



**Työterveyslaitos** | Arbetshälsainstitutet  
Finnish Institute of Occupational Health

# The cost of illness of the working-age population in the Nordic countries in 2012

– A COMPARISON TO 1991

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# **The cost of illness of the working-age population in the Nordic countries in 2012**

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## TIIVISTELMÄ<sup>4</sup>

Laskimme työikäiseen väestöön liittyvien sairauksien ja tapaturmien aiheuttamat kokonaiskulut (Cost of illness) neljässä Pohjoismaassa vuonna 2012 ja vertasimme lukuja vuoden 1991 vastaaviin lukuihin. Pyrimme tekemään laskelman samoja periaatteita noudattaen kuin Hansen (1993). Kukin Suomen Työterveyslaitosta vastaava laitos Norjassa ja Tanskassa sekä Karolinska Institutet Ruotsissa toimittivat luvut Hansenin mallin mukaan. Yleishavaintona on, että keskimääräiset kustannukset ovat hieman nousseet vertailuajan kohtien välillä, laskettuna euroina työvoimaan kuuluvaa kohti. Tanskassa kustannusten nousu on ollut suurinta, Norjassa kustannustaso on edelleen korkein. Kumpaakin ilmiötä selittää osittain maiden korkea yleinen työvoimakustannustaso. Ennenaikaiseen eläköitymiseen liittyvä kustannusnousu saattaa liittyä menetelmällisiin eroihin. Mielenterveyden häiriöistä aiheutuvat kustannukset ovat nousseet kaikissa maissa. Toisaalta verenkiertoelinten sekä tuki- ja liikuntaelinten sairauksista aiheutuvat kustannukset ovat laskeneet kaikissa maissa. Selvitimme myös sairauspoissaolojen ja ennenaikaisen eläköitymisen aiheuttamien kustannusten keskinäissuhdetta. Aineistomme viittaa siihen että vuonna 1991 havaittu käänteinen suhde näyttää vaimentuneen.

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<sup>4</sup> Haluamme kiittää seuraavia henkilöitä heidän panoksestaan tiedonkeruussa: Otto Melchior Poulsen, Hans Magne Gravseth, Harald Hannerz, Tore Tynes

## ABSTRACT<sup>5</sup>

We calculated the cost of illness in 2012 of the working-age population for four Nordic countries in monetary terms, and compared our figures with equivalent data for 1991. We used the same measurement methods as Hansen (1993). On average, we found that the costs have slightly increased in two decades, calculated as euro per labor force per year. The costs of mental health problems in particular have increased, whereas the costs of musculoskeletal and circulatory diseases have fallen. The observed general increase in early retirement costs may be due to methodological differences. The highest increase in early retirement costs were observed in Denmark. Norway has the highest cost level. Most of the increases in these two countries may, however, be explained by higher labor costs. We also explored whether the inverse relation between sick leaves and early retirement costs, which was discovered in the 1991 data, still remained. The relationship was only weak now.

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<sup>5</sup> We wish to thank Otto Melchior Poulsen, Hans Magne Gravseth, Harald Hannerz, Tore Tynes for their contribution during data collection.

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# 1 INTRODUCTION

This report is from the Nordic Occupational Safety and Health Initiative (NOSHI), which is a joint endeavor launched by the major occupational health and safety institutes of Denmark, Finland and Norway, to promote collaborative research in occupational safety and health. The planning meeting for this report of the cost of illness in the Nordic countries was held in August 2014. The study was carried out by researchers from Finland, Norway and Sweden.

In 1993, Hansen (1993) presented a research report on the costs of illness and accidents of the working-age population in four Nordic countries. The research project was funded by the Nordic Council of Ministers, and the report was published in its publications series. Later, Ahonen (1994) published an analysis of the report in NIVA's report series. Table 1 shows the basic results of the report. The data revealed major differences between the Nordic countries' total cost levels of illness, ranging from 15.77% to 22.21% of GDP. The data also showed that musculoskeletal disorders was the main cause of costs in the four Nordic countries.

	Den	Fin	Swe	Nor
Cancer	1.35	1.70	1.26	1.07
Mental illness	2.23	2.87	2.57	2.92
Nervous diseases	0.80	1.15	1.11	0.83
Cardio vascular	2.07	5.54	3.56	2.71
Respiratory organs	0.89	1.50	2.00	1.32
Dermatoses	0.15	0.24	0.30	0.21
Musculoskeletal	2.65	5.17	4.90	4.37
Accidents	1.03	1.28	1.49	1.34
Fatal accidents	0.10	0.30	0.13	0.08
Efterlön	1.43	0.00	0.00	0.00
Other	3.06	2.47	4.56	2.80
SUM	15.77	22.21	21.88	17.66

*Table 1 Total cost of illness in four Nordic Countries in 1991 according to illness in % of GDP. (Ahonen 1994 based on data of (Hansen 1993))*

These total costs were also divided into different costs of objects and activity in relation to gross domestic product (GDP) (Table 2). According to the data, production loss (sick leaves, early retirement and premature death) accounted for most of the total costs of illness.

	Hospital	Out-patient	Medication	Sick leave	Early retirement	Prem. death	TOTAL
Den	2.75	0.59	0.63	2.58	6.88	2.34	15.77
Fin	4.23	1.98	0.54	2.33	9.91	3.24	22.22
Swe	4.90	1.53	0.47	6.51	6.12	2.35	21.88
Nor	4.01	0.30	0.00	4.78	6.84	1.73	17.66
Nordic4	3.97	1.10	0.41	4.05	7.44	2.41	19.38

Table 2 Total cost of illness in four Nordic Countries in 1991 according to cost type and % of GDP. (Ahonen 1994 based on data of Hansen 1993)

An analysis of the structure of production loss in terms of sick leave and early retirement showed an inverse relationship between these two factors (Figure 1), which would mean that when one goes up the other goes down.

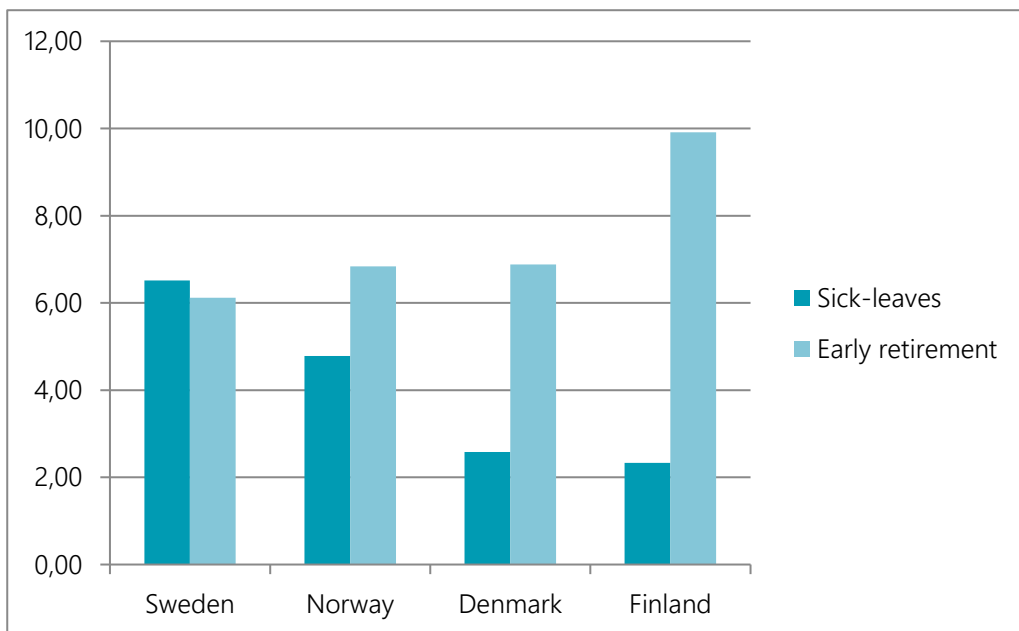


Figure 1. Sick leaves and early retirement in four Nordic countries according to % of GDP. (Ahonen 1994)

The study has not been repeated until now. In order to see how the mentioned costs have developed since the early 1990s, and whether the mentioned relationship between sick leaves and early retirement would be corroborated, NOSHI decided to conduct a study that would present the newest comparative data.



The aims of the project were to:

- estimate the costs of illness and accidents of the working-age population in the Nordic countries
- examine how the costs of illness have developed in the past 20 years and to determine the differences between the countries
- examine the relationship between the costs of sick leave and early retirement

Initially the group aimed to examine the work-related fractions of the costs, but it eventually came to the conclusion that the data were insufficient for such an analysis.

## 2 RESEARCH METHOD AND DATA

To estimate the annual cost of illness in each Nordic country, data on the following were collected from each country: hospital care, outpatient care, medication, sick leaves, early retirement, and premature death. The collected data concerned the nine major diagnoses, plus other diseases and non-medical reasons. It was decided that 2012 was the basic statistical year for data collection.

The cost of lost production was based on the following variables:

- Full work years lost
- Value of full work year (annual average wage added to wage-related employer costs at 2012 price level)

In the 1993 study, the costs were related to GDP, but because of the very different developments in GDP in the different countries during the two decades, this comparison was abandoned.

We used the incidence approach to calculate the loss of productive work years due to early retirement. The difference between 65 and the actual average retirement age was multiplied by the number of new retirees in one year. Part-time arrangements were also taken into account, if they were adequate and it was possible. To distribute the retirement cost among the nine main diagnoses, we used disability pension data. The difference between all disability cases and the sum of the nine diagnoses was classified as other diseases, whereas the difference between diseases-based loss and total loss was classified as non-medical causes.

The basic principle for estimating the value of production loss due to sick leaves involved first identifying the total average sick leave percentage of normal work time. We estimated the number of lost production years by multiplying the number of full-time annual work years by the sick leave percentage. The number of lost years were multiplied by the average value of the full-time work year. To distribute the costs among the main diagnoses, we used national disease-based sick leave compensation data whenever it was available. The difference between all disease-related cases and the sum of the nine diagnoses was classified as other diseases, whereas the difference between the total number of lost work years and the disease-specific loss was classified as non-medical causes.

The total annual hospital costs were distributed among the nine main disease groups according to the hospital patient days of each diagnosis.

Accordingly, the outpatient health care costs were divided among the different diagnoses according to the number of visits to polyclinics.

We estimated the loss of production due to premature death using diagnosis-based statistics, taking into account the age distribution of the diseased over one year. The total loss was the difference between 65 and the average age of each age group, multiplied by the number of cases in each group.

To compare the 1991 and 2012 data, all losses were expressed in 2012 values. To convert 1991 data into 2012 values, we used a GDP-deflator, and converted national currencies into euros using average the currency exchange rate for 2012 (Annex 3).

There may be some methodological differences between the estimations for 1991 and 2012, which basically relate to the "other diseases" and "other non-medical" cost groups.

Annex 1 presents the detailed sources of data from each country.

### 3 FINDINGS

Table 3 presents the estimated total cost of illness per worker. As the costs are expressed per person in the labor force, they are in principle comparable. They indicate that the total cost of illness is highest in Norway, and lowest in Sweden, and that Finland and Denmark come between these two. They also show that mental health is by far the most expensive group of diseases, followed by musculoskeletal diseases. Denmark's "efterlön", a benefit that some employees above the age of 60 are entitled to when they exit the labor force, was classified as "other non-medical", whereas "other" was classified as "other diseases". The difference between these two classes are fairly vague and somewhat arbitrary, but if we had not taken them into account at all, the cost of illness per labor force in the four Nordic countries in 2012 would have remained practically the same as that in 1991.

Diagnosis	Finland	Denmark	Sweden	Norway	Nordic4 2012
Neoplasm	970	861	1002	1067	975
Mental	3426	3723	4159	5360	4167
Nervous	586	507	496	1158	687
Circulatory	798	510	812	824	736
Respiratory	194	213	241	419	267
Skin diseases	54	10	78	181	81
Musculo	1411	828	1127	3762	1782
Injury	456	216	518	749	485
External	814	378	851	304	587
Other disease	1476	4389	717	3440	2505
Other non-med	2431	1964	2423	0	1704
2012 €/lf	12616	13599	12425	17264	13976

Table 3 Total costs of illness per worker in four Nordic countries in year 2012, €/labor force

Figure 2 compares the cost of illness per labor force in 2012 to the corresponding data from 1991.

The comparison indicates that the costs have increased in all four countries during the last two decades, mostly so in Denmark and the least in Norway and Sweden. The increase in Denmark mainly concerns the "other diseases" group and "efterlön", which may have been calculated more comprehensively now than it was in the 1990s.

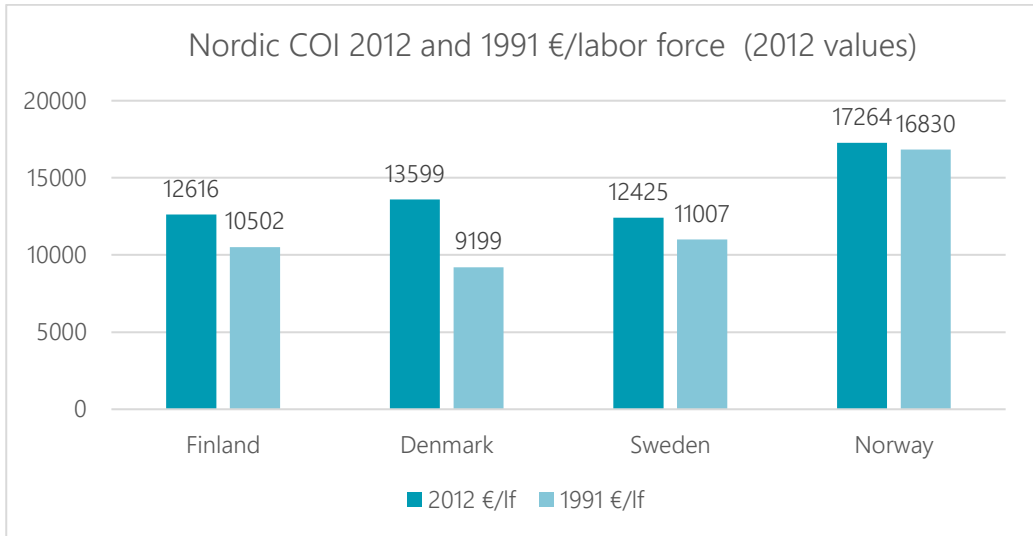


Figure 2 Total cost of illness in four Nordic countries in 1991 and 2012, €/labor force

To provide a more detailed picture, Figure 3 presents the total loss according to diagnoses and Figure 4 according to cost types. The average figures show that the costs of mental illness and early retirement have increased. In contrast, the costs of circulatory and musculoskeletal diseases have decreased. The increase in early retirement costs may be due to methodological differences.

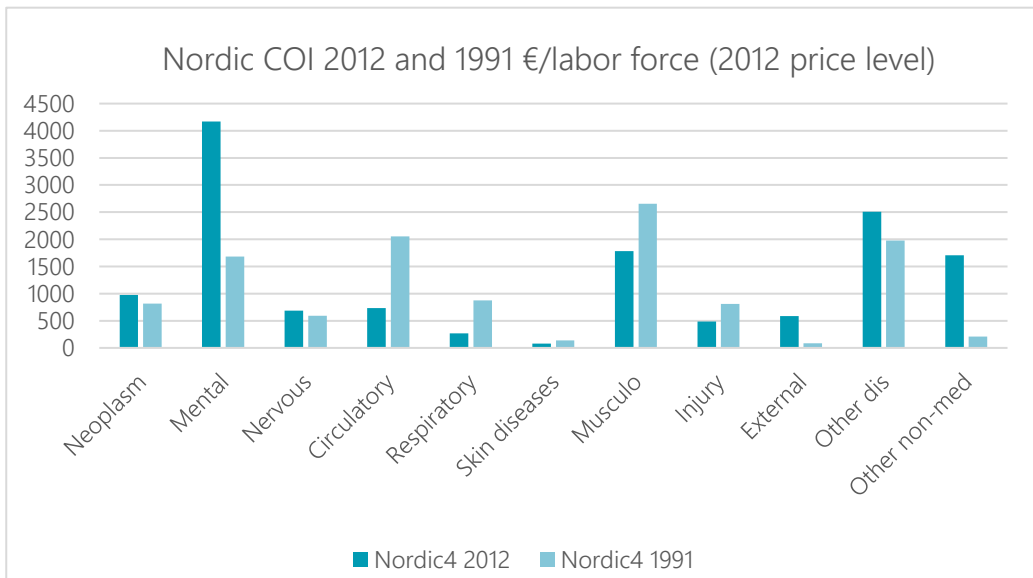


Figure 3 Costs of illness according to diagnoses in 1991 and 2012, €/labor force

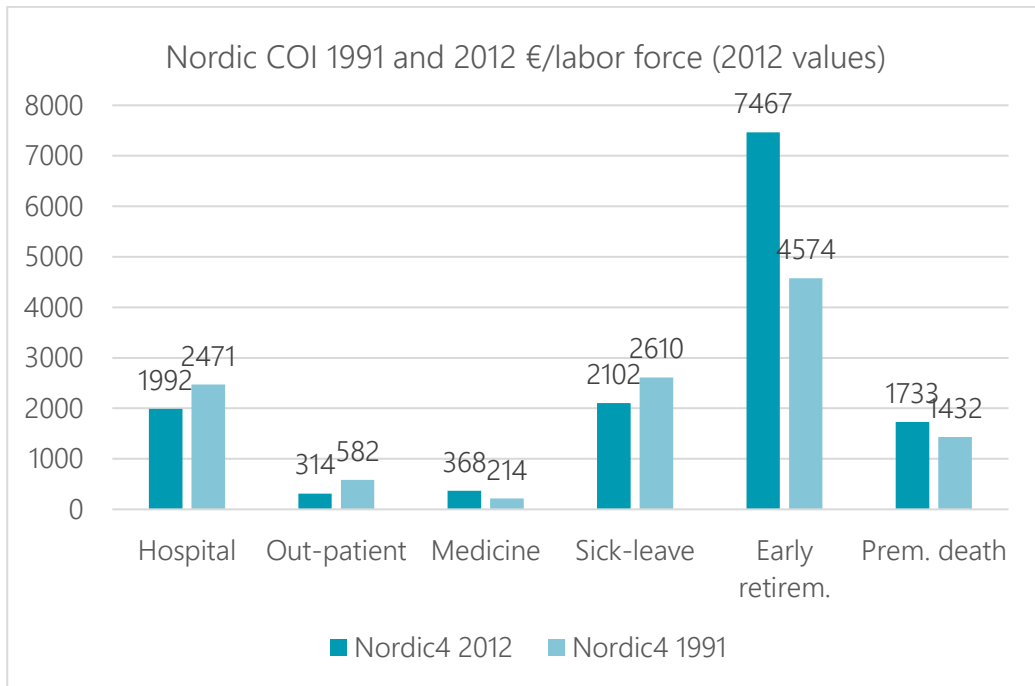
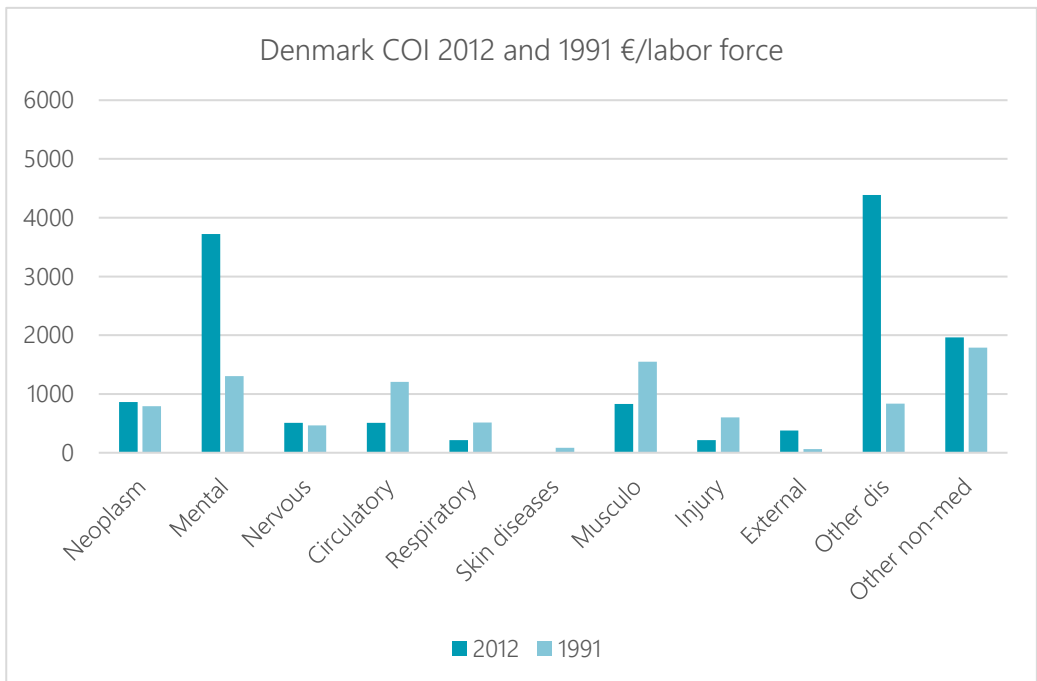


Figure 4 Costs of illness in four Nordic countries according to cost type, €/labor force

The four Nordic countries show very similar patterns in terms of costs of diagnoses (Figure 5). However, there are some differences. The costs of mental illness show the largest increase in Denmark, in spite of the fact that sick leave costs are all classified as “other diseases”. The costs of circulatory diseases have fallen considerably in Norway and Finland since 1991. In both countries they are, nonetheless, on a higher level than in the other two countries. The costs of musculoskeletal diseases are and have been lower in Denmark than in the other three Nordic countries. The costs of respiratory diseases have fallen the most in Sweden.



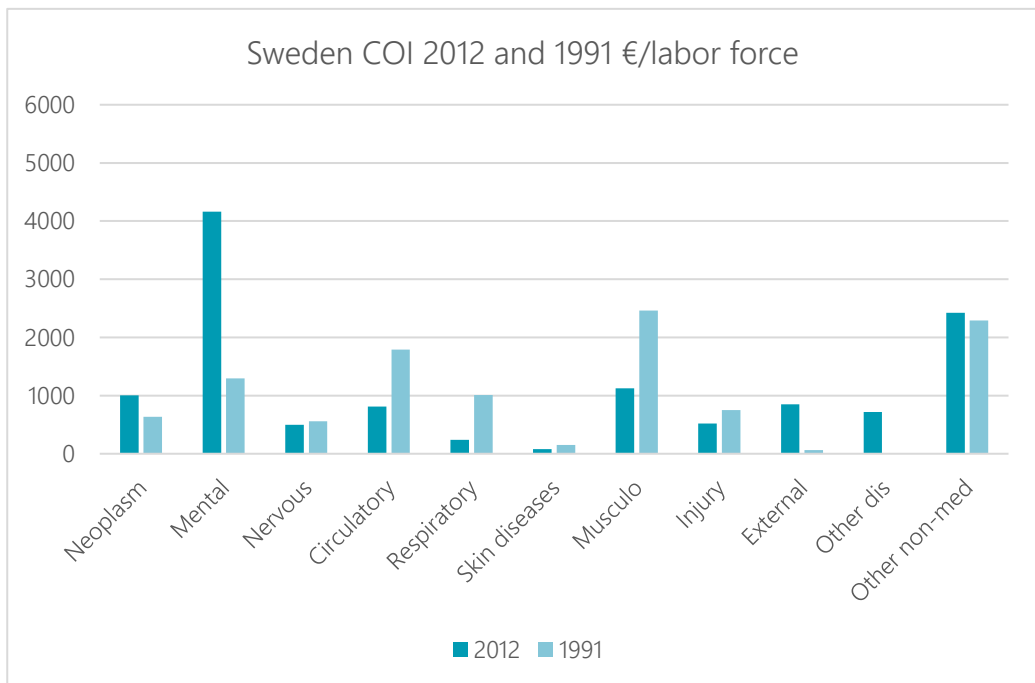
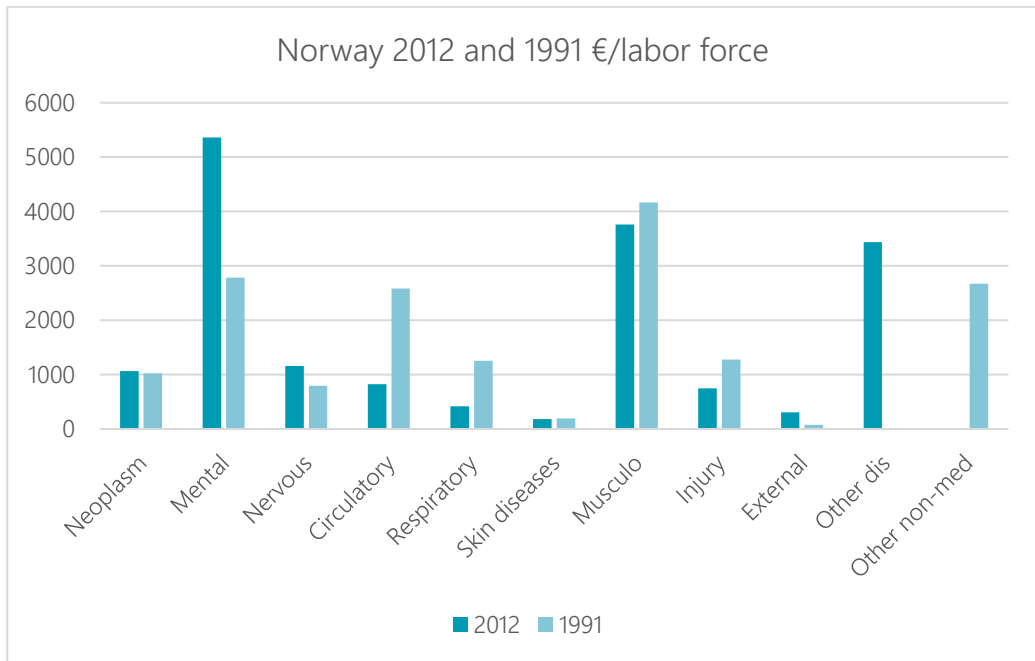


Figure 5 Costs of illness in four Nordic countries according to main diagnoses of illness 1991 and 2012, €/labor force



In terms of cost structure, the changes between 1991 and 2012 are very similar in the four Nordic countries (Figure 6). The cost of early retirement has risen considerably; the most in Norway and Denmark. However, the cost of sick leaves has fallen, except in Finland. For hospital costs, the picture is mixed: Increases in Sweden and Denmark, reductions in Finland and Norway. Out-patient care has decreased in all countries but Denmark. The costs of medication have increased in Finland.

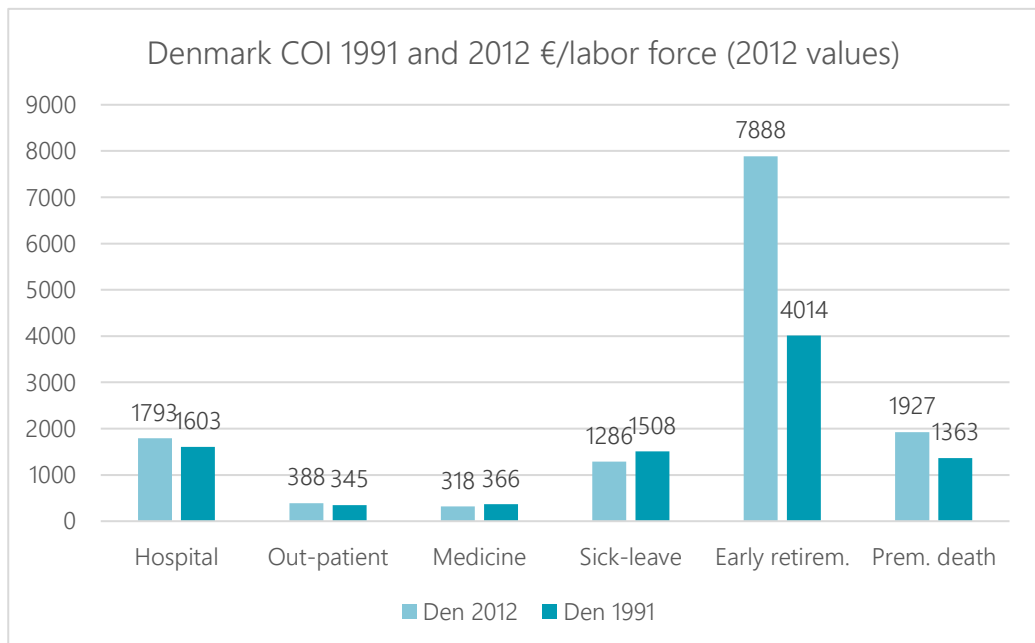
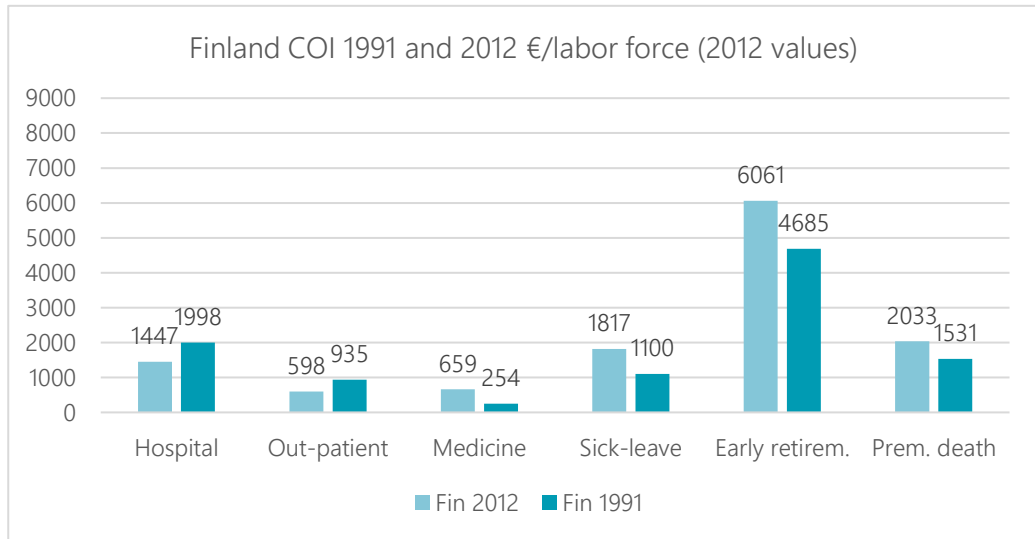




Figure 6 Structure of COI in four Nordic countries in 1991 and 2012, €/labor force

Figure 7 presents the cost of sick leaves. It shows that the differences between the four countries have evened out. It also shows that between 1991 and 2012, the costs have decreased in all countries but Finland. The findings only partially resemble NOSOSCO (Nordic Committee on Social Security Statistics) data on developments in the period 2000–2012 (Figure 8). In both sets of statistics for 2012, Sweden has a high level. In our

data, however, Norway is on a high level. Our data includes all sick leaves, whereas only absences of at least one week are included in the NOSOSCO data.

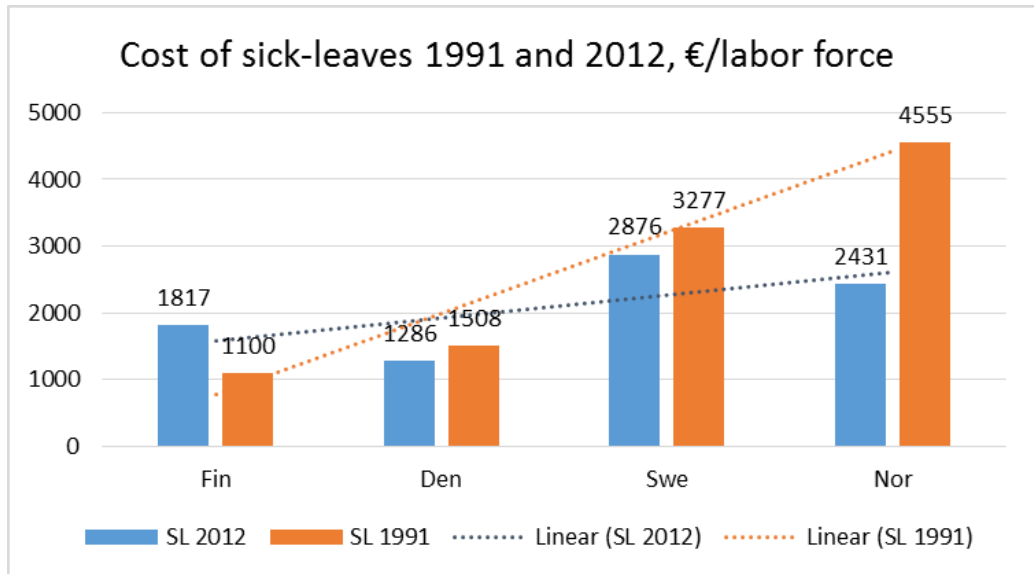


Figure 7 Cost of sick leaves in four Nordic countries, €/labor force. In ascending order of 1991.

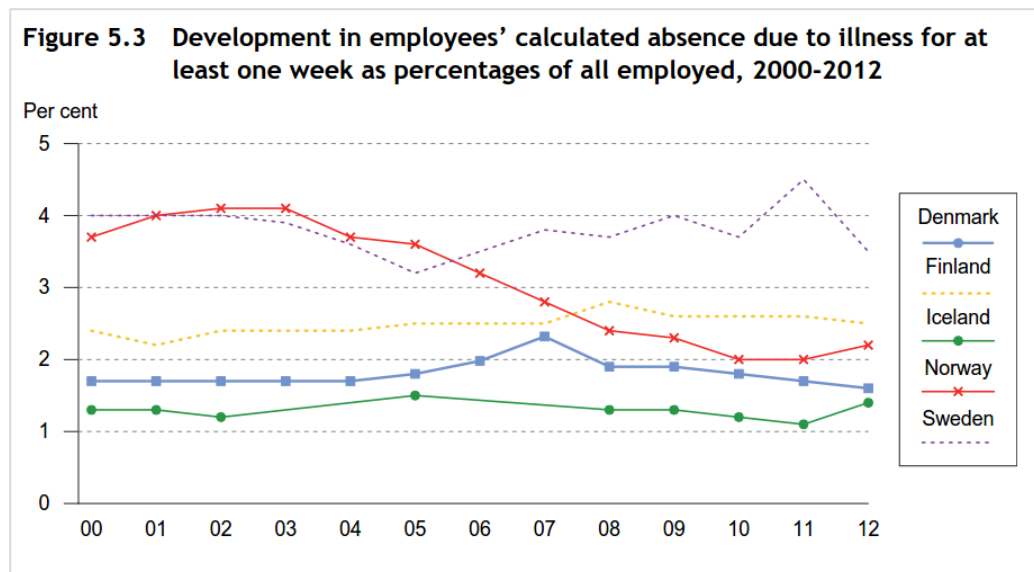


Figure 8 Absence due to illness in the Nordic countries 2000–2012. Social Protection in the Nordic Countries 2011/2012, Figure 5.3

In terms of costs of early retirement, the differences between the four Nordic countries have increased (Figure 9). The costs have increased in all countries; in Denmark by 97%, Finland 29%, Sweden 42% and Norway 77%. However, it must be noted that the 2012 data may have included more losses than the 1991 data.

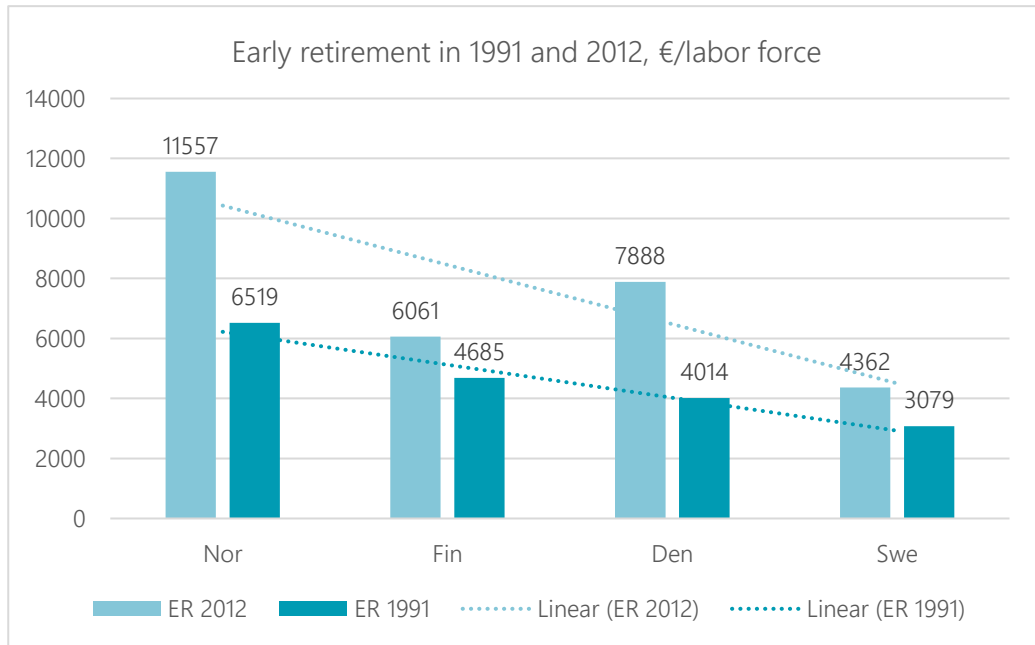


Figure 9 Early retirement costs in 1991 and 2012, €/labor force. In descending order of 1991.

In the 1991 data, the relationship between sick leave costs and early retirement costs is inverse (as % of GDP). This relationship more or less disappeared in terms of euro per labor force both for 1991 (Figure 10) and 2012 (Figure 11).

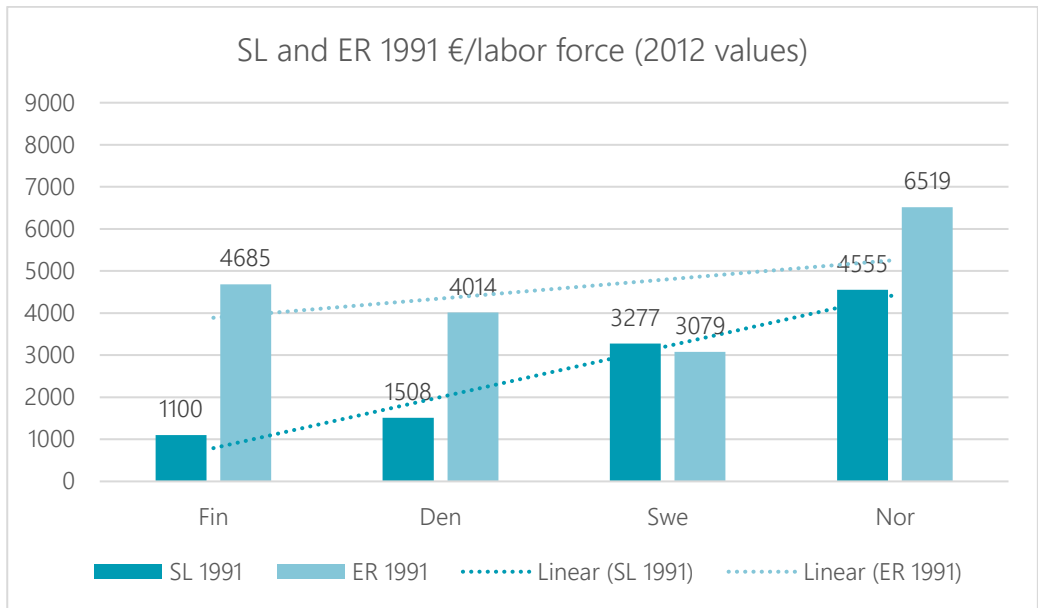


Figure 10 Sick leave and early retirement costs per labor force in four Nordic countries in 1991 (based on Hansen 1993 data) in increasing order of sick leaves.

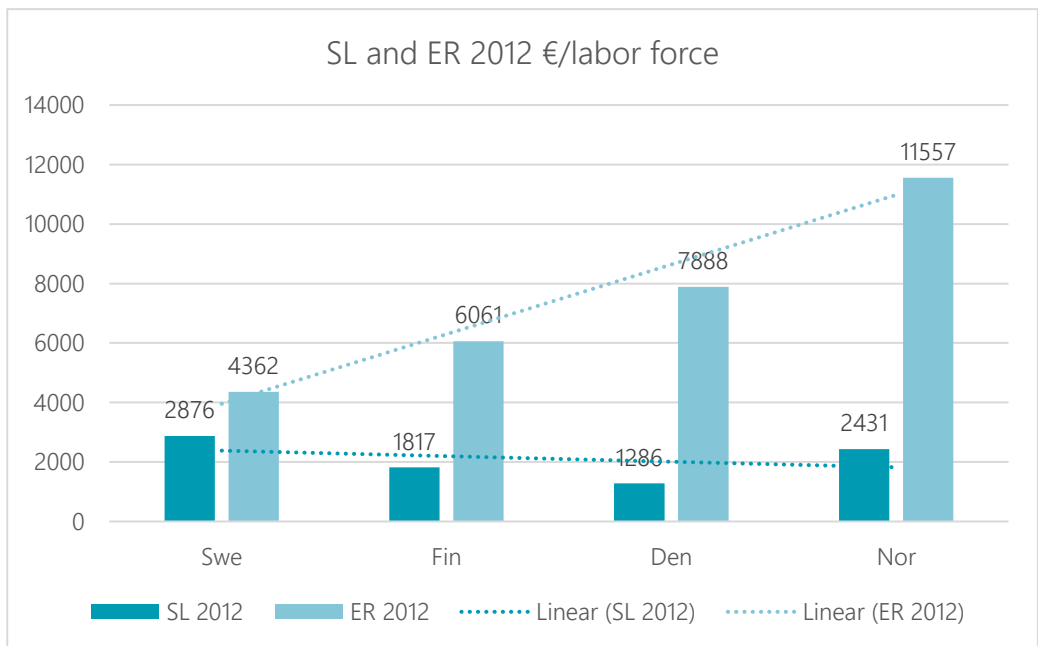


Figure 11 Relationship between costs of sick leaves and early retirement, €/labor force. In ascending order of early retirement.

## 4 DISCUSSION

This report estimates and compares the figures for the total cost of illness in four Nordic countries in 2012 and 1991. The comparison was not easy as it was not possible to exactly replicate the Hansen 1993 study, partly because the documentation was not detailed enough and partly because the statistical data procedures have changed. Therefore, one should be cautious when making conclusions on the basis of our findings.

In the Hansen 1993 report, costs were related to GDP. As the GDP of Norway had developed so differently from the rest of the Nordic countries (Figure 13), the 1991 costs were converted into 2012 values using a GDP deflator and 2012 currency converter (Annex 3).



Figure 12 GDP/capita in 1991 and 2012 in four Nordic countries. Source: World Bank

The achieved results are not only explained by health differences in the analyzed four Nordic countries: Some of the differences are due to different item values, most significantly the value of a full-time work year (Figure 15). If we only look at lost work years (Figure 14) Denmark's loss is considerably smaller than that of Finland, whereas in the

financial analysis, the reverse is true. In other words, because Denmark's average wage and employer costs are higher than those of Finland, its production losses seem higher.

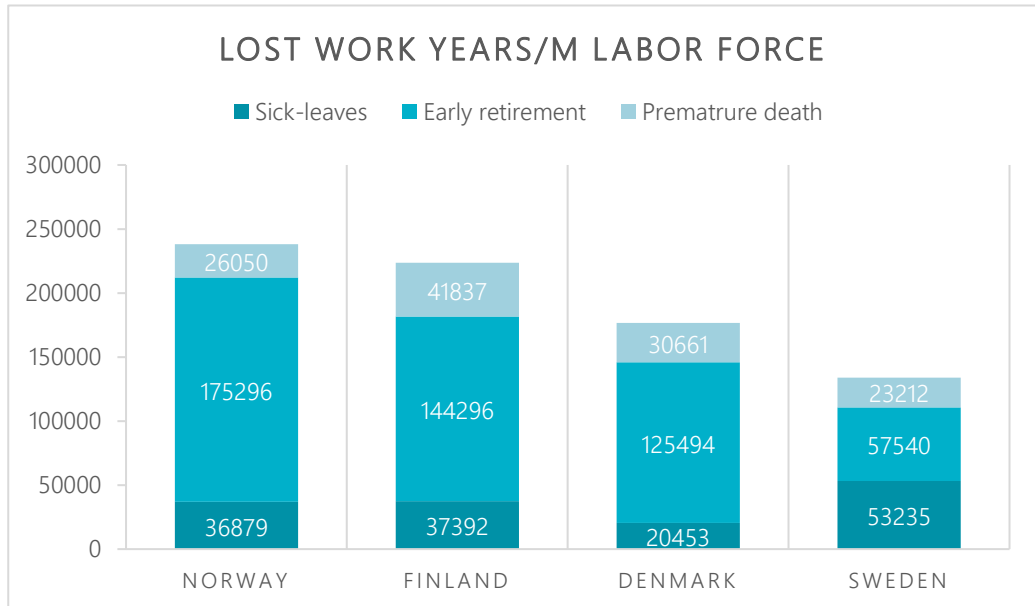


Figure 13 Lost work years in four Nordic countries in 2012

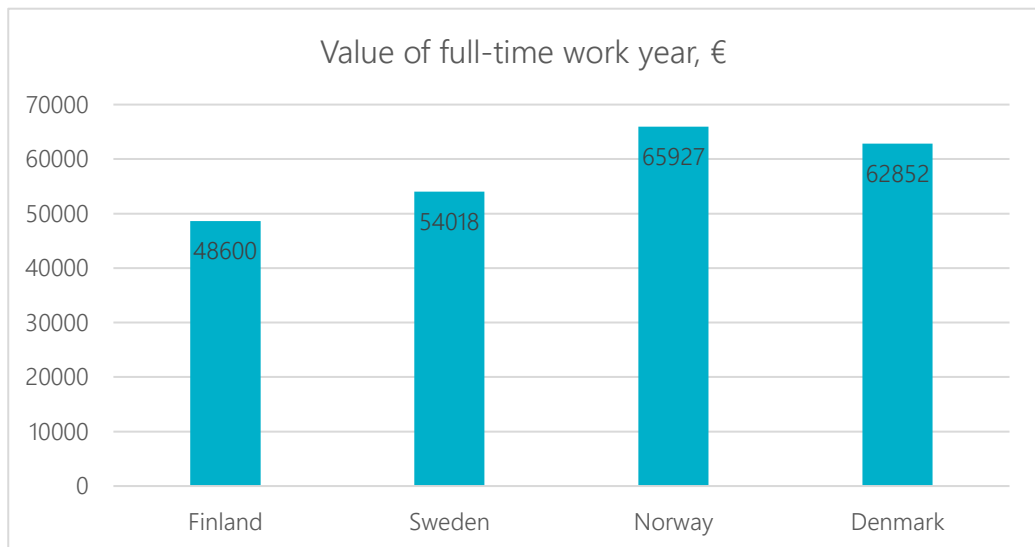


Figure 14 Value of full-time work year in 2012 in four Nordic countries, €

## Conclusion

The results in this study show that the total cost of illness among the working-age population has slightly increased between 1991 and 2012, even when methodological differences are taken into account. Furthermore, there has been a shift in the burden of illness in the different countries. Musculoskeletal disorders, which represented the costliest illnesses in almost all Nordic countries in 1991, have been replaced by mental illnesses as the costliest disease in 2012. In some countries, for example Denmark, it was not possible to distribute the cost of production loss due to sick leave across diagnoses. This means that the total cost presented for each diagnosis in Denmark is truly underestimated.

It is remarkable that in two decades, the relative cost of illness has not decreased in the examined countries. The average loss still represents a quarter of the average value of a full work year in these countries. Even a slight reduction in these costs would improve their competitive position in the international market.



# ANNEX 1

## STATISTICAL SOURCES USED FOR EACH COUNTRY

### Danish data

These data were provided by the National Research Centre for the Working Environment (NRCWE), and were based on available public statistics.

### Finnish data

#### *Economic and population assumptions*

Item	Value	Value/ pers or day	Source	url
Polpulation, age 15–64	3517089		Rissanen et al. 2014	<a href="http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf">http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf</a>
Employed persons, age 15–74	2483000		SF 2012 Employment	<a href="http://www.tilastokeskus.fi/til/tyti/2012/13/tyti_2012_13_2013-03-05_tau_006_en.html">http://www.tilastokeskus.fi/til/tyti/2012/13/tyti_2012_13_2013-03-05_tau_006_en.html</a>
Wages and employer costs Bill €	100.378	40,426	SF 2014 National acc	<a href="http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html">http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html</a>
Monthly earnings full-time worker €	3284		SF 2014 Wages	<a href="http://www.stat.fi/tup/suoluk/suoluk_palkat_en.html">http://www.stat.fi/tup/suoluk/suoluk_palkat_en.html</a>
Monthly employers' social contributions	766		SF 2014 National acc	<a href="http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html">http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html</a>
Value of full-time work year €	48600	48600	Earnings + contrib	
Work days in 2012	253			<a href="#">Rissanen et al. 2014</a>
Gross domestic product (GDP) M€	199.8	80467	SF 2014 National acc	<a href="http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html">http://www.stat.fi/tup/suoluk/suoluk_kansantalous_en.html</a>
GDP/capita €	36904			
Hospital day cost average €		213	Kapiainen et al. 2014	<a href="https://www.julkari.fi/bitstream/handle/10024/114683/THL_RAPO3_2014_web.pdf?sequence=1">https://www.julkari.fi/bitstream/handle/10024/114683/THL_RAPO3_2014_web.pdf?sequence=1</a>

Illness treatment costs € age 15–64	7792		Rissanen et al. 2014	<a href="http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf">http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf</a>
Hospital costs M€ age 18–64	3167		Kapiainen et al. 2014b	<a href="http://www.julkari.fi/bitstream/handle/10024/116156/URN_ISBN_978-952-302-192-1.pdf?sequence=1">http://www.julkari.fi/bitstream/handle/10024/116156/URN_ISBN_978-952-302-192-1.pdf?sequence=1</a>
Outpatient care M€ age 18–64	1309		D:o	
Medication costs M€	1793		Tiina Pensola	
All care M€, age 18–64	6269			
All care M€, age 18–64	6269			
Sickness absence M€	3412		Rissanen et al. 2014	<a href="http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf">http://www.stm.fi/c/document_library/get_file?folderId=53630&amp;name=DLFE-32812.pdf</a>

### *Premature death*

Information on deaths and the population at risk is based on the registries of Statistics Finland. In Finland, causes of death are based on cause-of-death certificates. (Obduction index is about 35% in Finland).

[http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin\\_ter\\_ksyyt/020\\_ksyyt\\_tau\\_102.px/?r\\_xid=2bbcce6b-078e-4824-9450-a472ae9ef4ff](http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ter_ksyyt/020_ksyyt_tau_102.px/?r_xid=2bbcce6b-078e-4824-9450-a472ae9ef4ff)

### *Sick leave*

Sickness allowance days (11–300 days) were based on the registries of the Social Insurance Institute of Finland (SII). We used the days of economically active individuals, that is, students and individuals outside of the labor force for reasons other than retirement are not included (in Finland pensioners are not entitled to sickness allowance days). For long-term sick leaves (11+ days) we added the first 10 days by taking into account the number or sickness periods. Approximately 3.5% of all compensated sick leaves were partial: These are usually 50%. Thus we estimated 50% of partial sick leaves as loss. The registries contained no sick leaves due to skin diseases among economically active individuals. For this reason, the number of sick days is based on the assumption that the prevalence of their sick days is equivalent to that of the whole working-age population.

Source: Kelan sairausvakuutustilasto 2012, [www.fpa.fi/statistik](http://www.fpa.fi/statistik)>årsstatistik

In order to estimate short sick leaves (sickness periods lasting a maximum of 10 days, which do not entitle a person to receive SII's allowance) we used an estimate of 9.4 sick leave days per person to estimate the total loss from which to subtract the compensated days:

(9.4 days\*2338986 persons)

9.4 days per employee is based on the estimation of the Labour Force Survey of Statistics Finland

Source: Labour Force Survey, Statistics Finland

Source:

Kelan sairausvakuutustilasto 2012

[www.fpa.fi/statistik/årsstatistik](http://www.fpa.fi/statistik/årsstatistik) and kelasto

Note! These figures were higher than those in the Työolobarometri (Working conditions barometer) 2013 (7.4) but lower than those of EK (11).

[http://raportit.kela.fi/ibi\\_apps/WFServlet](http://raportit.kela.fi/ibi_apps/WFServlet)

Lyly-Yrjänäinen Maija (2014). Työolobarometri 2013. Ministry of Employment and the Economy (32/2014) [https://www.tem.fi/files/40839/TEMjul\\_32\\_2014\\_web\\_09092014.pdf](https://www.tem.fi/files/40839/TEMjul_32_2014_web_09092014.pdf)

### *Disability pensions*

We obtained information on full and partial disability pensions (DP) (both prevalence and incidence) by age and cause in 2012 in Finland from the Finnish Centre for Pensions.

The mortality of individuals on disability pension was estimated on the basis of data received from Anu Polvinen, PhD, from the Finnish Centre for Pensions. These estimations were based on the mortality of individuals who began receiving their pension in 1987 during 1988–2007. These estimations were used to separate loss due to mortality from loss due to pension when calculating the total loss due to sickness and early retirement.

### *Outpatient care, hospital days and visits to polyclinics*

Information on hospital days and outpatient days by age and diagnosis are based on the registries of the National Institute for Health and Welfare (THL)

<http://www.julkari.fi/handle/10024/110864> and data received from Professor Mika Gissler.

### *Medication*

Information on medication is based on the registries of the Social Insurance Institute of Finland.

[www.kelasto.fi](http://www.kelasto.fi)

## **Swedish data**

### *Disability pension*

Data include information on the total number of individuals who received disability pension (both partial and full) in Sweden in 2012. Although it is possible to order detailed information regarding full and partial DP for each diagnosis, the data that was recently ordered did not contain this.

Statistics are also available for the total number of individuals who receive disability pension in each age group, divided into partial and full DP. Information on diagnoses is not available in this. Statistics are also available for the total number of individuals who receive DP in each diagnosis group, divided into partial and full DP. Information on age is not available in this data.

Statistics for new cases of DP in 2012 are divided into full and partial DP for each diagnoses and age group, and a "Incidence of DP" column is presented. Data on full-time DP as well as partial DP were recalculated to present "total number of new full-time cases in 2012". The loss due to non-medical early retirement was calculated using prevalence data. The total number of pensioners under 65 was reduced by half of the number of part-time disability pensioners to obtain total "prevalence-loss". From this figure, the DP loss was subtracted to obtain the loss due to "non-medical" early retirement.

Age was calculated as per December 31th.

When ".." is presented in the table, it means that the number of cases was too low to be presented. The range is anything between one and nine individuals.

*Source: Försäkringskassan*

### *Sick leave*

Data include information on the total number of paid full sick leave days in Sweden in 2012. These data only include calendar day 15 and above. Day 2 to 14 is paid by the employer. These periods were added on the basis of information from "Konjunkturstatistik över sjuklöner" ([http://www.scb.se/sv/\\_Hitta-statistik/Statistik-efter-amne/Arbetsmarknad/Sjukloner/Konjunkturstatistik-over-sjukloner-KSju/#c\\_undefined](http://www.scb.se/sv/_Hitta-statistik/Statistik-efter-amne/Arbetsmarknad/Sjukloner/Konjunkturstatistik-over-sjukloner-KSju/#c_undefined)), and classified as "other non-medical".

Diagnosis are based on that given on the sickness certificate provided by the medical doctor.

In addition to this, we provided information on the number of new sick leave cases per 1000 employees in each diagnosis group, as well as statistics on the average length of each sick leave period per diagnosis group. This is useful when estimating the cost of sick leaves to the employer (at least for those cases that lead to sick leave lasting over 14 days).

According to the statistics, the total number of employed individuals in Sweden in 2012 was 3 954 888.

Age was calculated as per December 31th.

*Source: Försäkringskassan*

### *Medication*

Medication consumed in 2012 is presented for each diagnosis and age group. The statistics are presented in SEK. They include all medication consumed in each primary diagnosis group, regardless of the reason for the medication. This is because someone diagnosed with cancer, for example, may also have medication for other illnesses. These medication costs are also included.

*Source: Socialstyrelsen*

### *Outpatient care*

We present the total number of visits to a medical doctor in 2012 per diagnosis and age group. The given diagnosis is based on the primary diagnosis given by the medical doctor at the patient's first visit. These statistics only include visits to medical doctors in specialized outpatient care. Visits to primary care are not included (statistics not available).

*Source: Socialstyrelsen*

### *Deaths*

We present the number of deaths in each age and diagnosis group in 2012. The data include all individuals who died in Sweden during the year, regardless of whether or not they were living in Sweden. Diagnoses were coded according to the international version of ICD-10, as opposed to the Swedish version.

*Source: Socialstyrelsen*

### *Hospital care*

The statistics contain information on the total number of days of hospital care in 2012. The presented diagnoses are the individual's main diagnoses.

*Source: Socialstyrelsen*

## **Norwegian data**

### *Hospital data*

The data were taken from the 2013 report of Samdata (Huseby BM 2014). The figures include overnight as well as day patients in hospitals.

<https://helsedirektoratet.no/statistikk-og-analyse/samdata> (Statistics presented in Norwegian).

### *Outpatient data*

Includes consultations with general practitioners. The data were provided by Statistics Norway, The Statbank, and Norway Health services. <https://www.ssb.no/statistikkbanken/selecttable/hovedtabellHjem.asp?KortNavnWeb=helsesat&CMSSubjectArea=nasjonalregnskap-og-konjunkturer&checked=true>

### *Medication*

Information on medication is based on data from the Norwegian Prescription Database (NorPD). <http://www.norpd.no/>

*Norwegian Prescription Database (NorPD)*

NorPD contains data on the drugs dispensed in Norway and provides information on the users of a particular drug or drug category. The data can be categorized by sex, age and geographical location.

The statistical presentation of drug consumption in Norway is based on total sales data from wholesalers. The statistical material is arranged according to the Anatomical Therapeutic Chemical (ATC) Classification, and Defined Daily Doses (DDD) are employed as units of measurements. The parts containing statistics for each main ATC group are only partly translated into English. Extended use of ATC codes for all the substances included should, however, improve the comprehension of foreign readers.

The ATC classification system and the use of DDD as a measuring unit have become the gold standard for international drug utilization research. The ATC/DDD system is a tool for exchanging and comparing data on drug use on international, national or local levels.

The data is based on the Drug Consumption in Norway 2010–2014 publication. The figures are prepared and published by the department of pharmacoepidemiology of the Norwegian Institute of Public Health.

The latest report on drug consumption in Norway can be found at:  
<http://www.legemiddelforbruk.no/english/> (report in Norwegian).

### Use of Data

The Norwegian Institute of Public Health (NIPH) permits reports from this website to be stored electronically, printed, reproduced and further processed as long as the source “Norwegian Prescription Database” is cited on every report, table or figure – see “About the Database” for full details.

Data from the Prescription Database are intended for general scientific research purposes, statistical analysis and planning. The privacy of the individual is strictly protected and the data are anonymous.

NIPH is not responsible for interpretation or analysis performed by third parties.

### *Sick leave*

The numbers include doctor-certified sick leave for employees aged 16-69 (not available to include only 16-65 year in the official statistics), for individuals registered as living in Norway. The numbers do not include self-certified sick leave, absence due to sick children, or sick leave among the self-employed.

The information is based on the 2012 data in the table on this website:

<https://www.nav.no/no/NAV+og+samfunn/Statistikk/Sykefravar+-+statistikk/Tabeller/Legemeldte+sykefrav%C3%A6rsdagsverk+2+kv+2005-2014+Diagnose+og+kj%C3%B8nn..391460.cms>

The numbers on this site are from the second quarter; thus they are multiplied by 4 (to obtain one year), then divided by 230 (to convert work days into work years).

This site does not contain sick leave data for the diagnoses of cancer, dermatoses and accidents. This information is provided in Table 4.2 of this document:

<https://helsedirektoratet.no/Lists/Publikasjoner/Attachments/886/Samfunnskostnader-ved-sykdom-og-ulykker-IS-2264.pdf>

Source: Nav

### *Early retirement/disability pension*

The figures include new cases of disability pension (both partial and full) for individuals aged 16-65. In other words, incidence rather than prevalence is used, i.e. new cases and non-established cases. The number of the latter is somewhat lower.

The information on new disability pensioners on this website:

[https://www.nav.no/no/NAV+og+samfunn/Statistikk/AAP+nedsatt+arbeidsevne+og+uforetrygd+-+statistikk/Tabeller/Nye+mottakere+av+uf%C3%B8repensjon%2C+etter+kj%C3%B8nn+og+alder.+%C3%85ret+2005-2014+\\*%29.+Antall.409135.cms](https://www.nav.no/no/NAV+og+samfunn/Statistikk/AAP+nedsatt+arbeidsevne+og+uforetrygd+-+statistikk/Tabeller/Nye+mottakere+av+uf%C3%B8repensjon%2C+etter+kj%C3%B8nn+og+alder.+%C3%85ret+2005-2014+*%29.+Antall.409135.cms)

is combined with the information on diagnoses on this website:

<https://www.nav.no/Nye+mottakere+av+uf%C3%B8repensjon+etter+diagnose%2C+alder+og+kj%C3%B8nn.+2011.+Kvinner+og+menn.+Prosent.321669.cms>

"Efterløn" is "AFP" – Avtalefestet pensjon in Norwegian. Individuals may retire at the age of 62 under certain circumstances (other than illness). The figures we have provided for the lost work years before the age of 65 due to this arrangement are based on this site:

<https://www.nav.no/no/NAV+og+samfunn/Statistikk/Pensjon+-+statistikk/Tabeller/Nye+mottakere+med+AFP+i+kommunal+sektor+og+ny+AFP+i+privat+sektor+fra+2011+etter+kj%C3%B8nn+og+alder.+1..401445.cms>

Source: Nav



### *Premature death*

All data are taken from the "Bank of statistics" from the Statistics Norway website (<https://www.ssb.no/statistikbanken>)

We found the number of cause-specific deaths in the different age groups, and then calculated the loss of work years due to each diagnosis. "Fatal accidents" include all accidental deaths in the 16-64-year age group, and not only fatal accidents at work among workers under 65 years of age, for which the number of lost working years is 912. Homicides and suicides are not considered "accidental" and are thus coded as "other".

*Source: Statistics Norway*

## ANNEX 2. ECONOMIC EVALUATION OF LOST PRODUCTION IN 1993 STUDY

In the 1993 report (Hansen 1993, Ahonen 1994), the loss of production caused by illness was expressed in terms of lost work years and % of GDP.

### **Sick leave**

In the (1993a:63) report, the cost of sick leaves was calculated as follows:

Number of employees x annual work hours x part-time factor x hourly wage cost x sick leave % = loss of production

The loss was distributed across diagnoses according to the share of sick leave days of each diagnosis in relation to the total amount of sick leave days. The share of part-time work was assumed to be 20% in all countries.

### **Early retirement and premature death**

In the 1993 report, the loss of production due to early retirement and premature death was estimated as follows:

Annual number of early retirements or deaths x diagnosis fraction x work-related fraction x annual work hours x part-time factor x annual wage cost x interest rate = present value of early retirement

This calculation was made for each diagnosis, taking into account the age structure of the case compared to the general pension age (65). The part-time share was assumed to be 5%. An interest rate of 4% was used.

## ANNEX 3. CONVERSION OF LOSSES INTO €/LABOR FORCE

In order to make the 1991 and 2012 data comparable, the losses were converted into €/labor force.

The use labor force figures and sources for year 1991 were as follows:

<b>MLabour force</b>			
Den	2,910403	Index Mundi	<a href="http://www.indexmundi.com/facts/denmark/labor-force">http://www.indexmundi.com/facts/denmark/labor-force</a>
Fin	2,572443	Index Mundi	<a href="http://www.indexmundi.com/facts/finland/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/finland/labor-force#SL.TLF.TOTL.IN</a>
Swe	4,679784	Index Mundi	<a href="http://www.indexmundi.com/facts/sweden/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/sweden/labor-force#SL.TLF.TOTL.IN</a>
Nor	2,144918	Index Mundi	<a href="http://www.indexmundi.com/facts/norway/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/norway/labor-force#SL.TLF.TOTL.IN</a>

For the year 2012 the data and sources were:

<b>MLabour force</b>			
Den	2,910403	Index Mundi	<a href="http://www.indexmundi.com/facts/denmark/labor-force">http://www.indexmundi.com/facts/denmark/labor-force</a>
Fin	2,572443	Index Mundi	<a href="http://www.indexmundi.com/facts/finland/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/finland/labor-force#SL.TLF.TOTL.IN</a>
Swe	4,679784	Index Mundi	<a href="http://www.indexmundi.com/facts/sweden/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/sweden/labor-force#SL.TLF.TOTL.IN</a>
Nor	2,144918	Index Mundi	<a href="http://www.indexmundi.com/facts/norway/labor-force#SL.TLF.TOTL.IN">http://www.indexmundi.com/facts/norway/labor-force#SL.TLF.TOTL.IN</a>

In order to convert 1991 values into 2012 values, we used a GDP deflator. The deflator values and sources were as follows:

<b>Country</b>	<b>1991</b>	<b>2012</b>	<b>Deflator</b>	<b>url-address</b>
Den	77	116.84	1.517403	<a href="http://www.indexmundi.com/facts/denmark/gdp-deflator">http://www.indexmundi.com/facts/denmark/gdp-deflator</a>
Fin	80.05	115.04	1.437102	<a href="http://www.indexmundi.com/facts/finland/gdp-deflator">http://www.indexmundi.com/facts/finland/gdp-deflator</a>
Swe	79.99	114.44	1.430679	<a href="http://www.indexmundi.com/facts/sweden/gdp-deflator">http://www.indexmundi.com/facts/sweden/gdp-deflator</a>
Nor	61.61	137.11	2.22545	<a href="http://www.indexmundi.com/facts/norway/gdp-deflator">http://www.indexmundi.com/facts/norway/gdp-deflator</a>

In order to convert national currencies into euros. the following converters were used

	<b>Den</b>	<b>Fin</b>	<b>Swe</b>	<b>Nor</b>
Converter	0.134338	0.168188	0.114935	0.133735

Source: <http://www.ozforex.com.au/forex-tools/historical-rate-tools/yearly-average-rates>

## OTHER SOURCES:

Ahonen, Guy: "The Costs of Occupational Accidents and Diseases in the Nordic Countries". NIVA-Report No. 4, 1994. Helsinki

Hansen, S: Arbejdsmiljø og samfundsökonomi – en metode til konsekvensbeskrivning. NORD 1993:22, Nordisk Ministerråd, København.

Huseby BM (ed.). Samdata spesialisthelsetjenesten 2013. ( Report in Norwegian). The Norwegian Directorate of Health, Oslo;2014.

NOSOSCO: Social Protection in the Nordic Countries 2011/2012

The cost of illness in 2012 of the working-age population for four Nordic countries was calculated in monetary terms, and compared with equivalent data for 1991. On average, the costs have slightly increased in two decades, calculated as euro per labor force per year. The costs of mental health problems in particular have increased, whereas the costs of musculoskeletal and circulatory diseases have fallen.

The observed general increase in early retirement costs may be due to methodological differences. The highest increase in early retirement costs were observed in Denmark. Norway has the highest cost level. Most of the increases in these two countries may, however, be explained by higher labor costs.

The inverse relation between sick leaves and early retirement costs was also investigated. The relationship, which was discovered in the 1991 data, to some extent remained in the 2012 data.

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