to THLI for which the relationship between average level and inequality is not clear-cut

Taken literally, this suggests that there may not be too much of a trade-off between the average and the distribution of health. Hence, there may be ways for countries to achieve both a reduction in health inequalities *and* an improvement in average health at the same time. We need to caution, however, against a too literal interpretation of these figures, in light of the severe doubts about the extent to which the average level of the health indicators is a reliable proxy of "true" health. However, we can draw the conclusion that is possible to reconcile good average health level with low inequality: they are not necessarily opposed to themselves.

[13] The lowess regression line has been drawn excluding two outliers: Sweden and Lithuania

Figure 16: Average level and inequality index of TRWA in European countries. 2004, second quarter



Concluding remarks

The present work was or primarily explorative nature. Our intention was to explore the utility of a major European-wide household survey, which has hitherto been un-exploited by health researchers, for the measurement of health as well as for the measurement of socioeconomic inequalities in health. Judging whether the resulting health data are indeed reliable proxies for "true" health is of course compromised by the problem that true health is unobservable. The health information at hand from the EU Labour Force Survey is limited in that it considers health only as a reason for different dimensions of "less than normal" labour supply or labour market participation. It was however shown in the epidemiological literature, on the basis of other survey data, that this kind of sickness absence-related data may after all be a good predictor of later mortality. On the other hand, the economics literature pointed to the existence of a strong bias in sickness absence data in response to the incentives set via countries' social security systems. We thus had to "purify" the LFS health information by countries' degree of generosity. Nevertheless, while the corrected values appeared slightly more "plausible" than the uncorrected ones, we would at this stage not guarantee that our proposed method has successfully transformed the health information into a valid measure of countries' average population health.

Assuming that the above incentives are likely to differ more between than within countries, we felt far more comfortable in using the health data to measure the size and evolution of socioeconomic inequalities in health. We calculated standard concentration indices, using five different proxies for socioeconomic status, based on education attainment and occupational categories. Our results were broadly robust to the different SES proxies, both in terms of the size of inequalities and in terms of trends. Once we decomposed the inequality data series into its trend and seasonal component, it became clear that overall, for most countries and most health indicators, health inequalities have been increasing, a result that is confirmed by other recent research (Mackenbach 2006). In contraxt to the existing research, however, we are basing our conclusions on a significantly larger sample for a longer period of time.

Given the chiefly exploratory nature of our analysis, we have probably raised more questions than answered. There remains significant scope to explain the pattern and trends in the average health indicators we have employed. We were particularly surprised to see rather pronounced fluctuations in both health and health inequalities for essentially all health indicators and years, as soon as the survey data became available at sub-annual intervals. Not least, further research should also seek to decompose the pattern and trends in health inequalities into its drivers.

References

Bergendorff S (2003). *Sickness absence in Europe – a comparative study*. Paper presented at the 4th International Research Conference on Social Security in Antwerp, 5-7 May 2003.

Bommier A., Stecklov G. (2002) Defining health inequality: why Rawls succeeds where social welfare theory fails, *Journal of Health Economics* 21 (3), 497-513

Bonato L, Lusinyan L (2004). *Work absence in Europe*. IMF Working Paper WP/04/193.

Campostrini S and Bellini P (2000) Sick-Leave and Other Job-Related Health Issues from Labour Force Surveys Data, *International Statistical Review / Revue Internationale de Statistique*, Vol. 68, No. 2. , pp. 189-198.

Charlier H and Franco A (2001) *The EU Labour Force Survey on the Way to Convergence and Quality*, Proceedings of Statistics Canada Symposium 2001 Achieving Data Quality in a Statistical Agency: A Methodological Perspective

Christensen K B, Labriola T, Kivimäki M (2008). Explaining the social gradient in long term sickness absence: a prospective study of Danish employees. *Journal of Epidemiology and Community Health*, 62:181-183.

Edwards R (2008) Who is hurt by procyclical mortality? Social Science & Medicine 67 (2008) 2051–2058

Ferraro KF, Farmer MM (1999). Utility of health data from social surveys: Is there a gold standard for measuring morbidity? American Sociological Review, Vol. 64, No. 2 (Apr., 1999), pp. 303-315

Frick B, Malo MA (2005). *Labour market institutions and individual absenteeism in the European Union*. University Witten-Herdecke, mimeo.

Ganzeboom, Harry B.G.; Treiman, Donald J. (1996). "Internationally Comparable Measures of Occupational Status for the 1988 International Standard Classification of Occupations". *Social Science Research* (25), pp. 201-239

Henrekson M and Persson M (2004) The Effects on Sick Leave of Changes in the Sickness Insurance System, *Journal of Labor Economics*, Vol. 22, No. 1, 2004.

Holmlund B. (2004). Sickness absence: an introduction. *Swedish Economic Policy Review.* 11:3-8.

Ichino A., Riphahn R. (2005). The effect of employment protection on worker effort: absenteeism during and after probation. *Journal of the European Economic Association*, 3(1):120-143.

Kondo N, Subramanian SV, Kawachi I (2008). *Economic recession and health inequalities in Japan: analysis with a national sample, 1986-2001*, Journal of Epidemiology and Community Health, Volume: 62 Issue: 10 Pages: 869-875.

Johansson P and Palme M (2002) Assessing the Effect of Public Policy on Worker Absenteeism, *The Journal of Human Resources*, Vol. 37, No. 2. (Spring, 2002), pp. 381-409.

Kivimäki M. et al (2003). Sickness absence as a global measure of health: evidence from mortality in the Whitehall II prospective study. *British Medical Journal*, 327:364

Mackenbach JP (2006) *Health Inequalities: Europe in Profile* An independent, expert report commissioned by the UK, Presidency of the EU (February 2006)

Mackenbach JP, Stirbu I, Roskam AJ, Schaap M, Menvielle G, Leinsalu M, Kunst AE and the EU Working Group on Socioeconomic Inequalities in Health. Socioeconomic Inequalities in Health in 22 European Countries. N Engl J Med 2008; 23: 2468-2481

Marmot M (2005) Social determinants of health inequalities, *Lancet* 2005; 365: 1099–104

O'Donnel O, van Doorslaer E, Wagstaff A, Lindelow M (2008) *Analyzing Health Equity Using Household Survey Data. A Guide to Techiques and Their Implementation*, World Bank, Washington CD, USA.

Osterkamp R, Röhn O (2007). Being on sick leave: possible explanations for differences of sick-leave days across countries. *CESifo Economic Studies,* 53(1):97-114.

Rae D (2005). *How to reduce sickness absences in Sweden: lessons from international experience*. OECD Economics Department. Working Paper ECO/WKP(2005)29

Ruhm C (2000). Are recessions good for your health? Quarterly Journal of Economics 2000;115: 617–50.

Scruggs L (2006) The Generosity of Social Insurance, 1971-2002, *Oxford Review of Economic Policy*, 22 (3), 349-364

Valkonen T, Martikainen P, Jalovaara M et al. (2000). Changes in socioeconomic inequalities in mortality during an economic boom and recession among middle-aged men and women in Finland. European Journal of Public Health; 10:274–80.

Wagstaff A (2002). Inequality aversion, health inequalities and health achievement. Journal of Health Economics, 21(4):627-41