



## Management of Primary Prevention Against Respiratory Diseases in Organizations as an HRM tool

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### ABSTRACT

**Purpose** – This study focusses on the use of risk management tools in crisis situations in organisations, their prediction, and minimisation in the area of potential pandemic respiratory diseases.

**Aims(s)** – It aims to identify the primary tools for prevention against respiratory diseases, to identify the costs associated with this prevention, and to provide the basis for the creation and subsequent dynamization of the Economic Model of preventive measures against respiratory infections, along with the use of AI.

**Design / Methodology / approach** – For this purpose, a detailed search of scientific studies was carried out to identify primary prevention tools against respiratory diseases in organisations, as well as available economic calculations, methods and models. Furthermore, their validation was carried out directly in the organisations through interviews and using the Focus Group method, where the benefits of the individual measures were discussed with representatives of the selected organisations.

**Findings** – The different parts of the future predictive model for the organisation and prevention of respiratory diseases were verified, including input data for the organisation's cost calculator. Based on the identified deviations, adjustments were made to the individual input data for the respective prevention measures in the model under consideration.

**Limitations of the study** – A possible limitation for a more accurate comparison of the results of the search studies with the results of the research could be the current number of enterprises contacted or their location in four regions of the Czech Republic.

**Originality/value** – Its calculation confirms that it is more economically advantageous for a company to invest its resources in the primary prevention of respiratory diseases and to extend its measures to the use of AI in this prevention.

### KEY WORDS

organization, HRM, risk, crisis, respiratory disease, primary prevention, cost calculator

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## 1 INTRODUCTION

For centuries, humanity has been dealing with a wide range of various epidemiological diseases, many of which can be associated with respiratory diseases. In the past century, the largest waves of pandemic flu were recorded in 1918, 1957, and 1968, and were informally identified by their presumed locations of origin as the Spanish, Asian, and Hong Kong flu. The origins of these pandemics have usually not been precisely clarified, are often disputed, and people have had a very difficult time looking for ways to end them. Since there were usually no effective means to end these pandemics, they entailed considerable damage to human life and property (Kilbourne, 2006).

In the 21st century, it seemed that similar situations would not happen again; the healthcare system of developed countries is at a high level, vaccination against the flu has been developed, and there are some measures and tools to deal with potential flu waves. However, in 2019, an unknown virus of COVID-19 disease appeared in Wuhan, China, which quickly spread to all continents and most countries of the world with great speed and due to the globalised environment.

The Czech Republic was not an exception in this regard, which is why this pandemic opened up a discussion among many representatives of companies in the profit sector and public bodies in the territory of municipalities, regions, and states on how to face a similar situation in the future. More and more organizations have begun to address the implementation of preventive measures in the field of crisis management and strategic management; to further consider which management tools from the field of human resources to implement in the event of a pandemic spread of infectious respiratory diseases. Pandemics and diseases affect a few factors that are new to businesses and that they must be able to deal with. This viral disease has caused the bankruptcy of countless businesses, as well as the emergence of risks that are new to businesses. Therefore, it is very important that a company integrates risk management into its normal business activities. (Zuzák and Königová, 2009). Risk management is considered a specific form of management that helps to manage crisis situations. It is a set of methods, procedures, and tools used for extensive analyses that can lead to the detection of problem areas leading to the emergence of risk. (Antušák, Vilášek, 2016). Every organization during its activities is faced with a risk that can develop into a crisis, and for the organization it can mean the paralysis of business activity or even endanger its further functioning. Risk management has become an integral part of the work of managers whose task is to manage, direct, influence, or minimise risks. (Grasse, 2012)

The aim of this study is to find out the basic HRM tools for the primary prevention of respiratory diseases in organizations based on a search of the professional literature. Finding out what the implications of the implementation of HRM tools for the prevention of the spread of respiratory diseases may have for the organization. And it should be checked for individual parts of the prepared Economic Preventive Model of the organization against the spread of respiratory diseases including the calculation of costs and benefits of organizations in connection with the occurrence of respiratory infectious diseases.

## 2 METHODOLOGY

Data on the mentioned topic was obtained by systematically selecting studies from scientific databases and studying the leading research outputs relevant to the stated objectives of this study. The authors' main intention was to search the content of published studies dealing with possible preventive measures and strategies that are introduced or recommended to prevent the spread of infectious respiratory diseases among employees in organizations and then synthesize the conclusions from the searched relevant studies and recommendations. Based on the research, a questionnaire survey was conducted in organizations, and a Focus Group was organized with organizations' representatives on respiratory diseases in the workplace.

According to available literary sources (Fait et al., 2021), prevention against respiratory diseases can be divided into primary, secondary, and tertiary. Primary prevention is aimed at promoting health and preventing diseases when there are no signs of respiratory disease among workers in the organization, secondary prevention already includes workers with signs of possible respiratory disease, tertiary prevention already refers to confirmed respiratory disease infection. In this study, the author team decided to focus first on the HRM tools of the so-called primary prevention of workers' health protection against respiratory diseases. HRM tools mean activities that serve to protect the health of employees (primarily from respiratory diseases) and their application is controlled by HRM. Therefore, a literature search of the sources available in the field of prevention of the spread of respiratory diseases in organizations was carried out with a focus on the so-called primary prevention. These are measures whose implementation can significantly limit the spread of infectious respiratory diseases in workplaces. The data was obtained by a gradual selection of studies and other sources from important scientific databases and then by studying the selected results that corresponded to the stated objectives of this study. The main intention of the authors was to conduct a search of the content of published studies dealing with possible preventive measures and strategies that are introduced or recommended to prevent the spread of infectious respiratory diseases among employees of organizations and then to synthesize the conclusions of the relevant studies and recommendations searched. Scientific databases, Web of Science, Wiley library and Scopus were selected to search for valid conclusions on the given topic. To achieve the objective, it was first necessary to create a research question. For this review of the literature, a prognostic type of review question

was chosen that tries to predict the probability of the relationship or result of the research findings with their confirmation or refutation by the research conducted. Wording of the given questions:

1. What are primary prevention tools against respiratory diseases in organizations?
2. What are the costs of using the primary HRM tools to prevent respiratory disease in organizations?
3. Is there a model that deals with HRM tools and their effectiveness in organizations?

## 2.1 HRM TOOLS OF PRIMARY PREVENTION IN ORGANIZATIONS

One of the most discussed tools to prevent the occurrence and spread of respiratory diseases in the workplace is the home office and sick days chosen by many companies to limit the entry of selected profession workers. A number of authors deal with this in their studies, e.g. Abulibdeh et al. (2020) states that adopting remote work under certain circumstances can reduce the negative impact of the pandemic and be a mitigating measure for the economy of the company. Daniels et al. (2022) deals with the different approach to workers at the workplace and in the home office mode, who recommends evaluating the situation after the pandemic and thus better prepare for possible future crisis situations through communication. The use of remote work in his study is also supported by Ahmed et al. (2020) because it allows employees to do their work without risking the possibility of contracting respiratory diseases. Other studies (Piper et al., 2017; Kumar et al., 2013) emphasize the positive effect of provided sick days on the health protection of employees and on the company's economy.

It is indisputable that a worker with high-quality immunity is more resistant to various types of disease, and thus also to respiratory infections to which he may be exposed in the workplace. Immunity can be strengthened in various ways, for example, Scudiero et al. (2021) states that the functions of the immune system are mainly influenced by physical activity, nutrition, and the absence of respiratory or cardiovascular diseases. According to other authors (Cortez et al., 2020), sports activities, whether performed collectively or individually, are a very important tool for activating immunity among employees; this form of prevention is especially important for workers with sedentary jobs. Other support tools, such as wellness or preventive spa stays, have a similar effect on immunity. The immunity of workers can be further supported with various financial and non-financial benefits. In his study, Hadizadeh et al. (2021) highlights the relationship between vitamin D use and the incidence of various respiratory infections and discusses the postulated mechanisms and clinical data supporting the protective role of vitamin D against complications mediated by COVID-19. Hug et al. (2022) report that a balanced diet that includes adequate amounts of vitamin C, vitamin A, vitamin D, magnesium, selenium, zinc, and phytonutrients has shown promise in increasing immunity in COVID-19 and other respiratory infections due to its potential anti-inflammatory and antioxidant properties. Fragala et al. (2021) assume a change in health benefits in favour of respiratory diseases.

Workers who already have a chronic disease can be particularly affected by the infection of a respiratory disease. Therefore, many organizations focus a priori on the monitoring of risk groups of workers. Singh et al. (2021) state in his research that the following facts have a significant influence on the spread of corona virus infection: age over 65 years, comorbidities, access to hygiene, air temperature, and other factors. In addition to groups of workers with chronic diseases, according to some authors (Moossavi et al., 2021), it is necessary to sufficiently protect workers in healthcare facilities and other high-risk professions or increase the protection of the company's key workers.

Preventive measures against respiratory diseases undoubtedly include increased hygiene measures in businesses. Based on model predictions, some authors (Haque et al. 2021) call for strict hand hygiene and the use of personal protective equipment.

The support for vaccination in the fight against the spread of respiratory diseases is expressed in the study by Singh et al. (2020), who recommends using this effective tool even for uninsured individuals so that there is no further spread of infections.

A modern way of prevention is the use of wearable electronic devices to prevent employees with suspected respiratory infections from personally participating in the work process (De Korte et al., 2018; Fanta et al., 2018) and thus transmitting respiratory diseases within their workplace, the entire company, or in

public areas. Digitization of the healthcare sector enables, on the one hand, a high-quality diagnosis of diseases and, on the other hand, also their effective treatment. Volpi et al. (2021) states that digital diagnostic platforms can be valuable for patients, especially in low- and middle-income countries where it is difficult to access expert clinical advice. The importance of electronic healthcare methods in the present and in the future and the advantages of its use for physicians and patients are addressed in his study by Rowland et al. (2020), who assumes its gradual expansion in most medical fields.

Other authors (Halgurd et al., 2003; Zamora-Illarionov et al., 2020) describe the use of digital diagnostics in the disease of COVID-19, for example, using medical detection kits or cheaper versions of built-in smartphone sensors. These can also be used by ordinary citizens for the purpose of virus detection, measuring the signals of smartphone sensors is part of the designed artificial intelligence (AI), which can be used to predict the severity of the disease in many cases.

## 2.2 COSTS ASSOCIATED WITH THE SPREAD OF RESPIRATORY DISEASES IN ORGANIZATIONS

In addition to the benefits it brings to organizations, the implementation of HRM tools for the prevention of the spread of respiratory diseases is also associated with the costs that had to be incurred for their implementation. On the other hand, according to several authors, business losses caused by the absence of some employees at the workplace due to quarantine or the respiratory disease itself can be eliminated in this way. Hansen et al. (2017) state in their study that infectious diseases can have significant cost and productivity impacts for organizations. It is based on the premise of employers' knowledge of infection prevention strategies at the workplace, or their use and assessment to inform methods to reduce the impact of infectious diseases in the workplace. Meijster et al. (2011) also dealt with the analysis of the costs and benefits of evaluating the costs and benefits for occupational health settings in his work. One of the main objectives of the methodology proposed by him is to evaluate the cost-benefit ratios for the various stakeholders (employers, employees, and society). An estimate of the economic burden for employers due to the spread of respiratory diseases is described in his study by Birnbaum et al. (2002), which establishes a method of tracking the costs and benefits of suppressing the first wave of the Covid-19 pandemic in the United States. The costs of hospitalization, permanent damage to health after an illness, lost profit, etc. are calculated here. The state preventive protection policy was found to bring substantial savings in this direction. In their study, Morales et al. (2004) point out the importance of vaccination against respiratory diseases in terms of costs and benefits in Colombian society, who sees it as an important tool for maintaining existing productivity in organizations. It can therefore be stated that, according to most authors, the main consequence of preventive measures in organizations is a change in costs or a change in efficiency, or productivity. Some methods deal with the adequacy of the costs incurred in relation to the proven benefit (Fanta et al., 2018). These include Cost Minimizing Analysis (CMA), where the evaluation criterion is the lowest project cost. Cost Benefit Analysis (CBA) compares the total expected costs of an intervention with the total expected benefits. Cost-effectiveness Analysis (CEA) is used if the valuation of benefits (benefits) in monetary units using CBA is complicated. Another option to compare the benefits with the costs incurred is the use of the Cost-Utility Analysis (CUA) method. The results are measured in a special way, most often using acquired years of improved quality of life (Quality-Adjusted Life Years, QALY). Benefits are measured in units of the so-called lifetime adjusted for quality of life. It can be stated that the above-mentioned methods of measuring benefits and costs in the field of health care provision can be a certain starting point or a guide for the evaluation of these economic quantities in enterprises, but only after their transformation of measurability to the enterprise level, which their current form does not allow.

Wage compensation, which is provided for the first 14 days of illness for working days, serves as the basis for calculating the costs of an employee's respiratory illness. Since the research was conducted in the Czech Republic, the labour law legislation in the Czech Republic is taken into account. Furthermore, it is necessary to calculate the lost added value that the given employee brings to his employer. Formula for calculating the cost of respiratory disease per 1 employee ( $C_{RD}$ ):

$$C_{RD} = n_d * (WC_d + v_{a_{empl}})$$

where  $n_d$  is the number of working days of the employee's illness,  $w_{ca}$  is the daily wage compensation for the sick employee and  $v_{a_{empl}}$  is the added value per day per given employee.

### 2.3 MODELING THE PREVENTION OF THE SPREAD OF RESPIRATORY DISEASES

It follows from the above facts that the pandemic of respiratory diseases poses a significant risk to business entities and their interest is to eliminate this risk as much as possible. Therefore, the effort of many authors is to create preventive economic models that could bring about certain solutions to crisis situations associated with the spread of respiratory diseases for organizations. Talentsev et al. (2022) present a model for microsimulation of the prediction of the consequences of antiepidemiological interventions and, in this context, estimate public health impacts and direct and indirect cost losses. In their model, Shanmanzari et al. (2022) reveal a fundamental relationship between the structure of Pareto-efficient containment measures (in terms of loss of life and economic activity) and key disease and economic parameters such as disease infection rate, recovery rate, and quality capacity care. The COVID-19 pandemic has led some authors to create models whose implementation represents a reduction in economic losses of business entities. The SIR model (Perakis et al., 2022) enables the prediction of the evolution of COVID-19, and in particular the occurrence of new waves, is essential for the management of operations and supply chains during the pandemic. Identifying and predicting COVID-19 waves is critical to answering three major supply chain questions for manufacturers, retailers, restaurants, and healthcare organizations. In his study, Zieba (2021) presents a model in which he addresses the question of how to face the COVID-19 pandemic in the business sphere, increasing the resilience of businesses in crisis situations, changes in the business models of businesses, the impact of the pandemic on business operations and management.

Although the above-mentioned models represent pandemic preventive measures, they do not a priori address the question of the use of human resource management tools to prevent the spread of respiratory diseases. Therefore, the team of authors of this study decided to focus on the issue of using crisis management tools in the process of preventing respiratory diseases using dynamic modelling and artificial intelligence.

The goal was established at the following levels:

1. carry out a literature search of available sources in the field of prevention of the spread of respiratory diseases in organizations with a focus on HRM tools for primary prevention against respiratory diseases in organizations, quantification of the costs of preventing the spread of infectious respiratory diseases and modelling in this area,
2. assess the current state of implementation of these tools on the sickness of workers in organizations through interviews and Focus Groups,
3. calculate the costs of HRM prevention tools in organizations - the basis is the average cost of the given measure per 1 employee per year, which was calculated from the organization's total cost of the measure per year (TCQ) according to the formula:

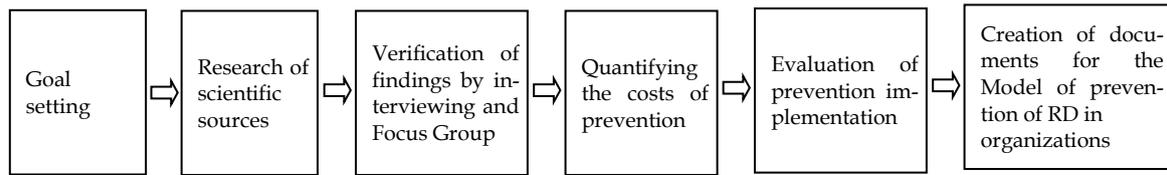
$$TCQ = TC / (Q_{empl} * p_{empl})$$

where TC is the total cost of the organization for the given measure per year,  $Q_{empl}$  is the total number of employees of the given organization and  $p_{empl}$  is the percentage of employees affected by the given measure;

4. create treasures for the Respiratory Disease (RD) Prevention Model in Organizations.

The individual successive steps are shown in the following diagram (Fig.1).

Fig 1. Research diagram



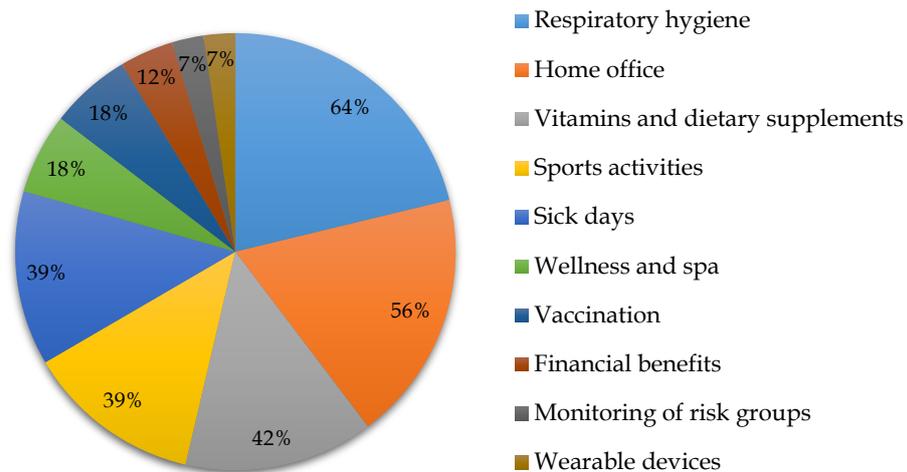
source: own illustration

The questionnaire survey was conducted using the method of guided interviews with qualified representatives of selected organizations within the PIDOZ project ((Preventive Intelligent Digital Health Protection) CZ.01.1.02/0.0/0.0/20\_321/0024397) in the period from November 2022 to March 2023, when its evaluation was carried out. A total of 72 questionnaires were evaluated, the content of which was the use of HRM tools of primary prevention in selected organizations and the list and characteristics of the system and individual organizational measures in them. The organizations participating in the questionnaire were small and medium enterprises, engaged in production or services, with headquarters in Hradec Králové, Pardubice, Central Bohemian Regions, and Prague. The questions were directed at 3 groups of employees: blue-collar professions, admin staffs and managerial professions. As part of research on the use of primary prevention HRM tools, the questions were directed to the areas that were identified as part of the literature search (see above). Representatives of nine organizations, mostly from the Pardubice Region, participated in the Focus Group on the topic "How can we mitigate the impact of respiratory infectious diseases in organizations using artificial intelligence?" This meeting was held at the Faculty of Economics and Administration of the University of Pardubice in March 2023.

### 3 RESEARCH RESULTS

Based on the content analysis of pre-selected texts and the subsequent literature review, the following basic tools of primary prevention against the spread of infectious respiratory diseases in organizations were selected: home office and sick days, vitamins, wellness and spa stay, sports activities, monitoring of risk groups, respiratory hygiene at workplaces, workplace education, vaccination, and the use of wearable electronic devices. Then the step of creating questionnaires for private and public organizations was taken, respectively. preparation of materials for guided interviews in organizations. The purpose of the given investigation was to verify the individual parts of the organization's future predictive model and the organization's prevention of respiratory diseases, including the input data of the organization's relevant cost calculator, and further, based on the verification and detected deviations, subsequent adjustment of the individual input data for the relevant preventions in the given future considered model. It emerged from a questionnaire survey and a Focus Group with selected representatives of organizations (view Fig. 2) that the most used measure of primary prevention is respiratory hygiene at the workplace - 64% of employers surveyed apply this scalding to all groups of workers (labor professions, admin staffs, and managerial professions). 42% of organizations use workplace education and vitamins for all employees. 56% of the organizations mentioned the home office as a means of prevention of respiratory diseases for administration personnel and management professions. 39% of employers also provide their employees with contributions for sports activities and sick days. Wellness and spas and vaccinations (18%), financial benefits (12%) and the least (7% and less) monitoring of risk groups and wearable devices are used less. These findings were also confirmed through the Focus Group, where individual measures were discussed.

Fig 2. Utilization of primary prevention measures in organizations



source: own illustration

The knowledge of the questionnaire survey and the Focus Group is that not all the measures mentioned are beneficial in the fight against respiratory diseases. One such example was financial benefits, which are often provided if the employee meets the minimum absence from work condition. This condition is contrary to the elimination of sick workers on the job and the effort to prevent the spread of respiratory diseases. Therefore, this extended benefit is unfavourable as a prevention against respiratory diseases. According to the questionnaire survey and the Focus Group, the other measures mentioned above can be characterized as beneficial in the fight against respiratory diseases, unfortunately, e.g. monitoring of risk groups and wearable devices are used very rarely.

### 3.1 DETERMINATION OF COSTS ASSOCIATED WITH RESPIRATORY DISEASE AND PRIMARY PREVENTION MEASURES

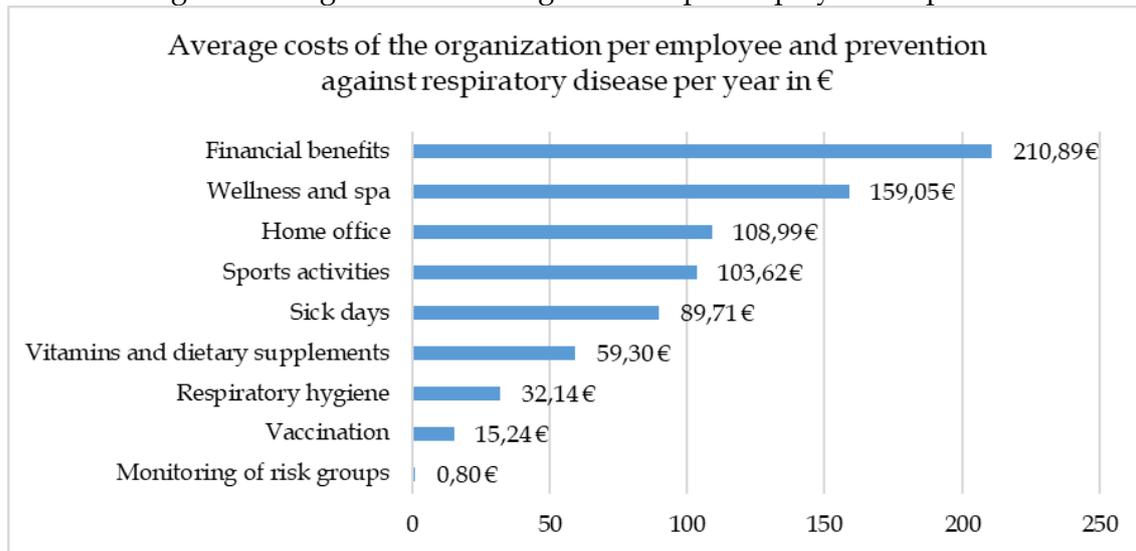
The primary cost associated with a respiratory disease at the workplace is the sick employee's wage compensation ( $w_{c_d}$ ), which is set for working days according to Act 262/2006 Coll., Labor Code. In the case of calculating the wage compensation at an average wage for 2022 of €1,698.36 (CZK 40,353), the  $w_{c_d}$  is €41.92 (CZK 996) (Czech Statistical Office). The cost of lost added value ( $va_{empl}$ ) is based on the average amount stated in the questionnaire survey, i.e., €8,417.51 (CZK 200,000) per year for 1 employee - after conversion, the  $va_{empl}$  is €33.40 per 1 day. Therefore, the total cost of respiratory disease of 1 worker (CRD) at the average salary in the Czech Republic is:

$$C_{RD} = n * (41,92 \text{ €} + 33,40 \text{ €})$$

$$C_{RD} = n * 75,32 \text{ €}$$

On the other hand, based on a questionnaire survey, the average costs of measures against the spread of respiratory diseases were compared in selected organizations, which are based on the total annual cost of the measure specified in the questionnaire. The total costs per year were calculated per 1 worker according to the number of employees who use these measures in the organization - it was considered whether a specific measure is used by all employees or only selected groups of workers according to the data in the questionnaire. From the thus calculated costs per 1 employee, an average was calculated according to the TCQ formula mentioned above. (If there were extremes in some of the cost measures, they were not included in the average). The following graph shows the average costs of individual measures within HRM primary prevention in companies (costs are converted at the CNB exchange rate as of (21/06/2023) 23.76 CZK/1 €)

Fig 3. Average costs of the organization per employee and prevention



source: own illustration

The graph shows that the costs in four cases exceed €100, and, on the other hand, in three measures, they do not reach the amount of €50 per employee per year. It must be added that the organizations do not directly track such a breakdown of costs, and the average numbers are created from expert estimates of the relevant employees in the monitored organizations. The research team divided the costs according to the primary purpose for which the company spends them. Specifically, on costs perceived as:

- a) benefits - contributions to vitamins, wellness, sports activities, financial benefits, sick days, and home office
- b) and Occupational Safety and Health (OSH) - respiratory hygiene and monitoring of risk groups.

With such a breakdown of the average costs per individual, it was found that 96% of the organization's average costs per employee for the prevention of respiratory diseases are benefits. Only 4% are health and safety costs.

### 3.2 PROCEDURES FOR INDIVIDUAL COST CALCULATIONS FOR PRIMARY PREVENTION MEASURES

For the purpose of calculating the costs of primary prevention, individual costs were determined by expert estimation and based on the Focus Group and discussions with representatives of organizations:

1. **Vitamins and dietary supplements:** The annual cost was set at €50.51 (CZK 1,200) per employee by expert estimate, after conversion to 1 working day per employee (calculated with 252 working days per year) €0.40.
2. **Sports activities, wellness and spas:** According to expert estimates and feedback from organizations, the cost was set at €210.44 (CZK 5,000) per employee per year - converted to €0.84 per day.
3. **Wearable device:** The price of a portable device according to current prices at the time the calculator was created was €79.55 (HEUREKA.cz). The percentage of employees using a wearable device (pNZ) is part of the formula for the cost of wearable equipment (NNZ), where  $Q_{empl}$  is the total number of employees:

$$NNZ = 79,55/252*(Q_{empl}*pNZ)$$

4. **Respiratory hygiene:** The determination of the cost of respiratory hygiene (NRH) depends on the consumption of hand sanitiser and the cost of ensuring the functionality of respiratory hygiene equipment at work. The assumption for calculating the consumption of hand sanitizer (SDR) for one employee was a single-use dose of 2 ml of disinfectant, which the employee uses 7 times per work shift - upon arrival, 3 times when using the toilet, at snack time, at lunch and when leaving.

The daily dose of disinfectant (DEZ<sub>d</sub>) per 1 employee is therefore 14 ml. The disinfectant price is €24.83 according to current prices (ASC group). The cost of 1 litre is therefore €4.97. Formula for SDR per 1 employee per day:

$$SDR = (DEZ_d/1000)*price\ 1\ l$$

After setting the price at €4.97/l, the SDR per 1 employee per day is €0.07.

When determining the costs of checking the functionality of respiratory hygiene equipment (KRH), it is assumed that an admin staff needs 4 hours per year for the entire organization to check. The number of employees in the organization is also taken into account by assigning 2 hours of work per 100 employees. The formula for KRH per 1 employee per day is then based on the number of hours of an admin staff, his hourly wage (w<sub>a</sub>), and the number of employees (Q<sub>empl</sub>):

$$KRH = [(4*w_a)/Q_{empl} + 0,02*w_a]/252$$

The resulting formula for respiratory hygiene costs is then:

$$NRH = SDR + KRH$$

5. **Monitoring of risk groups:** The cost of monitoring workers belonging to risk groups (NMR) for respiratory diseases corresponds to 1 hour of work of an admin staff per year (0.25 hours per quarter) and 1 hour of work per 100 employees. The NMR formula for 1 employee per day takes into account the number of hours of an admin staff, his hourly wage (w<sub>a</sub>), and the number of employees (Q<sub>empl</sub>):

$$NMR = [(1*w_a)/Q_{empl} + 0,01*w_a]/252$$

6. **Vaccination:** The cost of a respiratory disease vaccination (NOC) based on a doctor's vaccination certificate depends on the prices of the flu vaccines. It was set at €21.04 per 1 employee, with the assumption that a maximum of 10% of employees will be vaccinated. This expert estimate is based on discussions with company representatives at the Focus Group and with cooperating organizations.

$$NOC = 21,04*(Q_{empl}*0,1)/252$$

7. **Education in the workplace:** The cost of education for the prevention of respiratory diseases on the job includes the cost of respiratory hygiene training within the OSH framework. The current price per employee per year is €1.68 (CZK 40), i.e. €0.007 per day (SOURCE: BOZP.cz).
8. **Home office:** After the approval of the amendment to Act No. Act No. 262/2006 Coll., the Labor Code, the minimum flat rate per hour of work at home is CZK 2.80. This amendment will take effect in the course of 2023. Given that the resulting amount for the reimbursement of the costs of work at home calculated by comparative analysis meets this minimum amount, it is calculated with the calculated amount of €1.28 (30.49 CZK) per day of work at home.
9. **Sick days:** The cost of sick days (NSD), i.e., the time when the employee does not work but is paid, is made up of wage costs per employee (w<sub>empl</sub>), including contributions to social security and health insurance, and the added value of the employee (va<sub>empl</sub>). According to expert estimates and consultations in organizations and in the Focus Group, it is calculated that in this phase of the epidemic, 30% of employees will use sick days for a period of 3 days. The cost per 1 employee per day is determined by:

$$NSD = (w_{empl} * 1,34) + va_{empl}$$

10. **Financial benefits:** Due to the nature of the benefit, for which there is no basis for its calculation, and due to ineffectiveness in the fight against respiratory diseases, this measure was not calculated.

## 4 DISCUSSION

The evaluation of individual primary prevention measures based on how organizations use them and perceive their usefulness can be expressed using the following Matrix of primary prevention against respiratory diseases in enterprises. The authors of this text took inspiration for this matrix from Heribert Meffert and his publication Marketing management (1996). According to this author, the assumption is that a "good" strategy cannot develop its potential if implementation fails, and on the contrary, the implementation of a wrongly created strategic concept can mean significant economic losses for the organization. According to this author, the biggest problem we encounter in business practice is that the strategic concept created in many cases does not correspond to the real business situation. Accordingly, in the case of primary prevention, only optimally set and used preventive measures benefit - the matrix marked "Success", which the organization uses to protect its employees from respiratory infectious diseases. "Failure" in this case can be considered the provided financial benefits that are paid to employees for being at work, which can be counterproductive in the case of sick employees (see subsection 3.1) "Lost chance" represents a situation where the organization does not use the available tools for primary protection of its workers against respiratory infections. "Cost saved" refers to cost savings resulting from not using unprofitable primary prevention.

Fig 4. Matrix of primary prevention against RD

Use in the organization \ Profitability	Profitability	
	Unprofitable	Profitable
Unused	<p><i>Saved costs:</i></p>	<p><i>Lost chance:</i> Wearable devices, Monitoring of risk groups, Vaccination, Wellness and Spas</p>
Used	<p><i>Failure:</i> Financial benefits</p>	<p><i>Success:</i> Vitamins, Sports activities, Respiratory hygiene, Education at work, Home office, Sick days</p>

source: adapted from Meffert, H. (1996)

The second part of the research work was devoted to the possibilities of quantifying the costs of individual preventive measures. In the study The Economic and Social Impact of Respiratory Diseases on Organizations (Kožená et al., 2023), for example, costs related to the need to replace sick workers or workers in quarantine were examined. Subsequent searches of other literary sources, presented in this study (Hansen et al., 2017; Meijster et al., 2011; Birnbaum et al., 2002; Morales et al., 2004 ) confirmed that the main areas of preventive measures taken are changes in costs, productivity, or effectiveness, but did not specify the specific procedure for quantifying the costs of prevention for individual groups of workers in organizations; rather, they examined this issue from a macroeconomic point of view. The author's team first, based on the findings, the questionnaire survey, and the Focus Group, determined the procedure for calculating the costs of 1 sick worker with a respiratory disease based on the compensation of the sick employee's wages and his added value. At the average wage in the Czech Republic for the year 2022, the total cost of respiratory disease per 1 worker per day is €75.32. If we compare this amount with the costs of individual primary prevention measures that the organizations stated in the questionnaire survey, we will conclude that it is definitely more economically advantageous to apply these measures in the organization. If we leave out the financial benefits, which have proven to be unprofitable, the most expensive measure is the wellness and spa, the cost of which is €159.05 per year for 1 employee. Other beneficial primary prevention measures against respiratory disease in the workplace that organizations use cost around €100 or less per year. In the case of a wearable device, the cost of its purchase is €79.55 and this device definitely lasts for more than 1 year. In this direction, technical progress is helpful in the fight against respiratory diseases and organizations would use these devices to reduce their sickness costs.

The author's collective also searched for literary sources in the field of preventive economic models, which could represent for organizations a possible solution to crisis situations associated with the spread

of respiratory diseases. Some of them offered a more macroeconomic view of modelling pandemic situations (Talentsev et al., 2022; Shanmanzari et al., 2022), while others dealt with the situation of businesses, supply chains, and suggested increasing the resilience of businesses in crisis situations; furthermore, certain changes in the business models of companies (Perakis et al., 2022; Zieba et al., 2021), but did not directly include a focus on preventable HRM business tools. Given that one of the goals of this study was to create the basis for the creation and dynamism of the Economic Model of Preventive Measures Against Respiratory Infections, a simplified model of which the author collective has already presented in the publication Strategy for the Introduction of Preventive Measures Against Respiratory Diseases (Influenza and Covid-19) in Enterprises (Horáčková et al., 2023), this study laid the foundation for the primary prevention area of this model. The author's collective will continue to deal with subsequent parts of this model, creating and modifying it with the aim of optimizing and dynamizing it for wider use in organizations together with the use of AI.

## 5 CONCLUSION

The aim of this paper was to find out the basic HRM tools of primary prevention against respiratory diseases in organizations based on a search of professional literature; the most used appear to be: sick days and home office, wellness and spa stays, support of employee immunity through the provision of vitamins, monitoring of risk groups, increased hygiene measures (such as hand washing) including sufficient ventilation in workplaces, the possibility of free vaccination of workers, as well as the use of wearable electronic devices.

Furthermore, the author's collective focused on the possibility of finding out, or measuring, what consequences the implementation of HRM tools for the prevention of the spread of respiratory diseases can have for organizations. In addition to the benefits it brings to organizations, this is also associated with the costs that had to be incurred for their introduction. In this context, a research question was created: "What are the costs of using the primary HRM tools of respiratory disease prevention in organizations?" Research work in the area of methods for determining the costs and benefits of preventive measures has shown that these methods and calculations are focused on the societal level rather than on organizations. For this reason, they could be a starting point for evaluating economic and social measures in organizations, but their use for this purpose was found to be not very suitable. Also, in the field of modelling preventive measures against respiratory diseases, no adequate economic model was found for the protection of workers in organizations, with which the author's collective could complete the dynamization of the already created Economic Model against the spread of respiratory diseases.

Another goal of the authors' collective was the verification of individual parts of the prepared Economic Preventive Model of the organization against the spread of respiratory diseases and the possibility of quantifying the costs and benefits of organizations in connection with the occurrence of respiratory infectious diseases. This phase was followed by the creation of questionnaires for guided interviews in companies, the evaluation of which, along with meetings with representatives of selected organizations within the Focus group, was supposed to confirm or, on the contrary, refute the conclusions of the authors' collective in this area. It can be stated that approximate agreement was found in most of the areas of investigation. However, in order to generalise the stated conclusions, it would be necessary to reach a larger number of respondents from the interviewed organizations. Furthermore, methodologies for calculating the costs of prevention in organizations were proposed, which can be the basis for estimating the amount of primary costs for individual HRM measures in specific private and public organizations. In conclusion, it can be stated that the author's team succeeded in meeting the goals set for this professional study. However, since this is a very current and globally widespread topic, there are many opportunities in this area to continue its further development, either through dynamic modeling and the use of artificial intelligence in the field of crisis management of organizations, or by optimizing the conditions for the quality of life of their employees and everything population. Only in this way will the organization and the entire society be successfully prepared for the next possible crisis situation, perhaps in the form of another pandemic situation.

## REFERENCES

- Abulibdeh, A., 2020. Can COVID-19 mitigation measures promote telework practices? *Journal of Labor and Society*. 23(4), 551-576.
- Ahmed et al., 2020. Paid Leave and Access to Telework as Work Attendance Determinants during Acute Respiratory Illness. *Emerging Infectious Diseases*. Vol. 26 (2020) Dostupné z: <https://doi.org/10.3201/eid2601.190743>.
- Antušák, E., Vilášek, J., 2016. *Základy teorie krizového managementu*. Praha: Karolinum, s. 15.
- ASC group. Dezinfekční prostředek na ruce Well done ULTRA FINE 5l. [vid. 2023-07-25] Dostupné z: <https://www.mydla.cz/dezinfekcni-prostredek-na-ruce-well-done-ultra-fine-5l>.
- Birnbaum HG, Morley M, Greenberg PE, Colice GL. Economic burden of respiratory infections in an employed population. *Chest*. 2002 Aug;122(2):603-11. doi: 10.1378/chest.122.2.603. PMID: 12171839.
- BOZP.cz. Ceník. [vid. 2023-07-25] Dostupné z: <https://www.skolenibozp.cz/cenik/>.
- Cortez, A., C. et al., 2022. Centers of physical activities and health promotion during the COVID-19 pandemic. *Revista da Associacao Medica Brasileira Open Access* Volume 66, Issue 10, Pages 1328 - 1334.
- Český statistický úřad. Průměrné mzdy - 4. čtvrtletí 2022. [vid. 2023-07-25] Dostupné z: <https://www.czso.cz/csu/czso/cri/prumerne-mzdy-4-ctvrtleti-2022>.
- Daniels, R. A., Miller, L. A., Mian, M. Z. and Black, S., 2022. One size does NOT fit all: Understanding differences in perceived organizational support during the COVID-19 pandemic. *Business and Society Review*. 127(1), 193-222.
- De Korte, E. M., Wiezer, N., Janssen, J. H., Vink, P. and Kraaij, W., 2018. Evaluating an mHealth App for Health and Well-Being at Work: Mixed-Method Qualitative Study. *JMIR Mhealth Uhealth* [online]. 28. března 2018 [vid. 20. listopadu 2022]. Dostupné z: <https://mhealth.jmir.org/2018/3/e72/>.
- Fait, T. a kol. *Preventivní medicína*. 3. aktual. vyd. Praha: Maxdorf, 2021, 431 s. ISBN 978-80-7345-680-1.
- Fanta, G. B., Pretorius, L. and Erasmus, L. D., 2018. Economic analysis of sustainable ehealth implementation in developing countries: a systematic review. *IAMOT 2018: International Conference on Management of Technology*. Birmingham, UK.
- Fragala et al., 2021. Return to Work: Managing Employee Population Health During the COVID-19 Pandemic. *Population Health Management*. Vol. 24 (2021) Dostupné z: DOI: 10.1089/pop.2020.0261.
- Grasseová, M., 2009. *Analýza podniku v rukou manažera*. Brno: Bizbooks, 325 s.
- Hadizadeh, F., 2021. Supplementation with vitamin D in the COVID-19 pandemic? *Nutr Rev*. 2021 Jan 9;79(2):200-208. doi: 10.1093/nutrit/nuaa081. PMID: 32679589.
- Haque, M., 2020. Handwashing in averting infectious diseases: Relevance to COVID-19. *Journal of Population Therapeutics and Clinical Pharmacology*, 27(SP1), e37-e52. <https://doi.org/10.15586/jptcp.v27SP1.711>.
- Halgurd et al., 2003. Human-Computer Interaction (cs.HC); Machine Learning (cs.LG); Populations and Evolution (q-bio.PE) Cite as:arXiv:2003.07434 [cs.HC], (or arXiv:2003.07434v2 [cs.HC] for this version). <https://doi.org/10.48550/arXiv.2003.07434>.
- Hansen et al., 2017. Assessing workplace infectious illness management in Australian workplaces. *Infection, Disease & Health*, Volume 22, Issue 1, March 2017, Pages 12-20.
- Heureka.cz. Garmin vívofit 4 L. [vid. 2023-07-25] Dostupné z: <https://chytre-naramky.heureka.cz/garmin-vivofit-4-l/#prehled/>.
- Horackova, K.; Ochtinska, H.; Vaclavikova, K.; Soukalova, K.; Brodsky, Z.; Mandysova, M.; Satera, K.; Kozena, M., 2023. Strategies for Introducing Preventive Measures against Respiratory Diseases (Influenza and Covid-19) in Companies in the Czech Republic: Meta-Analysis. *Health Problems of Civilization* ; 17(1):12-23. doi: <https://doi.org/10.5114/hpc.2022.122274>.
- Hug, A. K. et al., 2022. COVID-19 Pandemic and Immune Boost up: The Synergistic Role of Nutrients. ISSN: 2347-467X, Online ISSN: 2322-0007.
- Kilbourne, E., D., 2006. *Influenza Pandemics of the 20th Century*. PMID: 16494710 doi: 10.3201/eid1201.051254 PMID: PMC3291411.

- Kozena, M., Mandysova, M., Brodsky, Z., Satera, K., Horackova, K., Vaclavikova, K., 2023. The Economic and Social Impact of Respiratory Diseases on Organisations. *Acta academica karviniensia*;23(1):19-31. doi: 10.25142/aak.2023.002.
- Kumar et al., 2013. Policies to Reduce Influenza in the Workplace: Impact Assessments Using an Agent-Based Model. *American Journal of Public Health*. Vol. 103 (2013): 1406-1411. Dostupné z: doi: 10.2105/AJPH.2013.301269.
- Meijster, T., et al., 2011. Cost-benefit analysis in occupational health: a comparison of intervention scenarios for occupational asthma and rhinitis among bakery workers. *Occup Environ Med*. 2011 Oct;68(10):739-45. doi: 10.1136/oem.2011.064709. Epub 2011 May 31. PMID: 21632520.
- Ministerstvo práce a sociálních věcí. Kalkulačka pro výpočet výše náhrady mzdy v roce 2023. Dostupné z: <https://www.mpsv.cz/kalkulacka-pro-vypocet-vyse-nahrady-mzdy-v-roce-2023>.
- Moossavi et al., 2021. Prevention of COVID-19: Preventive Strategies for General Population, Healthcare Setting, and Various Professions. *Adv Exp Med Biol*. 2021;1318:575-604. doi: 10.1007/978-3-030-63761-3\_32. PMID: 33973200.
- Morales A, Martinez MM, Tasset-Tisseau A, Rey E, Baron-Papillon F, Follet A., 2004. Costs and benefits of influenza vaccination and work productivity in a Colombian company from the employer's perspective. *Value Health*. 2004 Jul-Aug;7(4):433-41. doi: 10.1111/j.1524-4733.2004.74006.x. PMID: 15449635.
- Perakis, G., Singhvi, D., Lami, O.S., and Thayaparan, L., 2022. COVID-19: A multiwave SIR-based model for learning waves. *Production and operational management* [online]. 29. ledna 2022 [vid. 20. listopadu 2022]. Dostupné z: <https://doi.org/10.1111/poms.13681>.
- Rowland, S., P. et al., 2020. What is the clinical value of mHealth for patients? In *npj Digital Medicine*, 3:4 ; <https://doi.org/10.1038/s41746-019-0206-x>.
- Scudiero, O. et al., 2018. Exercise, immune system, nutrition, respiratory and cardiovascular diseases during COVID-19: A complex combination. *Journal of Environmental Research and Public Health* Open Access Volume 18.
- Shahmanzari, M., Tanrisever, F., Eryarsoy, E., and Sensoy, A., 2022. Managing disease containment measures during a pandemic. *Production and Operation Management* [online]. 11. ledna 2022 [vid. 20. listopadu 2022]. Dostupné z: <https://doi.org/10.1111/poms.13656>.
- Moossavi, S. et al., 2021. Prevention of COVID-19: Preventive Strategies for General Population, Healthcare Setting, and Various Professions. *PubMed : Book cover Coronavirus Disease - COVID-19 pp 575-604*. doi: 10.1007/978-3-030-63761-3\_32.
- Singh, P. K., Kiran, R., Bhatt, R. K., Tabash, M. I., Pandey, A. K. and Chouhan, A., 2021. COVID-19 pandemic and transmission factors: An empirical investigation of different countries. *Journal of public affairs* [online]. 20. února 2021 [vid. 20. listopadu 2022]. Dostupné z: <https://doi.org/10.1002/pa.2648>.
- Singh T, Taitel M, Loy D, Smith-Ray R., 2020. Estimating the Effect of a National Pharmacy-Led Influenza Vaccination Voucher Program on Morbidity, Mortality, and Costs. *J Manag Care Spec Pharm*. 2020 Jan;26(1):42-47. doi: 10.18553/jmcp.2020.26.1.42. PMID: 31880234.
- Talantsev, A., Fasth, T., Wenner, C., Wolff, E. and Larsson, A., 2022. Evaluation of pharmaceutical intervention strategies against pandemics in Sweden: A scenario-driven multiple criteria decision analysis study. *Journal of Multi-Criteria Decision Analysis*. 29(1-2), 49-66.
- Volpi et al., 2021. Using a mobile health app to improve patients' adherence to hypertension treatment: a non-randomized clinical trial. *Pub Med Central*. Published online 2021 May 28. doi: 10.7717/peerj.11491. PMCID: PMC8166239. PMID: 3412359.
- Zamora-Illarionov et al., 2020. The use of eHealth to design a regional health promotion program in the workplace: Institute of Costa Rican Electricity case series. *Mhealth*. 2020; 6: 44. Published online 2020 Oct 5. doi: 10.21037/mhealth-19-231.
- Zieba, K., 2021. How can systems thinking help us in the COVID-19 crisis? *Knowledge and Process Management*. 29(3), 221-230.
- Zuzák, R.; Königová, M., 2009. *Krizové řízení podniku: 2., aktualizované a rozšířené vydání*. Praha: Grada.

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