

Socio-demographic and morbidity characteristics in people on long-term sick leave

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Abstract

Background. Certifying long-term sick leave along with coordination of the complex rehabilitation programs are important activities of social insurance doctors. They have the role in preventing the loss of work capacity of employees which may lead to leaving the labor market and transition to other social insurance benefits, such as work disability pension.

Objectives. Analysis of long term sick leaves (over 183 days) with the identification of risk factors and population groups with low potential for work capacity rehabilitation.

Method. We conducted a cross-sectional study between September 2019 and September 2020. The information was collected from the registers of the National Institute of Medical Assessment and Work Capacity Rehabilitation Bucharest and from the EXPMED application. The data were statistically analyzed using the PSPP software.

Results. The highest percentage of rehabilitation was achieved in case of traumatic injuries (73.17%), followed by musculoskeletal diseases (70.06%). We noticed lower recovery in case of nervous system diseases (50.56%) and cardiovascular diseases (44.23%). In other pathologies the recovery percentage was 58.37%. People who regained their work capacity were significantly younger than those who turned to other forms of social benefits, disability pension or old-age pension (47.87 ± 8.93 vs. 53.16 ± 8.43).

Conclusions. Most of the subjects (72%) regained their work capacity and did not need disability pension. We identified different socio-demographic and morbidity characteristics in people on long term sick leave and target groups that require intensive intervention measures.

Background

Absenteeism from work produces measurable effects on labor productivity and generates additional costs for social security systems. Sick leave is a benefit granted by law to employees who are physically or mentally unable to carry out their professional activity, for variable periods depending on the nature and severity of their health condition. (1, 2)

The current legislation in Romania stipulates that the amount corresponding to the first five working days of sick leave to be paid by the employer and for the following days to be paid from the Unique National Health Insurance Fund (FNUASS-Romanian abbreviation). (3)

In Romania, the maximum duration of sick leave is up to 183 days with the possibility of extension up to 273 days in certain situations, both for common diseases or injuries outside work, as well as for work accidents and occupational diseases. The period of temporary incapacity for work is accepted for a longer period, between 1 year and 1 year and a half, in special cases: cancer, AIDS, tuberculosis, some cardiovascular diseases. (3)

The social security legislation for temporary work incapacity provides cash benefits in order to compensate for the loss of income due to illness. This financial support during periods of temporary incapacity for work is assigned for medical treatment and work capacity rehabilitation. In general, long-term sick leave is a major concern for all health insurance systems.

The process of returning to work after temporary work incapacity must follow all the necessary steps for safe reintegration of the worker but paying attention at the proper management of the period of temporary work incapacity. (4)

Access to appropriate medical treatment as soon as possible along with a suitably modified work on a position that maximizes skills and experience are important parts of prevention in health care. (5)

The activity of social insurance physicians regarding the evaluation of the temporary incapacity for work involves a comprehensive approach focused on assessing the remaining abilities and prognosis of work capacity rehabilitation in cases of long-term incapacity for work (91–273 days of sick leave) in all medical conditions. (3, 6)

The main objective is to avoid work disability by early identification of the optimal time range in which a maximum medical improvement could be obtained, keeping patient's ability to successfully return to work in a safe, productive and competitive way.

A significant step in the correct management of these cases would be for the social security physicians to assume more responsibly their lead role in supervising long periods of temporary work incapacity, together with the other healthcare providers: attending physicians or general practitioners.

The recommendations for establishing the optimal period of temporary incapacity for work include successive evaluations at each 30 days, within the maximum period provided by law, based on the systematic functional evaluation depending on the diagnosis.

The prognosis of work capacity rehabilitation is estimated according to the classical clinical and functional parameters while considering the contextual factors.

The following strategy is in use:

1. The prognosis of work capacity rehabilitation is considered favorable if medical rehabilitation is obtained within the first stage of temporary work incapacity (first 90 sick days). This is the case of mild functional impairment defined by the improvement of specific functional parameters. Return to work is decided if the person performs a light/sedentary work, carried out in adequate working conditions. Another 30 days of sick leave will be approved until normal functioning is obtained in case of more demanding professional activities or comorbidities that may increase the risk of more severe forms of diseases with poorer functional status.
2. If rehabilitation program from the first stage of temporary work incapacity (first 90 sick days) does not bring enough improvement (suggested by the persistence of abnormal functional parameters)

the social insurance physician may request a new medical evaluation. Depending on the patient's condition, an additional period of temporary work incapacity will be approved or the assessment of the remaining work capacity will be recommended.

3. If an optimal functioning could not be achieved during the maximum period of temporary work incapacity provided by law, work capacity assessment will be indicated, according to current procedures. This situation is characteristic for disabling functional impairments when despite active monitoring, the course of the disease is slowly favorable, the patient remains symptomatic and the functional parameters do not significantly improve.
4. For severe medical conditions with poor medical prognosis during the prolonged period of sick leave, the minimum time necessary to complete the procedure for granting a degree of work disability will be approved.

Several determinant factors for work capacity rehabilitation have been described in the literature: socio-demographic, occupational or factors related to social security systems and policies. Many extensive studies come mainly from Nordic countries, where a coordinated system of good practices works on monitoring absenteeism due to medical causes (temporary incapacity for work), prevention and implementation of measures to promote early return to work and job retention (7, 8). We wanted to identify the characteristic factors for Romania. To our knowledge no such study was done until now.

Methods

We analyzed the long-term sick leaves (over 183 days) certified by The National Institute of Medical Assessment and Work Capacity Rehabilitation Bucharest. The procedures are established by the National House of Public Pensions (CNPP-the Romanian abbreviation), in relation to the disease progression and the results of the individualized rehabilitation program. For this purpose we conducted a cross-sectional study between September 2019 and September 2020.

A number of 3889 sick leaves was studied, 1306 in 2019 and 2583 in 2020, with an average of 299 sick leaves/month. Few socio-demographic factors were available: age, gender and county of residence. Medical reason for sickness absence (illness or injury) and the number of days granted in each case were specified. We also had information about the clients' condition at the end of the sickness period: they were fully recovered, the severity of their illness required a partial or full work disability pension, they were entitled to old age pension or early retirement and the number of deceased persons.

All socio-demographic and medical parameters were compared between groups by chi-square test (for nominal and categorical variables) or by independent-samples t-test (for numeric variables). In order to increase the validity of the study, the results were certified using additional statistical methods: correlation analysis, multiple linear regression for the continuous dependent variables and multiple logistic regression for dichotomous dependent variables. Statistical significance p-value was conventionally established at 0.05 and parameters estimated for a 95% confidence interval. The data were processed with PSPP software.

All methods were carried out in accordance with current guidelines and regulations.

Results

Socio-demographic situation.

The subjects were mostly men: 2140 (55%) men vs. 1749 (45%) women. The mean age of the group was 49.45 ± 9.15 years, with generally lower ages among women: average age of women / men: 48.35 ± 8.48 vs 50.36 ± 9.57 ; $p < 0.001$.

The group included all people who requested more than 183 days of sick leave in the specified period of time and came from all counties of Romania. We analyzed this population referring to the development regions of Romania, eight larger regional divisions which do not have an administrative status but serve as a unit for collection of regional statistics. They are named by their geographical position in the country: (1) Northeast, (2) Southeast, (3) South, (4) Southwest, (5) West, (6) Northwest, (7) Center, and (8) Bucharest-Ilfov. The analysis of the degree of GDP in each developing region in Romania in the period 1995–2010 highlighted that the South and North Regions are two regions having a low level of economic development; on the contrary, Bucharest-Ilfov and Western and North-West Regions have a higher level of economic and social development than the other regions. (9, 10, 11) (Table I)

Table I. Number of requests depending on the development regions of Romania

Regions	Name	Number of requests (%)	GDP (% from EU average)
1	Northeast	426 (3%)	36
2	Southeast	303 (6%)	52
3	South-Muntenia	729 (8%)	46
4	Southwest-Oltenia	417 (11%)	42
5	West	283 (14%)	60
6	Northwest	198 (17%)	51
7	Center	481 (19%)	54
8	Bucharest-Ilfov	1052 (22%)	139
Total	Romania	3889 (100%)	58

Number of requests and days needed for recovery

The average number of sick days over 183 days for various pathologies was 64.81 ± 27.65 . Depending on the number of days off from work due to illness requested, there were three periods of time off paid ($p <$

0.001):

- less than 30 days (most for 30 days): 24.40 ± 8.91 (886 requests)
- between 31 and 60 days (most for 60 days): 54.25 ± 9.68 (950 requests)
- over 61 days, (most for 90 days): 88.79 ± 4.89 (2053 requests)

An analysis according to the medical cause was also performed and clinical diagnosis was coded according to ICD-10, the 10th revision of the International Statistical Classification of Diseases and Related Health Problems.

Most requests for sickness absence were determined by musculoskeletal disorders (ICD-10 code M00-M99–46.28%), followed by traumatic injuries (ICD-10 code S00-T98–28.64%). On the 3rd place were the diseases of the circulatory system (ICD-10 code I00-I69 with 7.83%) and the diseases of nervous system (ICD-10 code G00-G69) occupied the 4th place with 4.62%. Other pathologies accounted for 12.63%; $p < 0.001$. (Table II)

The highest average number of days was given to musculoskeletal pathology respectively 69.54 days for one case, followed by the traumatic pathology with an average of 68.80 days for one case; $p < 0.001$. The average number of approved days for the pathology of the nervous system was 68.19 and occupied the 3rd place. Diseases of the circulatory system were on the 4th place with an average number of 61.80 days/case (Table II).

Men required a higher number of days to recover than women (66.03 ± 26.92 vs. 63.29 ± 28.46 ; $p = 0.003$). Also, a higher number of days of sick leave in the last year has been used by those who have retired, 71.94 ± 25.04 vs. 65.41 ± 27.31 days; $p = 0.012$.

Table II. Distribution of requests and rehabilitation according to ICD-10

ICD-10	Nervous system (G00-G99)	Circulatory system (I00-I99)	Musculoskeletal system (M00-M99)	Injury (S00-T88)	Other pathologies	Significance (p)
% of requests	4.62%	7.83%	46.28%	28.64%	12.63%	< 0.001
Nr. of days	68.19 ± 26.68	61.80 ± 28.75	69.54 ± 26.03	68.80 ± 25.07	52.08 ± 29.57	< 0.001
Rehabilitation (%)	50.56%	44.23%	70.06%	73.17%	58.37%	< 0.001

Social and economic impact of long-term sick leave

We investigated the relationship between the number of days needed for rehabilitation and social and economic factors, known for their impact on health and access to medical care. The number of days needed for rehabilitation was strongly correlated with the richness and opportunities of the region of origin. Correlation analysis showed a negative correlation between the number of days needed for rehabilitation and the regional position in the economic ranking, in the sense that the number of days requested decreases with the increase of the level of social and economic regional development; $r=-0.89$, $p = 0.003$, so persons from richer regions took significantly lower number of days for rehabilitation (Fig. 1). Other studies have also communicated strong correlation between patterns of mortality and disability and geographical areas of socio-economic deprivation. (12, 13). In our case, this might have several explanations: people in poorer regions may have had more severe forms of illness, sick leave days have been used not only for recovery, but either as a refuge from dissatisfaction at work, in terms of salary, work schedule or duties or to compensate for the cumbersome administrative process.

Statistical significance for the variables associated with the length of sick leave (regional development, clinical diagnosis, retirement status) was tested using multiple linear regression. From these parameters, the best coefficients were obtain only for regional community and clinical diagnosis. In conclusion, the predisposed people for using a longer period of sick leave are those who have traumatic or musculoskeletal pathology and are coming from poor socio-economic regions (Table. III).

Table III. Odds ratio (OR) and 95% confidence intervals (CI) for factors associated with longer sick leave

Variable	Significance (p)	OR (95% CI)
Regional development	< 0.001	2.48 (2.05–2.90)
Clinical diagnosis	< 0.001	10.29 (7.78–12.80)

From our analysis it turned out that more than 95% (95,9466%) of the requested sick leave days were confirmed but practice has shown that this percentage also includes the situations in which it was not possible to meet the timing of the current procedure and required approval to cover periods justified more by bureaucracy, less by poor health.

The gross daily amount of the allowance for temporary incapacity for work, due to a common illness, represents 75% of the average daily income. Taking into account that in Romania in 2021 the average gross salary was about 1166 EUR, the annual financial impact on the budget only for compensations for long-term sick leaves was estimated at more than 40 million EUR/year. Many authors have shown that to this amount other costs should be added: health care expenditure, impact on workers and their families or loss of productivity, which are difficult to estimate. (14) Other papers estimated that the indirect costs of work accidents and occupational diseases can be four to ten times greater than the direct costs. The ILO estimates that lost working time, workers' compensation, interruption of production, and medical expenses could cost up to four per cent of the global GDP. (15)

Data regarding rehabilitation

The highest percentage of rehabilitation was achieved in the case of traumatic injuries (73.17%), followed by musculoskeletal diseases (70.06%). We noticed lower recovery for nervous system diseases (50.56%) and cardiovascular diseases (44.23%). In other pathologies the recovery percentage was 58.37%; $p < 0.001$

People who regained their work capacity were significantly younger than those who turned to other forms of social benefits, disability pension or old-age pension (47.87 ± 8.93 vs. 53.16 ± 8.43); $p < 0.001$. In contrast, the recovery rate was not significantly different between the two sexes (70.71% vs. 72.70%).

Their condition at the end of the period of temporary incapacity for work was analyzed globally and according to the medical cause based on the following categories:

- fully recovered (resumed professional activity)
- eligible persons to receive an work disability pension, according to the degree of work disability (permanent incapacity for work)*
- old-age pensioners

At the end of the period of temporary incapacity for work 72.43% recovered and resumed their professional activity, 21.35% benefit from work disability pension (permanent incapacity for work) and 6.22% received early or full retirement benefits.

According to the degree of work disability, 1.35% benefited from 1st degree, 7.20% from 2nd degree and 12.80% from 3rd degree.

**According to law no. 263 from 2010 on the unitary system of public pensions, the work disability is defined in relation to the degree of loss of work capacity as follows:*

- a) 1st degree, characterized by total loss of work capacity and self-care, persons need daily assistance for basic activities;*
- b) 2nd degree, characterized by the total loss of work capacity, while maintaining self-care ability;*
- c) 3rd degree, characterized by the loss of at least half of the work capacity, the person being able to perform a professional activity at part time. (Law no. 263 from December 16th 2010, article 69).*

The analysis of the condition at the end of the period of temporary work disability depending on the medical cause (according to ICD-10 codes), showed that the highest percentage of recovery was obtained in cases of traumatic injuries – 73.17%, followed by the recovery in a percentage of 70.06% of musculoskeletal diseases. A lower recovery was observed in cases of diseases of the nervous system

(50.56%) and only 44.23% of cases recovered from diseases of the circulatory system. Other pathologies recovered in 58.37% of cases; $p < 0.001$.

To certify the independent contribution of each of the variables (age and type of disease) to predict return to work (nominal dichotomous variable – return to work: yes/no), we performed a binary logistic regression analysis. The data suggest that age and clinical diagnosis are the best indicators for resuming professional activity at the end of the sick leave period; in this case, persons were not classified as work disabled or retired (Table. IV).

Table IV. Odds ratio (OR) and 95% confidence intervals (CI) for factors associated with return to work

Variable	Significance (p)	OR (95% CI)
Age	< 0.001	1.07 (1.06–1.09)
Clinical diagnosis	< 0.001	2.30 (1.85–2.86)

A different category has also been identified, caused by fatal events. Mortality rate was reduced 0.2% (8 cases): 2 from circulatory diseases (strokes), 2 in case of severe musculoskeletal diseases and 4 from traumatic injuries (complex polytrauma).

Discussion

The mission of social insurance physicians is to contribute to better management of temporary work incapacity, from 91 to 273 days of sick leave for different pathologies. This activity requires experience and continuity. In the same time, the specific legislation must be applied.

Considering that monitoring temporary incapacity for work is initiated by social insurance physicians at territorial level and continued in INEMRCM, we are an effective working professional group, the aim being the optimal control of long term sick leaves. However, knowledge about predictive factors for long-term sickness absence and work disability pension is limited.

Our study showed that more frequently, older people did not resume their professional activity and applied for other forms of social benefits. Age has been identified in many studies as a strong predictor for employee absenteeism (8, 16, 17). However, the relationship is not analyzed in detail. It is not clear whether the higher prevalence of absenteeism among older employees is due to the physiological functional decline or to the fact that young employees are preferred in the labor market. The age influence is also estimated in terms of sick leave duration. Thus, older employees may have longer sick leaves compared to younger ones. We did not find any significant difference in this regard. Workplace demands, cultural factors, ethical and moral standards were also mentioned as potential factors that may influence absenteeism at workplace, differentiated by age groups and regardless of clinical diagnosis (8, 16).

Higher rehabilitation was found in traumatic injuries and musculoskeletal diseases. Low risk for disability pension in injuries was indicated by other researches (18)

Higher duration of sickness absence was reported in musculoskeletal diseases and traumatic injuries. Most days of sick leave taken in the categories musculoskeletal diseases or external causes were also found by other authors. (19)

Our study found a higher duration of sickness absence at those coming from less developed regions. Similar results were reported in studies conducted in several European countries, proving that social and economic status significantly influences temporary incapacity for work. The causes are related to living conditions, behavioral factors and lifestyle with a direct impact on health or to unfavorable working conditions. (20, 21)

Several limits of the study should be considered. Due to an incomplete information system, limited data were reported. Significant social and professional information was lacking about marital status, children, level of education, profession, length of service, field of activity. An indirect and rough information regarding the economic status was made from perspective of subjects belonging to the development regions of Romania.

Given that prolonged sick leave is requested by various specialist physicians, it become necessary to raise their awareness to provide the most complete data, including social and professional aspects and the development of training programs regarding the management of sick leaves. In these programs, setting two important objectives should be underlined: improve health condition along with return to the same level as before of social and professional activity. There is also a need to raise awareness of the economic impact of periods of temporary incapacity for work, by reduced productivity and costs to the state budget.

It should also be noted that this paper did not analyze the information regarding issue of sick leave certificates for certain diseases (specific cardiovascular diseases, AIDS, neoplasms or tuberculosis). In these cases, according to the current legislative provisions, the allowance for temporary incapacity for work can be granted for a longer period of time, up to one year or one year and a half and the social insurance physician's approval is not necessary, the attending physician having the entire responsibility for the cases.

From these perspectives, this paper refers to a limited aspect regarding the temporary incapacity for work, respectively the long-term temporary incapacity for work in well-defined pathological situations (over 183 sick days and which requires the approval of INEMRCM). For a national level overview of the phenomenon, the present data should be integrated and correlated with more statistical data from other institutions with responsibilities in this field (National Health Insurance House, National House of Public Pensions) and with several socio-economic data, which would provide a better image of the cost of illness and the financial burden of paying sick leave benefits in particular.

Conclusions

In total, 72% of people who received a prolonged sick leave returned to work. The remaining 28% were either severely affected which qualified them to receive a type of work disability pension or they met the criteria to early or age-limit retirement. Older people who have had cardiac or neurological diseases have regained their ability to work to a lesser extent. Complex and individualized intervention measures must be applied to this vulnerable group.

In over 95% of cases, the sick leave days were granted, but it was found that the application did not fully reflect the medical condition, but also situations with difficult administrative procedure. At the same time, the burden of sick leave is significant. These findings allow us to draw up some measures to improve the activity.

Sick leave has traditionally been authorized by social insurance physicians and INEMRCM, thereby having control over paid leave expenditure. Recent changes to the Romanian methodology of granting sick leaves have already been made. A new procedure has been established which provides the assessment of the health condition and the monitoring of the patients, through the plan for following the evolution of the disease, drawn up by the attending physician. The rehabilitation plan is customized, so that the measures can be closely followed. Their impact is expected to be reflected in the decrease of the period of temporary incapacity for work, full regaining of work capacity and fostering social and professional reintegration.

Declarations

- **Ethics approval and consent to participate:** The study was approved by the Ethics Committee of The National Institute for Medical Assessment and Work Capacity Rehabilitation Bucharest and all the data was processed anonymously and complied with the principles stipulated in the Declaration of Helsinki.
- **Consent for publication** All authors approved the manuscript and this submission.
- **Availability of data and materials** The datasets analysed during the current study are provided in a supplementary file.
- **Competing interests** The authors report no declaration of interests
- **Funding** Not applicable
- **Authors' contributions:**
 - CO had substantial contribution to the conception, analysis, interpretation of data and drafted the manuscript
 - DG had substantial contribution to the conception, design of the work and revision of the manuscript
 - SC had substantial contribution to the conception, design of the work and acquisition of data
 - All authors read and approved the final manuscript.

References

1. Codul muncii, ediția a 13-a actualizată la 1 februarie 2021, editura Rosetti Internațional, București 2021, ISBN 978-606-025-051-7
2. Țiclea A, Georgescu L - Dreptul securității sociale, curs universitar, ediția a V-a revăzută și adăugită, Editura Universul juridic, București, 2014
3. Emergency Ordinance no. 158/2005 on sick leaves and social insurance benefits with subsequent amendments and completions
4. Cathryn Baldwin C, Brusco NK (2011) The Effect of Vocational Rehabilitation on Return-to-Work Rates Post Stroke: A Systematic Review, *Topics in Stroke Rehabilitation*, 18:5, 562–572, DOI: 10.1310/tsr1805-562
5. International Social Security Association (ISSA) Guidelines: Return to Work and Reintegration; <https://ww1.issa.int/guidelines/rtw>; accessed January 15th 2022
6. Order No. 15/2018 on the approval of the Norms for the application of the provisions of the Government Emergency Ordinance no. 158/2005 on sick leaves and social insurance benefits
7. European Commission, Sick pay and sickness benefit schemes in the European Union, Background report for the Social Protection Committee's, In-Depth Review on sickness benefits, Brussels, 17 October 2016
8. Thorsen S.V., Friberg C., Lundstrøm B., Kausto J., Örnelius K., Sundell T., Male Kalstø A., Thune O., Gross B., Petersen H. and Haram, O. (2015) 'Sickness Absence in the Nordic Countries', *Nordic Social Statistical Committee (NOSOCO)*, 59:2015.
9. Gheorghe Zaman Gh, Goschin Z, Vasile V - Evoluția dezechilibrului teritorial din România în contextul crizei economice; *Romanian Journal of Economics*, 2013, vol. 37, issue 2(46), 20–39; <http://www.revecon.ro/articles/2013-2/2013-2-2.pdf>, accessed January 15th 2022
10. Development regions of Romania, https://en.wikipedia.org/wiki/Development_regions_of_Romania; accessed January 15th 2022
11. GDP per capita in 276 EU regions, <https://ec.europa.eu/eurostat/documents/2995521/8700651/1-28022018-BP-EN/15f5fd90-ce8b-4927-9a3b-07dc255dc42a> accessed January 15th 2022
12. Krokstad S, Johnsen R, Westin S. Social determinants of disability pension: a 10-year follow-up of 62 000 people in a Norwegian county population. *Int J Epidemiol*. 2002 Dec;31(6):1183-91. doi: 10.1093/ije/31.6.1183. PMID: 12540720;
13. Rognerud MA, Krüger O, Gjertsen F, Thelle DS. Strong regional links between socio-economic background factors and disability and mortality in Oslo, Norway. *Eur J Epidemiol*. 1998 Jul;14(5):457–63. doi: 10.1023/a:1007448120325. PMID: 9744677
14. Toseva El, Stoyanova R, Turnovska T. Economic costs due to workers' sick leave at wastewater treatment plants in Bulgaria. *Medycyna Pracy*. 2018;69(2):129–141. doi:10.13075/mp.5893.00577
15. Leppink N - Socio-economic costs of work-related injuries and illnesses: Building synergies between Occupational Safety and Health and Productivity, at INAIL Seminar on «The costs of non-safety»

Bologna, 14 October 2015, https://www.ilo.org/wcmsp5/groups/public/—europe/—ro-geneva/—ilo-rome/documents/genericdocument/wcms_415608.pdf

16. Allebeck P, Mastekaasa A, Risk factors for sick leave – general studies, *Scand J Public Health* 2004; 32 (Suppl 63): 49–108; <https://journals.sagepub.com/doi/abs/10.1080/14034950410021853>
17. Thomson L, Griffiths A., Davison S. Employee absence, age and tenure: a study of nonlinear effects and trivariate models. *Work and Stress*2000; 14(1): 16–34.
18. Gjesdal S, Bratberg E. Diagnosis and duration of sickness absence as predictors for disability pension: results from a three-year, multi-register based* and prospective study. *Scand J Public Health*. 2003;31(4):246–54. doi: 10.1080/14034940210165154. PMID: 15099029)
19. Vahtera J, Westerlund H, Ferrie JE, Head J, Melchior M, Singh-Manoux A, Zins M, Goldberg M, Alexanderson K, Kivimäki M. All-cause and diagnosis-specific sickness absence as a predictor of sustained suboptimal health: a 14-year follow-up in the GAZEL cohort. *J Epidemiol Community Health*. 2010 Apr;64(4):311–7. doi: 10.1136/jech.2008.083923. Epub 2009 Aug 13. PMID: 19679706; PMCID: PMC2925046
20. Krokstad S, Johnsen R, Westin S. Social determinants of disability pension: a 10-year follow-up of 62 000 people in a Norwegian county population. *Int J Epidemiol*. 2002 Dec;31(6):1183-91. doi: 10.1093/ije/31.6.1183. PMID: 12540720
21. Shiels C, Gabbay MB, Ford FM. Patient factors associated with duration of certified sickness absence and transition to long-term incapacity. *Br J Gen Pract*. 2004 Feb;54(499):86–91. PMID: 14965385; PMCID: PMC1314799

Figures

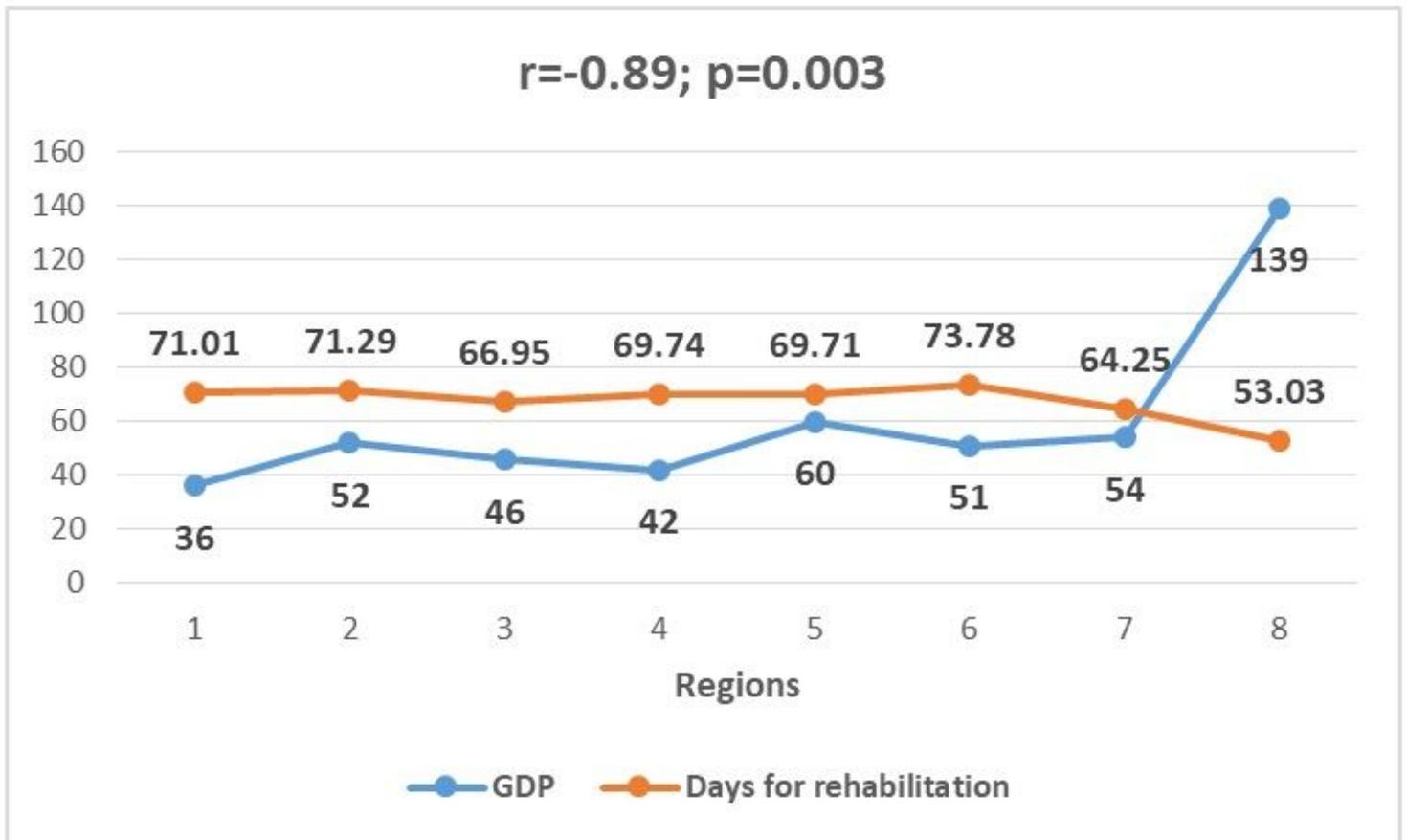


Figure 1

Correlation between the number of sick days needed for rehabilitation and the level of social and economic regional development

Supplementary Files

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