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Lost Productivity in Four European Countries among Patients with Rheumatic Disorders

Are Absenteeism and Presenteeism Transferable?

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Abstract

Background: When national pharmacoeconomic guidelines are compared, different recommendations are identified on how to identify, measure and value lost productivity, leading to difficulties when comparing lost productivity estimates across countries. From a transferability point of view, the question arises of whether differences between countries regarding lost productivity are the result of using different calculation methods (methodological differences) or of other between-country differences. When lost productivity data differ significantly across countries, the transferability of lost productivity data across countries is hindered.

Objective: The objective of this study was to investigate whether country of residence has a significant influence on the quantity of lost productivity among patients with rheumatic disorders. Confounding factors that might differ between countries were corrected for, while the methodology used to identify and measure lost productivity was kept the same.

Methods: This question was investigated by means of an online questionnaire filled out by 200 respondents with a rheumatic disorder per country in four European countries, namely the Netherlands, the UK, Germany and France. In addition to those regarding lost productivity, the questionnaire contained questions about patient characteristics, disability insurance, disease characteristics, quality of life and job characteristics as these variables are expected to influence lost productivity in terms of absenteeism and presenteeism. The data were analysed by regression analyses, in which different components – being absent in last 3 months, number of days absent and presenteeism – of lost

productivity were the main outcome measures and other variables, such as gender, impact of disease, shift work, job control, partial disability and overall general health, were corrected for.

Results: The results showed that country sometimes has a significant influence on lost productivity and that other variables such as, for example, age, disease severity, number of contract hours, decision latitude, experienced health (as reported on the visual analogue scale) and partial disability, also influence lost productivity. A significant influence of country of residence was found on the variables 'being absent in the last three months', 'number of days absent' and 'quality of work on the last working day'. However, country did not influence 'quantity of work on the last working day' and 'overall presenteeism on the last working day'.

Conclusion: It can be concluded that country has a significant influence on lost productivity among patients with rheumatic disorders, when corrected for other variables that have an influence on absenteeism and presenteeism. Transferring lost productivity data across countries without adaptation is hindered by the significant differences between countries in this patient group. As a result, transferring lost productivity data, being either monetary values or volumes of productivity losses, between countries can give wrong estimations of the cost effectiveness of treatments.

Key points for decision makers

- Differences between countries can be found on self-reported lost productivity by people with a rheumatic disorder
- A number of factors also have an influence on lost productivity and should therefore be taken into account
- It is not advisable to use lost productivity data from other countries without adaptation as it can lead to an over- or underestimation of the cost effectiveness of treatments

Introduction

Economic evaluations are used in a growing number of jurisdictions to support decision making.[1] However, performing economic evaluations is time consuming, costly and requires trained researchers. Therefore, most technologies are evaluated in a limited number of jurisdictions, creating pressure for decision makers to use results from outside their own jurisdiction. This raises the question of whether foreign economic evaluations can be used without drawing the wrong conclusion.[2-5] Due to differences between, for instance, healthcare systems, practice patterns and prices, economic evaluations can differ between jurisdictions. The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) Task Force on Transferability indicates that data are transferable if they can be adapted to apply to other settings than the study country.[6]

So far, the majority of the transferability research has focused on the transferability of healthcare costs.[7] Nevertheless, the costs of lost production related to disease can be substantial, as these

costs can exceed the total healthcare costs, which is the case in rheumatoid arthritis.[8] The transferability of lost productivity has not yet been investigated, but it is already clear that salaries differ between countries. However, it is not clear whether the quantities (number of days) differ between countries. In a previous article we have discussed that the inclusion of lost productivity in economic evaluations is a contentious subject.[9] This has resulted in different recommendations in pharmacoeconomic guidelines on the perspective, and on the inclusion and valuation of lost productivity. This can result in large differences in lost productivity estimations, which will hinder the transferability of lost productivity data.[9] The question arises whether differences in lost productivity data are the result of using different calculation methods (methodological differences) or are due to system and cultural differences between countries.[9]

Lost productivity develops when someone becomes ill, influencing the ability to work. Lost productivity consists of two components, namely absenteeism (sickness absence) and presenteeism (reduced performance at work).[10] Lost productivity is a complex phenomenon influenced by several factors.[11]

Theoretical Framework

Figure 1 shows the factors described in the literature that influence lost productivity.

The level of lost productivity is related to disease severity.[12] As our study concentrates on rheumatic disorders, specific disease severity characteristics such as disease duration and pain are included.[13]

It is known that different levels of impairment and quality of life (QOL) will lead to different levels of observed productivity. When the impairment is limited, individuals may choose to stay at

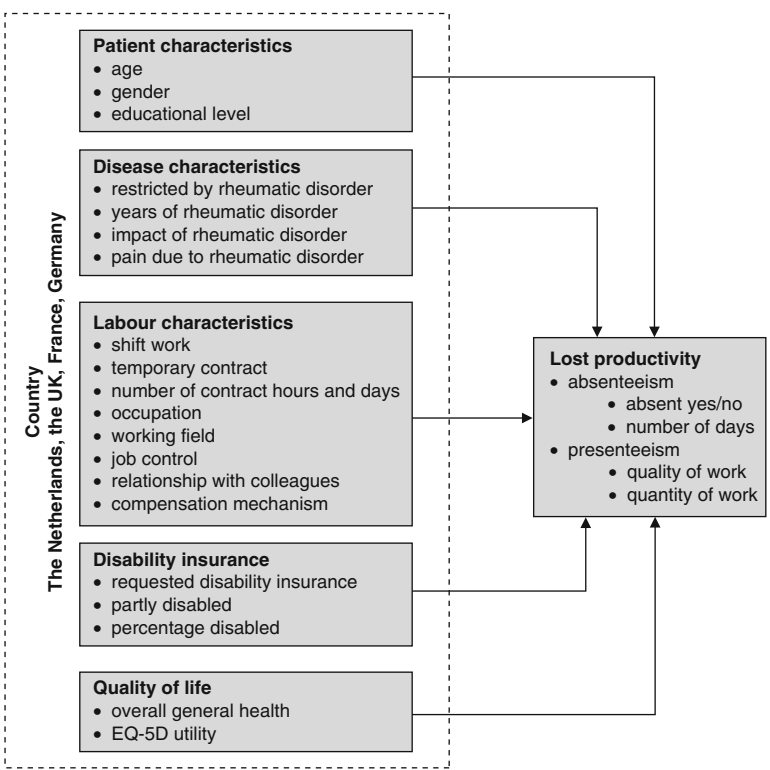

Fig. 1. Factors that influence lost productivity.

work, even though they are less productive, and as the impairment increases as the disease progresses the individual may decide to stay at home. When recovering, a person may decide to return to work, while not being fully productive yet.[14]

Other research has indicated that absence is influenced by factors at a personal level, work-related factors and societal factors.[10] Furthermore, the type of work and country influences the level of absenteeism.[15] The relationship between work-related factors and presenteeism has also been researched; it was found that a temporary contract, low job control (the possibility of organizing work yourself), high job demands and highly emotionally demanding work are associated with presenteeism.[10]

When performing economic evaluations from the societal perspective the cost of lost productivity should be included. Costs of absenteeism are calculated by multiplying the days absent with the gross earnings. The actual costs of lost productivity could be lower due to compensation mechanisms. The work could be carried out by others or upon return to work. Taking compensation into account by subtracting the hours compensated for from the hours of absenteeism will lead to lower estimations of the costs of lost productivity.[16]

Research on the influence of gender gave conflicting results. Laaksonen et al.[12] indicated that women have higher absenteeism than men, but Gimeno et al.[17] found the opposite result. Differences in working conditions of men and women could explain these gender differences. Furthermore, the total disease costs, including the costs of lost productivity, are not only influenced by patient and disease characteristics, but also by differences in medical practice, financing and social security systems.[15] Other findings suggest that the sick leave percentage is lower in southern European than the EU average.[17]

At the moment, it is not clear how country of residence influences lost productivity. The influence of country can only be investigated by measuring lost productivity using the same method in a comparable population in different countries, taking the influence of other factors into account. When significant differences between countries can be found after correction for the factors described in the theoretical framework it can be concluded that the transferability of lost productivity data is hindered. The objective of this study was to investigate whether the country of residence has a significant influence on lost productivity among patients with rheumatic disorders, correcting for possible confounding factors that might differ between countries, while keeping the methodology to identify and measure lost productivity the same.

Methods

Population and Procedures

To investigate if lost productivity differs between countries, data about individual lost productivity were needed. The data were collected in March 2010 by the research organisation TNS NIPO (Taylor Nelson Sofres Nederlands Instituut voor Publieke Opinie [Dutch Institute for Public Opinion]), but the development of the survey and the data analyses were carried out by the authors. This organization sent potential eligible respondents in a homogenous disease state an e-mail with a link to an online questionnaire (see the Supplemental Digital Content, http://links.adisonline.com/PCZ/A149).

People were eligible to participate in this research if they had a rheumatic disorder – either self-reported or confirmed by a medical doctor – and were between 20 and 65 years of age. The choice was made to include only working-age respondents with the same disease to be sure that the populations in the different countries were comparable. Previous research has indicated that musculoskeletal diseases, which have a high prevalence, have a high impact on worker participation and productivity. Therefore, a significant part of the societal costs of reduced productivity are caused by musculoskeletal problems.[18] It is also known that the costs due to lost productivity are an important part of the total costs of rheumatic disorders; for example, in rheumatoid arthritis the costs of lost productivity account for 25–71% of the total costs of the disease.[8,15] The age limit was intended to increase the chance that the respondents were employed and neither still studying nor retired.

All potential respondents were members of the patient panels of TNS NIPO, and all were willing to fill out questionnaires. TNS NIPO gave some points for any questionnaire the respondents filled out and the collected points can be converted into gift vouchers. The respondents could fill the questionnaire out at whatever time suited them best, but there was a restriction of a total of 200 respondents per country, resulting in a total of 800 respondents. Since we expected some dropout due to subjects not having a paid job and we required at least 20 subjects for each of the 20 independent variables in the analyses, this sample size was considered to be sufficient.

The questionnaire was sent to respondents in four European countries, namely France, Germany, the Netherlands and the UK, being England and Wales. The Netherlands was chosen because it is the country in which the study was initiated. The other three countries were selected because the maximum prices of pharmaceuticals in the Netherlands are determined by taking the average of the prices in four so-called reference countries. These reference countries are decreed in the Dutch Pharmaceutical Prices law, in which four neighbouring countries are selected, namely Belgium, Germany, France and the UK.[19] Consequently, these countries are of interest to the Netherlands. Nevertheless, Belgium was not included in this study as, given the existing patient panels in Belgium, it was not possible to include 200 respondents from both language regions within Belgium, being Wallonia and Flanders. Respondents from both regions would be needed as legislation and other variables differ between the two regions.

Measures

The questionnaire was developed to measure the different constructs, as displayed in figure 1. Whenever available, existing validated questionnaires or specific parts of such questionnaires were utilized. Health-related QOL was measured using the EQ-5D. The answers on the EQ-5D were utilized to calculate utilities using the national value sets.[20,21] Patient characteristics, job characteristics and lost productivity were measured using the Productivity and Disease Questionnaire (PRODISQ), which is a modular questionnaire that has been developed for measuring lost productivity for people in paid labour. Presenteeism, as one of the components of lost productivity, was operationalized by making a distinction between the quality and quantity of work on the last working day of the respondent. Respondents could indicate how well and how much work was carried out on their last working day on a ten-point scale. Presenteeism occurred whenever the respondent scored lower than ten on the scale. The two presenteeism scales were also added up to create an overall presenteeism score.[22,23] One of the components of labour characteristics as given in figure 1 is job control, which consists of job demand and decision latitude, and was therefore converted into two scales. Job demand is related to an aggregate of psychological stressors affecting work. Decision latitude can be described as the individual's potential job-related decision making. Components of decision latitude are use of skill, time allocation and organizational decisions.[24]

The questions about the severity of the rheumatic disorder were selected from the Dutch-Arthritis Impact Measurement Scales-2 (Dutch-AIMS2), which is an instrument for assessing the health status of patients with rheumatic disorders. The respondents had to indicate the disease severity and impact and pain of the disease in the last 12 months. One of the questions from this questionnaire allowed for calculating the number of years a respondent had had a rheumatic disorder.[25] The overall general health questions were the first questions from the European Health Status Module, part of the European Health Interview Survey.[26] Overall general health was measured using two questions, namely general health and experienced health (as reported on the visual analogue scale). General health could be scored ranging from very good to very poor and experienced health was scored on a scale ranging from 0 to 100.

Countries can differ in two ways, namely in system characteristics and cultural differences. Differences in system characteristics cause differences in the procedures and financial consequences concerning temporary absenteeism and the regulations on disability and disability

insurance between countries.[17] Because there is no international questionnaire about disability insurance for individuals, these questions were formulated in consultation with experts in the field, after identifying the information needed. Cultural differences could result in different attitudes towards labour and sickness, which can cause differences of opinion on absenteeism and disability. Original versions of the questionnaires were utilized when they existed in the relevant language (for instance the EQ-5D), and translated from Dutch by professional translators when necessary (for instance for PRODISQ).

Statistical Analyses

Dummy variables were created for categorical variables with more than two categories. Furthermore, the whole dataset was checked for missing data. Simple imputation methods were used for missing data on the variables 'educational level' (3 missing values) and 'percentage of disability' (662 missing values). This high number of missing values for the latter variable was due to the fact that only people who are partialy disabled answered this question. The missing data were imputed by utilizing the answers on related variables, meaning that respondents who answered earlier that they were not partialy disabled were considered to be 0% disabled. After the simple imputation, multiple imputations with five imputations were performed for the variables 'hours per week of paid labour' and 'number of days of paid work', both with 62 missing values. The results pooled across the five imputed datasets are reported.

To investigate whether variables were significantly different between the four countries, one-way ANOVA tests were performed for continuous variables and chi-squared (χ^2) tests were performed for categorical variables. Only respondents with a paid job were included in the analyses. Logistic regression analysis was performed to examine the influence of country on being absent or not in the last 3 months and on presenteeism during the last working day. Poisson regression analysis was carried out to investigate the influence of country on the number of days absent in the last 3 months. In each of these analyses, other variables that could also influence lost productivity according to the theoretical framework were included as additional predictor variables.

Multicollinearity was checked by calculating the variance inflation factor (VIF) for each predictor variable. When VIF was above 10, different strategies were used to lower the multicollinearity. Categorical variables with two levels were recoded in 1 versus −1, and categorical variables with more than two levels were recoded using an orthogonal coding scheme.[27] Continuous variables were centred (the total average was deducted from the score of each individual respondent). These strategies were sufficient to decrease the VIF value below the critical value.

A top-down strategy was used, whereby all independent variables of the theoretical framework were first included in the analysis model. Except for the dummy variables representing the four countries, non-significant independent variables were deleted step by step when their p-value was higher than 0.10. Each time the variable with the highest p-value was deleted and the model was then run again to inspect the p-values of the remaining variables, removing the least significant one. The p-values for the pooled results across multiple imputations were employed. Dummy variables were deleted if, for continuous outcomes, the F-Change, or for binary outcomes, the likelihood ratio of the model versus the model without dummy variables, was not significant ($p > 0.10$). The F-Change indicates whether a regression analysis with multiple independent variables gives a significantly better description of the dependent variable than a regression analysis with less independent variables. For the reduced model containing only significant predictors, the effects of country were examined for significance. All statistical analyses were performed using SPSS 17 (SPSS Inc., Chicago, IL, USA).

Results

Characteristics of the Respondents

Table I shows the characteristics of the whole sample (830 respondents) and of the respondents with a paid job (539 respondents) in the four

Table I. Characteristics of the respondents

Characteristic	All respondents				Respondents with a paid job			
	Netherlands	UK	France	Germany	Netherlands	UK	France	Germany
No. of respondents (% of all respondents with a paid job)	230	200	200	200	173 (75.2%)††,§§	116 (58%)**	129 (64.5%)	121 (60.5%)**
Male (%)	79 (34.3)	82 (41)	62 (31)	72 (36)	71 (41.0)	47 (40.5)	41 (31.8)	47 (38.8)
Average age [y] (SD)	48 (9.54)††	52 (10.26)**,‡‡,§§	48 (10.20)††	47 (9.64)††	47 (9.40)	50 (10.36)‡‡,§§	45 (8.93)††	46 (9.51)††
Own health: % very good–good	51.7‡‡,§§	45‡‡,§§	29.0**,††	25.0**,††	57.2‡‡,§§	59.5‡‡,§§	31.0**,††	31.4**,††
Restricted by illness: % seriously restricted	12.2§§	17.5§§	17.0§§	29.0**,††,‡‡	9.2§	6.0§§	16.3	20.7*,††
Mean y of rheumatic disorder (SD)	13.48 (9.55)	11.42 (9.65)	13.68 (11.87)	11.71 (8.63)	12.86 (9.45)†	9.77 (8.36)*	12.17 (9.88)	10.98 (7.72)
Mean utility	0.69	0.55	0.63	0.74	0.72	0.66§§	0.67§§	0.77††,‡‡
Mean utility: EQ-5D UK[a]	0.63††	0.55**	0.61	0.60	0.66	0.66	0.64	0.64
Mean experienced health scale 0–100 (SD)	65.09 (21.58)§§	66.58 (22.45)§§	65.51 (20.3)§§	57.14 (20.37)**,††,‡‡	67.88 (21.13)§	73.84 (19.82)§§	67.75 (19.42)	61.55 (19.19)*,††
Mean impact of rheumatic disorder scale 0–100 (SD)	45.74 (20.00)	44.96 (29.57)	43.30 (26.51)	46.03 (24.73)	43.46 (29.91)	41.94 (30.86)	42.98 (27.34)	42.40 (25.59)
Partiall disability (%)	60 (26.1)	41 (20.5)	35 (17.5)	32 (16)	28 (16.2)	5 (4.3)	12 (9.3)	9 (7.4)
No. of people that are 100% disabled	26	9	2	15	4	0	1	4
Last 3 months on sick leave (%)					57 (32.9)	21 (18.1)	42 (32.6)	47 (38.8)
Mean no. of days on sick leave (SD)					11.40 (17.17)	21.90 (26.74)	26.52 (29.78)	19.81 (25.63)
Currently on sick leave (%)					33 (14.3)	20 (10)	31 (15.5)	48 (24)
Mean contract hours (SD)					28.74 (10.08)††,‡‡,§§	33.18 (10.67)**	33.85 (7.73)**	33.21 (10.34)**

a UK tariffs were used for all countries.

* $p < 0.05$, ** $p < 0.01$ vs the Netherlands; † $p < 0.05$, †† $p < 0.01$ vs the UK; ‡ $p < 0.05$, ‡‡ $p < 0.01$ vs France; § $p < 0.05$, §§ $p < 0.01$ vs Germany.

included countries. The average age of the respondents in the four countries is between 48 and 52 years and, for respondents with a paid job, between 45 and 50 years. UK respondents are significantly older than respondents in France and Germany. In addition, the average duration of a rheumatic disorder is between 10 and 14 years, and in the Netherlands this average is significantly higher ($p < 0.05$) than in the UK. In the Netherlands and the UK the percentage of respondents who consider their own health to be very good or good is higher than in France and Germany. However, the utility scores are significantly lower in the UK than in Germany and France, which conflicts with the UK respondents' own perception of their health. For the variable mean utility, the value sets of the respondents' own country were used, i.e. for the French respondents the value set of France was used, and the value set of the UK was used to calculate the mean utility for the UK. The higher utility scores in Germany are not in line with the results showing that the German respondents are significantly more restricted due to their rheumatic disorder than are respondents in the Netherlands and in the UK. The statistically different valuations between countries by the respondents on the variables of their own health, restricted by disease, utility and experienced health do not result in a significant difference between the countries on the variable impact of the rheumatic disorder.

Significant differences can be identified in the percentage of respondents who still have paid work. In the Netherlands about 75% of respondents work, but the average number of contract hours is the lowest among the four countries. Furthermore, the characteristics of the respondents with a paid job indicate that they are on average younger and have better health; they are also less restricted by the rheumatic disorder and its duration is shorter.

Absenteeism in the Last 3 Months

The four countries differ in terms of being absent or not from work in the last 3 months. As can be seen in table II, respondents living in the UK have been absent significantly less often than respondents in the Netherlands, and the numbers of people being absent in France and Germany were also lower than in the Netherlands, although not significantly. Furthermore, the results show that persons who are seriously restricted or somewhat restricted are more often absent than persons who are not restricted. The odds ratio of 6.25 shows that respondents that are seriously restricted have a higher probability of being absent in the last 3 months than respondents that are not restricted. The number of contract hours is also related to being absent. Respondents with a higher number of contract hours have a higher rate of being absent, while older respondents and respondents with a fixed contract are absent less often. This model has an R^2 of 0.17, meaning that 17% of 'being absent' is explained by the model.

Table II. Results of logistic regression on being absent in the last 3 months ($R^2 = 0.17$ [Nagelkerke], model chi-squared [χ^2] = 69.28)

Characteristic	Odds ratio	95% CI (lower, upper bound)
Country		
UK vs the Netherlands	0.43*	0.23, 0.79
France vs the Netherlands	0.61	0.34, 1.05
Germany vs the Netherlands	0.84	0.50, 1.46
Patient characteristics		
Age (years)	0.97*	0.95, 0.99
Disease characteristics		
Seriously restricted vs not restricted	6.25**	2.84, 14.03
Somewhat restricted vs not restricted	2.27*	1.25, 4.06
Labour characteristics		
Temporary contract (1: yes, 2: no)	0.47	0.23, 0.95
Number of contract hours	1.03*	1.01, 1.06
Quality of life		
General health (1: very good to 5: very poor)	1.30	0.97, 1.75

* $p < 0.05$; ** $p < 0.001$.

Number of Days Absent in the Last 3 Months

The number of days absent is influenced by a number of variables. As can be seen in table III, significant differences were found between the countries. In the UK, France and Germany the respondents are absent more days than in the Netherlands, with the largest difference occurring between France and the Netherlands.

Respondents who are seriously restricted by the disease, who experienced a high impact of their rheumatic disorder, whose work is compensated for by others when absent, who have a low decision latitude in their work, a low experienced health and never requested disability insurance had been absent more days in the last 3 months. However, respondents who suffered from a rheumatic disorder for many years, younger respondents, those with a higher utility score and with less pain due to the rheumatic disorder had been absent fewer days. Furthermore, men working in shift work were absent more days than women with regular working hours. Educational level also had a significant influence on the number of days absent, whereby respondents with intermediate vocational and pre-university education have the highest average of number of days absent. The more days a week a respondent normally works, the higher the number of days absent in the last 3 months.

Table III. Results of poisson regression analysis on number of days absent (scaled Pearson chi-squared [χ^2] 2740.583, degrees of freedom [df] 133 [value/df 20.606])

Characteristic	B	95% CI (lower, upper bound)
Country		
UK vs the Netherlands	–0.19*	–0.35, 0.02
France vs the Netherlands	–0.44**	–0.56, 0.32
Germany vs the Netherlands	–0.26**	–0.38, 0.13
Patient characteristics		
Gender (1: male, 2: female)	0.27**	0.19, 0.35
Age (years)	0.01*	0.01, 0.02
Educational level		
Primary school[a]	0.48**	0.27, 0.69
Lower vocational education[a]	0.17	–0.04, 0.38
Junior general secondary education[a]	0.22*	0.01, 0.43
Pre-university education[a]	0.54**	0.35, 0.72
Intermediate vocational education[a]	0.60**	0.41, 0.79
Higher vocational education[a]	0.49**	0.30, 0.67
Disease characteristics		
Years of rheumatic disorder	–0.04**	–0.04, 0.03
Seriously restricted vs not restricted	–1.16**	–1.37, 0.96
Somewhat restricted vs not restricted	–0.57**	–0.75, 0.38
Impact of rheumatic disorder (0: worst possible to 100: best possible)	–0.01**	–0.01, 0.003
Pain due to rheumatic disorder (0: worst possible to 100: best possible)	0.01**	0.01, 0.012
Labour characteristics		
Shift work (1: yes, 2: no)	0.28**	0.19, 0.37
Number of contract days	0.20**	0.14, 0.26
Decision latitude (1: never to 4: always)	–0.16**	–0.19, 0.12
Compensation by others	–0.75**	–0.88, 0.63
Disability insurance		
Requested disability insurance (1: yes, 2: no)	–0.50**	–0.60, 0.41
Quality of life		
Experienced health (0: worst possible to 100: best possible)	–0.01**	–0.012, 0.007
EQ-5D utility (0: worst to 1: best possible health)	0.30*	0.12, 0.48

a Versus university.

* $p < 0.05$; ** $p < 0.001$.

Presenteeism

Overall presenteeism is significantly influenced by a number of variables. The model has an R^2 of 0.16. Poor general health significantly increases the possibility of presenteeism at work. In addition, a larger number of contract hours and high job demands are also positively related to presenteeism. However, having a rheumatic disorder for a higher number of years has a negative relation with regard to presenteeism, meaning a decreased possibility of presenteeism at work. When a respondent has high decision latitude at work this also decreases the possibility of presenteeism. Regarding overall presenteeism, the variable country has no statistically significant influence (table IV)

The statistical model explains 17% of the quality-related presenteeism. The possibility of quality-related presenteeism is significantly higher in France and Germany than in the Netherlands. In Germany, in particular, there is a higher chance that the quality of the work is lower than normal in comparison with the Netherlands. Furthermore, the number of contract hours increases the possibility of presenteeism. However, some other variables are negatively related to the occurrence of presenteeism. Better experienced health, a high utility score and high decision latitude decrease the possibility that the quality of work on the last working day was lower than on a normal working day.

The R^2 of this model on quantity-related presenteeism is 0.15. Having a partial disability leads

Table IV. Results of logistic regression analyses on presenteeism

Characteristic	Odds ratio	95% CI (lower, upper bound)
Presenteeism		
Disease characteristics		
Years of rheumatic disorder	0.97*	0.95, 0.99
Labour characteristics		
Temporary contract (1: yes, 2: no)	1.77	0.98, 3.13
Decision latitude (1: never to 4: always)	0.76*	0.63, 0.91
Job demand (1: never to 4: always)	1.36*	0.98, 1.88
Number of contract hours	1.03*	1.01, 1.06
Disability insurance		
Partial disability (1: yes, 2: no)	0.41*	0.22, 0.85
Quality of life		
Experienced health (0: worst possible to 100: best possible)	0.99	0.98, 1.00
General health (1: very good to 5: very poor)	1.79**	1.33, 2.40
Quality presenteeism		
Country		
UK vs the Netherlands	1.24	0.69, 2.14
France vs the Netherlands	1.91*	1.13, 3.16
Germany vs the Netherlands	2.84**	1.67, 4.82
Patient characteristics		
Age (years)	0.98	0.96, 1.00
Labour characteristics		
Relation with colleagues (0: very bad to 10: very good)	0.92	0.83, 1.01
Decision latitude (1: never to 4: always)	0.83*	0.68, 0.98
Number of contract hours	1.03*	1.00, 1.05
Disability insurance		
Partial disability (1: yes, 2: no)	0.57	0.30, 1.11
Quality of life		
Experienced health(0: worst possible to 100: best possible)	0.98*	0.97, 0.99
EQ-5D utility (0: worst to 1: best possible health)	0.36*	0.14, 0.97
Quantity presenteeism		
Disease characteristics		
Impact disorder (0: worst possible to 100: best possible)	1.01*	1.00, 1.01
Years of rheumatic disorder	1.03*	0.95, 0.99
Labour characteristics		
Temporary contract (1: yes, 2: no)	2.27*	1.29, 4.00
Number of contract hours	1.03*	1.00, 1.05
Disability insurance		
Partial disability (1: yes, 2: no)	0.30**	0.16, 0.6
Quality of life		
General health (1: very good to 5: very poor)	1.80**	1.40, 2.31

* $p < 0.05$; ** $p < 0.001$.

to a reduction in the quantity of work on the last working day. The country someone is living in does not have a significant influence on the quantitative dimension of presenteeism. When the rheumatic disorder has a high impact on the respondent's life and when the disorder has been experienced for a longer period, presenteeism is less likely in the sense that a lower quantity of work is done. Furthermore, having poor general health, a fixed contract and a high number of contract hours result in a lower quantity of work, thus less work was carried out on the last working day than on average.

Discussion

It was already clear that wages differ between countries, but our results indicate that country has a statistically significant influence on the lost productivity-related variables. In these respondents with rheumatic disorders, not only disease characteristics and QOL but also the country of residence influence lost productivity. Significant differences can be found between the Netherlands, the UK, France and Germany on 'being absent in the last three months', 'number of days absent in the last three months' and 'quality of work on the last working day'. Between-country differences could not be found by the dependent variables 'overall presenteeism' and 'quantity of work on the last working day'. Therefore, it can be concluded that country also has a significant influence on lost productivity when other variables that influence lost productivity are taken into account. For that reason it is not advisable to transfer lost productivity data between countries without adaptation, as the transferability of the data is hindered by the significant differences between countries. However, the results did not clarify whether the between-country differences are the consequence of differences such as those in system characteristics, or cultural and environmental or possibly genetic differences.

The results of this study are generally in line with the broader literature regarding which variables influence lost productivity, including the results that seem counterintuitive. The influence of country of residence on lost productivity has been seldom researched until now. However,

similar findings have been reported by Boonen et al.,[15] who also found significant differences between countries in lost productivity. Our results that older respondents are likely to be absent less often and that people who suffer from a rheumatic disorder for a longer period are less likely to report presenteeism were also reported by Van den Heuvel et al.[10] The results for older respondents can be explained by the 'healthy worker effect', which states that older respondents who are so seriously restricted by their disease that it will result in lost productivity have already left the workforce.[10] As a result, these older respondents were not included in our study sample. The counterintuitive relationship between the seriousness of restriction and presenteeism can, according to Van den Heuvel et al.,[10] be explained by the fact that these respondents have adapted their work according to the degree of restriction caused by the disease. The rest of the results are in line with the theoretical framework described in the Introduction.

According to the literature, the theoretical framework indicates which variables have an influence on lost productivity. In particular, the influence of country on lost productivity was not clear and was therefore investigated in this study. In addition to country, other variables included in the theoretical framework had a statistically significant influence on lost productivity. These variables belong to all characteristics presented in this framework, but which variables are significant differs slightly among the dependent variables. The variables included in the theoretical framework can be seen as a starting point, because all elements have a statistical influence on lost productivity. In addition, in international studies, country should be included in the theoretical framework as country has been found to have a statistically significant influence on some components of lost productivity. The overall results indicate that a variety of variables have a statistically significant influence on lost productivity.

However, only about 15% of the lost productivity could be explained by the statistical models. This indicates that other factors that were not included in the theoretical model, and therefore also not in the analyses, influence lost productivity. The variable 'compensation by others' was only included in the independent variables related to absenteeism as these questions were only included for absenteeism. However, it could be that compensation mechanisms also have an influence on presenteeism. In addition, coping with the disease by respondents could probably also influence the development and magnitude of lost productivity. Respondents with more adequate coping styles could have lower lost productivity. However, it is unclear which other factors have a significant influence on either the development or magnitude of lost productivity.

Limitations of the Study

The study has several limitations, mostly related to the study sample. In order to obtain a sample with a homogeneous disease state, only respondents with a rheumatic disorder were included. Allowing for different disease states might have introduced some bias. However, it is not clear whether the rheumatic disorder was diagnosed by a medical doctor for all respondents or whether respondents with self-reported rheumatic disorders were also included in the sample. The results presented are therefore applicable only to this population and our findings need to be confirmed in other disease areas. Furthermore, the data were collected using an online questionnaire which may have systematically excluded patients with a lower socioeconomic status, given the need for access to a computer and the internet. However, in these four countries most people have access to a computer with internet, which limits the impact of this potential source of selection bias.

Moreover, only respondents living in four European countries were included: a total of 200 respondents per country in the UK, France and Germany and 230 respondents in the Netherlands, resulting in a total of 830 respondents. Only respondents with a paid job were included in the analyses, leaving a total of 539 respondents. This number of respondents was large enough to perform all statistical analyses and to identify statistically significant differences. The number of countries, however, was limited to four Western European

countries. Therefore, it is not clear if the results found in this study can be generalized to other Western European countries. One difference compared with other countries is that the social security system is well developed in these four countries. As a consequence, our results are probably not useful for other European countries or for countries in other continents due to potential cultural differences with the four countries included in this study, differences in labour markets and differences between social security systems.

In addition, the study questionnaire was developed using existing validated questionnaires or specific parts of questionnaires. Unfortunately, no international questionnaires about disability insurance for individual respondents were available. As a consequence, the questions concerning disability insurance had to be specially formulated for this research and these remain yet to be further validated.

Conclusion

The results show that country has a relevant and statistically significant influence on lost productivity. Therefore, the lost productivity data are not comparable across countries; this hinders the transferability of lost productivity data for patients with rheumatic disorders. Furthermore, it is not yet clear how the lost productivity data can be adapted in a valid manner. However, only respondents from four European countries were included. It would be advisable to carry out more research to investigate whether lost productivity – especially quantity – differs between other countries and among other patient groups.

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