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Research Article

Comparative Analysis of Occupational Injuries Dynamics in Russia and the Republic of Crimea in 2017–2021

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Abstract

Introduction. One of the health-saving resources for the working population is the improvement of the occupational safety system and prevention of occupational injuries (OI). Systematic scientific research in this field remains relevant as it helps to understand the interrelationships between the causes and consequences of OI in different sectors of economic activity. In recent years, there has been a lack of research on the structure and dynamics of OI in the Republic of Crimea (RC), and its indicators have not been compared. The aim of this study was to conduct a comparative analysis of Crimean and all-Russian dynamics of occupational injuries over a five-year period from 2017 to 2021 in order to identify trends and develop strategies for improving production safety.

Materials and Methods. Methods of systematization of scientific literature on the issue of OI were employed. Statistical data on the state of OI in the Republic of Crimea and the Russian Federation were analyzed and compared. The results were graphically presented in the form of histograms. Additionally, the positions of the republic in the official ratings on compliance with labor legislation were taken into consideration.

Results. The analysis of statistics has made it possible to compare the structure and dynamics of OI indicators in the Republic of Crimea with similar data on the national average. Regional differences in occupational injury rates have been identified. In 2017–2021, the number of fatal injuries per 1 000 workers increased in the country, and in Crimea the problem was more acute than in the average for Russia. According to the results for 2021, construction was the most hazardous type of activity in the Crimean region, while mining was the most dangerous one in the Russian Federation. The relative rates of occupational injuries (per 1 000 employees) in the region were lower than the national average. At the same time, the proportion of fatal injuries in Crimea was 1.5–2 times higher than the national average. The highest level of fatal injuries in Crimea was recorded in 2018–2019, likely due to increased construction activity. Injury rates were increasing, while the costs of occupational safety measures were also rising. At the same time, in 2021, the amount of funds allocated to labor protection in Crimea was approximately 1.7 times lower than the similar national average (per employee).

Discussion and Conclusion. It is advisable to use data on occupational injuries in the Republic of Crimea to develop scientifically grounded recommendations for improving the regional occupational safety system. These results are partially influenced by the integration of Crimea and are presented in comparison with all-Russian indicators. Therefore, the findings of this scientific work can be applied more broadly when developing a strategy for labor protection in other regions of the Russian Federation.

Keywords: occupational injuries in the Republic of Crimea, the number of workers injured and killed at work, funding for labor protection measures

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Научная статья

Сравнительный анализ крымской и общероссийской динамики производственного травматизма в 2017–2021 гг.

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Аннотация

Введение. Одним из ресурсов здоровьесбережения работающего населения является совершенствование системы охраны труда и профилактики производственного травматизма (ПТ). Систематические научные исследования в этой области сохраняют актуальность, поскольку поясняют взаимосвязи причин и последствий ПТ в различных сферах экономической деятельности. В последние годы в Республике Крым (РК) не изучались структура и динамика ПТ, не сопоставлялись его показатели. Цель представленной научной работы — сравнительный анализ крымской и общероссийской динамики производственного травматизма за пять лет, в 2017–2021 гг. Новые данные должны стать базой для повышения безопасности производства.

Материалы и методы. Использовались методы систематизации научной литературы по проблеме ПТ. Анализировались и сравнивались статистические данные о состоянии ПТ в РК и Российской Федерации. Результаты графически представлены в виде гистограмм. Кроме того, учтены позиции республики в официальных рейтингах по соблюдению трудового законодательства.

Результаты исследования. Анализ статистики позволил сравнить структуру и динамику показателей ПТ в РК с аналогичными данными в среднем по стране. Выявлены региональные особенности ПТ. В 2017–2021 в стране росло число пострадавших со смертельным исходом в расчете на 1 000 работающих, причем в Крыму проблема стояла острее, чем в среднем по России. По итогам 2021 года самым травмоопасным видом деятельности в Республике Крым было строительство, а в РФ — добыча полезных ископаемых. Относительные показатели производственного травматизма (в расчете на 1 000 работающих) в регионе ниже, чем в среднем по стране. В то же время доля травм со смертельным исходом в Крыму в 1,5–2 раза выше среднероссийской. Самый высокий уровень летального травматизма в Крыму зафиксировали в 2018–2019 гг., что может быть связано с активизацией строительства. Показатели травматизма растут на фоне увеличения затрат на мероприятия по охране труда. При этом в 2021 году объем средств, направленных на охрану труда в Крыму, был примерно в 1,7 раза ниже аналогичного среднероссийского показателя (в расчете на одного работающего).

Обсуждение и заключение. Данные о производственном травматизме в РК целесообразно задействовать для составления научно обоснованных рекомендаций по совершенствованию региональной системы безопасности труда. Результаты отчасти связаны с интеграцией Крыма, даны в сопоставлении с общероссийскими показателями. Это значит, что итоги представленной научной работы можно использовать шире — при формировании стратегии развития охраны труда в новых субъектах РФ.

Ключевые слова: производственный травматизм в Республике Крым, численность пострадавших и погибших на производстве, финансирование мероприятий по охране труда

Благодарности. Авторы благодарят руководителя Управления Федеральной службы государственной статистики по Республике Крым и г. Севастополю Балдину О.И. за помощь в подготовке статьи. Авторы выражают благодарность редакции и рецензентам за внимательное отношение к статье и замечания, которые позволили повысить ее качество.

Для цитирования. Макаричева А.А., Ефимова В.М. Сравнительный анализ крымской и общероссийской динамики производственного травматизма в 2017–2021 годах. *Безопасность техногенных и природных систем.* 2024;8(2):7–16. https://doi.org/10.23947/2541-9129-2024-8-2-7-16

Introduction. In order to preserve the country's labor potential, it is necessary to maintain a high level of occupational safety (OS) and to improve preventive measures aimed at reducing the risk of occupational injuries (OI). Systematic scientific research in this area can help to better understand the causes and consequences of OI in various sectors of the economy.

Since 2014, when Crimea reunited with Russia, there have been significant changes in the region's economy. A new need has arisen for research on OI indicators as an element of the all-Russian OS system. Materials on OS issues published before 2014 were fragmentary, which proves the relevance of analyzing and introducing OI indicators into the scientific discourse in the Republic of Crimea (RC). These indicators are essential for the development of both theory and practice of industrial safety, as they reflect the processes of integration of the region's industries into the Russian OS system based on a modern regulatory framework.

Many studies are devoted to the analysis of individual OI indicators in the most traumatic industries — construction [1], agriculture [2], mining [3]. Key factors that lead to industrial accidents are determined [4]; measures to reduce occupational risks are discussed [5]. At the same time, many researchers note the problem of distorted statistics on OI and occupational diseases in Russia. A significant number of minor and moderate injuries are not reported and are not included in official statistics [6], which makes it difficult to accurately assess the socio-economic impact of such incidents [7]. Comparative OI studies across industry sectors worldwide emphasize the universal nature of risk factors and the underestimation of the number of accidents (AC) and the severity of their consequences [8]. Researchers agree that the OI complex nature, combined with changing working conditions and new occupational risks, requires constant monitoring and analysis of occupational safety indicators.

Comparative OI studies in new, developing regions of Russia, in particular in the Republic of Crimea, are of particular interest. In the first years after the republic became part of the Russian Federation, D.U. Abdulgazis [9] and E.N. Abiltarova [10] studied individual OI indicators at enterprises and organizations in Crimea. However, from 2017 to the present, the dynamics of indicators has not been studied, and no comparative analysis has been carried out. At the same time, such research is especially relevant in the context of a noticeable increase in economic activity, changes in the structure of the manufacturing sector and the domestic market. The significant increase in the rate of production activity in the region necessitates an examination of data regarding accident investigations, the specifics of injuries (including fatalities). It is crucial to analyze and interpret the facts, identify recurring patterns, and develop new strategies to prevent occupational health issues.

It is worth noting that there is insufficient knowledge of a wide range of issues, from the analysis of OI dynamics in the Republic of Crimea to innovative approaches to improving the system of prevention and training of specialists. This indicates the relevance and significance of the presented research.

The aim of the work was to conduct a comparative analysis of occupational injury rates in Crimea and Russia over a period of five years.

Main tasks:

– analysis of the regional OI structure and dynamics in 2017–2021;

– comparison of OI indicators in the Republic of Crimea with the average Russian;

– discussion of the possibility of using the results of the analysis to improve the OS system.

Materials and Methods. Methods of systematization of scientific literature on OI issues, as well as analysis and comparison of statistical data on occupational injury indicators in the Russian Federation and the Republic of Crimea were used. The statistical reports of the Federal State Statistics Service of Russia (Rosstat) and the Department of the Federal State Statistics Service (UFSGS) for the Republic of Crimea and Sevastopol for the period from 2017 to 2021 served as the basis for the analysis. The results were graphically presented in the form of histograms. In addition, two ratings of the Ministry of Labor of the Russian Federation were taken into account. The first one ranked the relevant regional executive authorities in terms of activities in the field of public administration of occupational safety and health. The second defined the positions of Crimea in terms of compliance with labor legislation.

Results

1. *Current state of occupational injuries in the Russian Federation and the Republic of Crimea.*

From the perspective of the research topic under discussion, the period from 2017 to 2021 was of particular interest. During this time, several important transformations occurred due to the increase in economic activity. Since 2020, there has been a slight decrease in it, which was associated with the pandemic of coronavirus infection and other circumstances.

Let us note a number of methodological limitations that need to be considered when conducting this and similar research. Firstly, Rosstat, the Federal Service for Labor and Employment (Rostrud) and the Social Insurance Fund (FSS) use various methods of accounting for industrial accidents. As a result, some generalized data do not match. Secondly, during this period in the region, private entrepreneurs did not take into account all cases of OI.

Thus, the Crimean and all-Russian indicators for 2017–2021 from the reports of Rosstat and the UFSGS for the Republic of Crimea and Sevastopol were studied. The analysis took into account direct data on the average number of employees, the number of victims of occupational accidents, including fatal ones. In addition, relative coefficient of the number of victims of occupational accidents (per 1000 employees), including fatal ones, was taken into account.

Information on the financing of OS measures at enterprises of the Republic of Crimea reflected the trends in the development of preventive measures in various industries.

At the first stage of the study, the Crimean and Russian average OI indicators for 2021 were compared. In 2021, in the Russian Federation, Rosstat recorded[1] 19,977,000 people employed at 158,264 enterprises from various fields of economic activity. By the end of the year, 93% of enterprises (147,630) reported no accidents. 21,609 people suffered injuries with disabilities (including fatalities), of which 30% were women (6,483). 1,210 people lost their lives as a result of serious accidents. Most of those who were fatally injured at work were men (93%).

According to the UFSGS data for the Republic of Crimea and Sevastopol[2], in 2021, 1,475 enterprises in the Republic of Crimea were subject to statistical accounting. Out of these, 1,400 (95%) did not have any accidents at the end of the year. The average number of employees of these enterprises was 181,773 people (9% of all those employed in production in the Russian Federation). 124 people were injured in work-related accidents with disabilities and fatal outcomes. Of these, 42 were women (34%). Fatal injuries were reported in nine cases, all of which were men.

In 2021, 93% of registered enterprises in the country and 95% in the Republic of Crimea did not record accidents. With regard to the total number of employees (in ppm of all employees in the Republic of Crimea), 0.68% suffered from disability in the Republic of Crimea, while the corresponding figure for the country as a whole was 1.08%.

The number of registered fatal accidents in the region accounted for 7.26% of the total number of work-related injuries. This figure was higher than the national average of 5.60%. The integral indicators for occupational injuries in the Republic of Crimea and Russia differed only slightly, so within the scope of this study, a separate analysis was conducted on occupational diseases by major economic activity.

Rosstat data[3] allowed us to identify the types of economic activity that were most affected by the number of fatal accidents in 2021. The table below shows the percentage of fatal accidents:

– manufacturing (22.6%);
– transportation and storage (16.5%);
– construction (15.9%);
– mining (14.8%);
– agriculture, forestry, hunting, fishing and fish farming (10.2%).

The number of people employed in various types of economic activity varied significantly, therefore, for a comparative OI analysis, it was advisable to use relative indicators per 1,000 people employed in a particular field. It was important to note that manufacturing employed about 25% of the average number of workers across the country, while mining employed only 5%, and this affected absolute OI indicators.

Mining was the leader among the types of economic activities recognized as injurious in Russia in 2021. Here, the number of victims with disability for one working day or more and with a fatal outcome amounted to 1.71 per 1,000 employees with an average of 1.08. Agriculture and forestry were in the second place (1.61). Activities in the field of culture, sports, leisure and entertainment took the third place (1.47). Construction was on the fourth place (1.35).

In the Russian Federation, the highest number of deaths due to work-related accidents was recorded in mining (0.18 per 1,000 workers with an average coefficient of 0.06), which was significantly higher than in construction (0.15) and agriculture (0.11).

In 2021, the Republic of Crimea reported the highest number of work-related injuries as a result of accident in construction. The OI coefficient for this sector was 2.72 per 1,000 employees and four times higher than the regional average (0.68). There were many injured persons in the field of water supply, waste collection and disposal (0.94), agriculture and forestry (0.88), mining (0.86) and manufacturing (0.79). The largest number of fatal injuries was recorded in construction and agriculture.

In Russia and Crimea, organizational problems were in the first place among the causes of accidents with serious consequences. This was evidenced by the results of labor protection monitoring[4]. Poor organization of production processes was the cause of every third accident with severe consequences, while the proportion of such incidents was constantly increasing.

[1] *Russian Statistical Yearbook. 2022*. Moscow: Federal State Statistics Service; 2023. 696 p. URL: https://rosstat.gov.ru/storage/mediabank/Ejegodnik_2022.pdf (accessed: 24.12.2023). (In Russ.).
[2] *Industrial Injuries at Enterprises and Organizations of the Republic of Crimea*. Department of the Federal State Statistics Service for the Republic of Crimea and Simferopol. Sevastopol. URL: https://82.rosstat.gov.ru/folder/27542 (accessed: 24.12.2023). (In Russ.).
[3] *Occupational Injuries in the Russian Federation in 2021*. Federal State Statistics Service. URL: https://rosstat.gov.ru/working_conditions (accessed: 24.12.2023). (In Russ.).
[4] *Results of Monitoring of Labor Conditions and Safety in the Russian Federation in 2021*. All-Russian Scientific Research Institute of Labor of the Ministry of Labor of Russia. URL: https://vnii-truda.ru/uploads/researches_file/659e9f020a8e7075635856.pdf (accessed: 24.12.2023). (In Russ.).

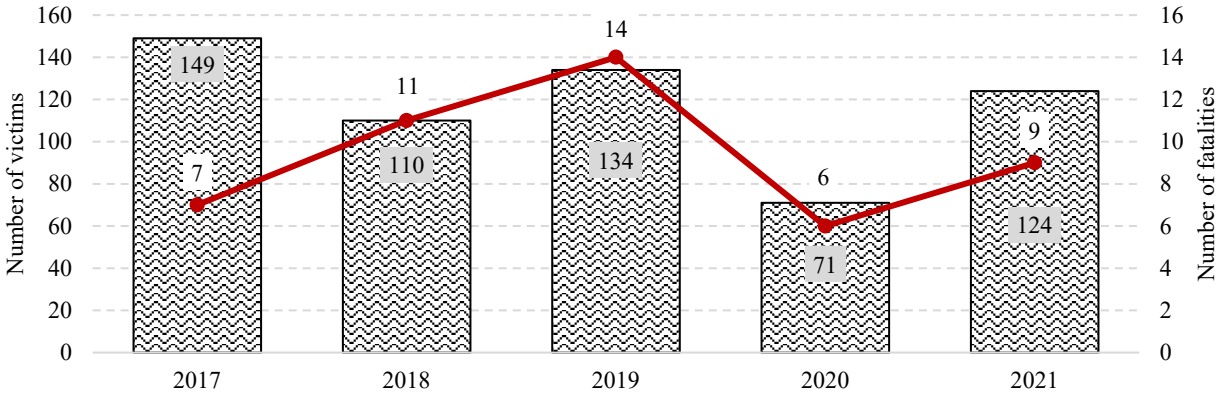
Minor but significant factors that contributed to occupational injuries include violations of traffic rules, poor labor discipline, and non-compliance with workplace safety standards. Approximately 7% of accidents with serious consequences were caused by deviations from the established technological process. Other reasons included shortcomings in the management and training of labor protection personnel, unsatisfactory condition and shortcomings in the organization of workplaces, refusal to use personal protective equipment. About a quarter of all accidents with serious consequences were difficult to classify unambiguously, as they were caused by circumstances that were not directly related to human error.

Thus, the comparison of OI indicators in the Republic of Crimea for 2021 revealed differences. When analyzing the basic integrated data, it appeared that the situation was fairly prosperous. However, a diversification of the Crimean indicators, in particular the distribution of victims per 1,000 employees in specific economic activities, indicated problems with ensuring security and the need for OS improvement.

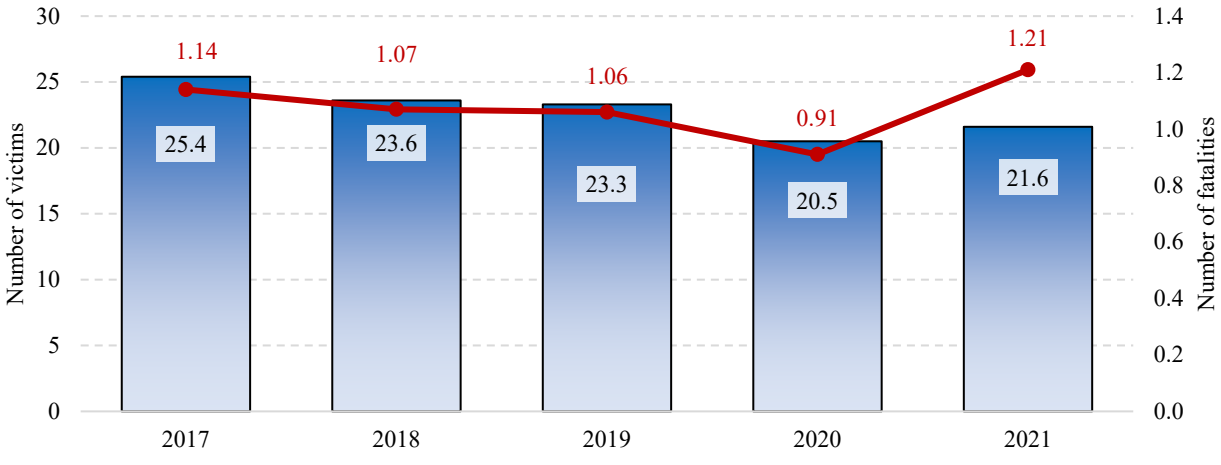
Given the size of Russia, in order to correctly compare the average indicators for the country and the subject of the federation, many factors must be taken into account, including nature, climate, and technological development of the region. Comparable OI indicators made it possible to identify areas of increased risk and prioritize occupational safety measures.

2. *Analysis of the dynamics of occupational injury rates in the Russian Federation and the Republic of Crimea from 2017 to 2021.*

Figure 1 provides the dynamics of the number of injuries and deaths at enterprises in the Republic of Crimea and the Russian Federation from 2017 to 2021.



a)



b)

Fig. 1. Dynamics of occupational injury rates from 2017 to 2021:
a — in the Republic of Crimea; *b* — in Russia

Figure 1 shows how the main OI indicators have changed over the studied period. In the Republic of Crimea, the maximum number of victims of accidents was recorded at manufacturing enterprises in 2017 — 149 people. In 2018 it was 110 people, in 2019 it was 134. The minimum was recorded in 2020 (71 people), but in 2021 the figure almost doubled to 124.

The dynamics of fatal accidents was similar. The number of fatal injuries had been growing for two years, peaking in 2019, sharply decreasing in 2020 and increasing again in 2021 (Fig. 1 *a*).

In the whole country, the number of recorded occupational injuries had steadily decreased since 2017 (25,445 people), fell to a minimum in 2020 (20,503 people) and increased in 2021 (21,609 people). At the same time, the number of fatalities increased from 1,140 in 2017 to 1,210 in 2021. In 2020, the lowest number of deaths as a result of industrial accidents was noted (910, Fig. 1 *b*).

In 2017–2021, the proportion of fatal injuries in the Republic of Crimea significantly exceeded the average statistical indicators (Fig. 2).

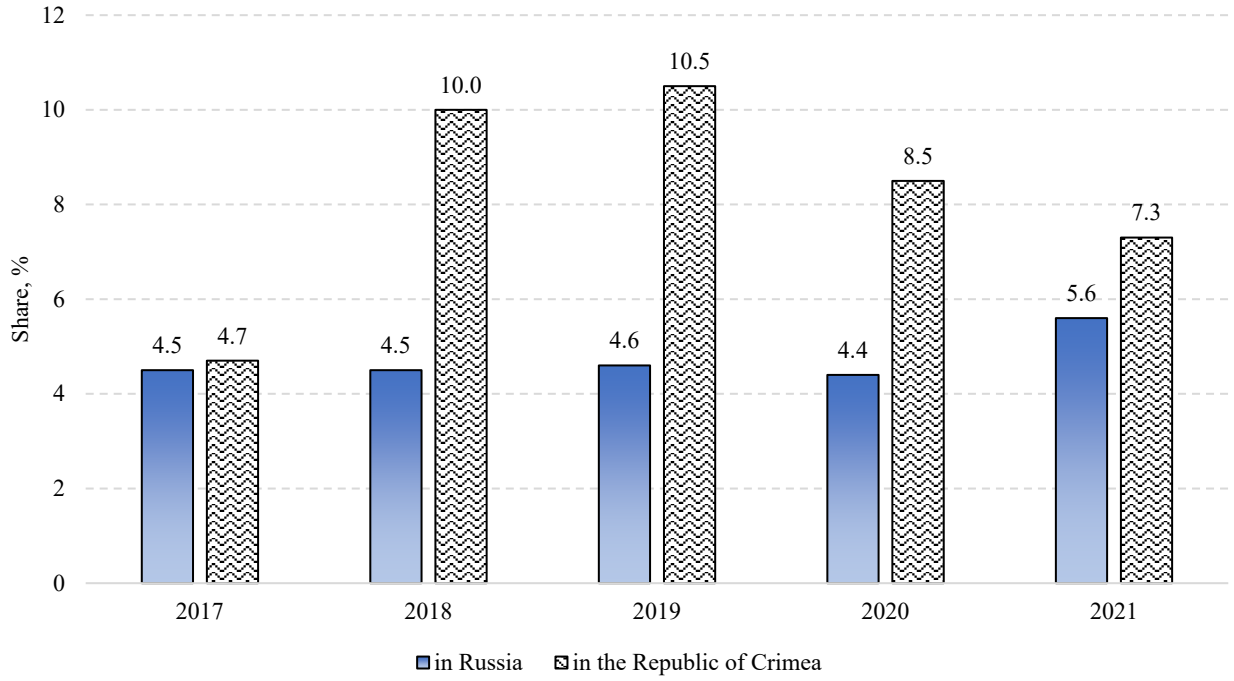


Fig. 2. Share of fatal injuries in Russia and the Republic of Crimea in 2017–2021, % of the total number of injuries

In 2018–2019, this indicator in Crimea was the highest and exceeded the national average by 2.2 times. This fact was probably related to the growth in construction volumes — this was the most traumatic type of economic activity in the region.

In the Russian Federation and Crimea, the situation regarding occupational injuries worsened in 2021 (compared to 2020) by three indicators:

– the total number of injuries at industrial enterprises increased (by 5% in the Russian Federation and by 75% in the Republic of Crimea);

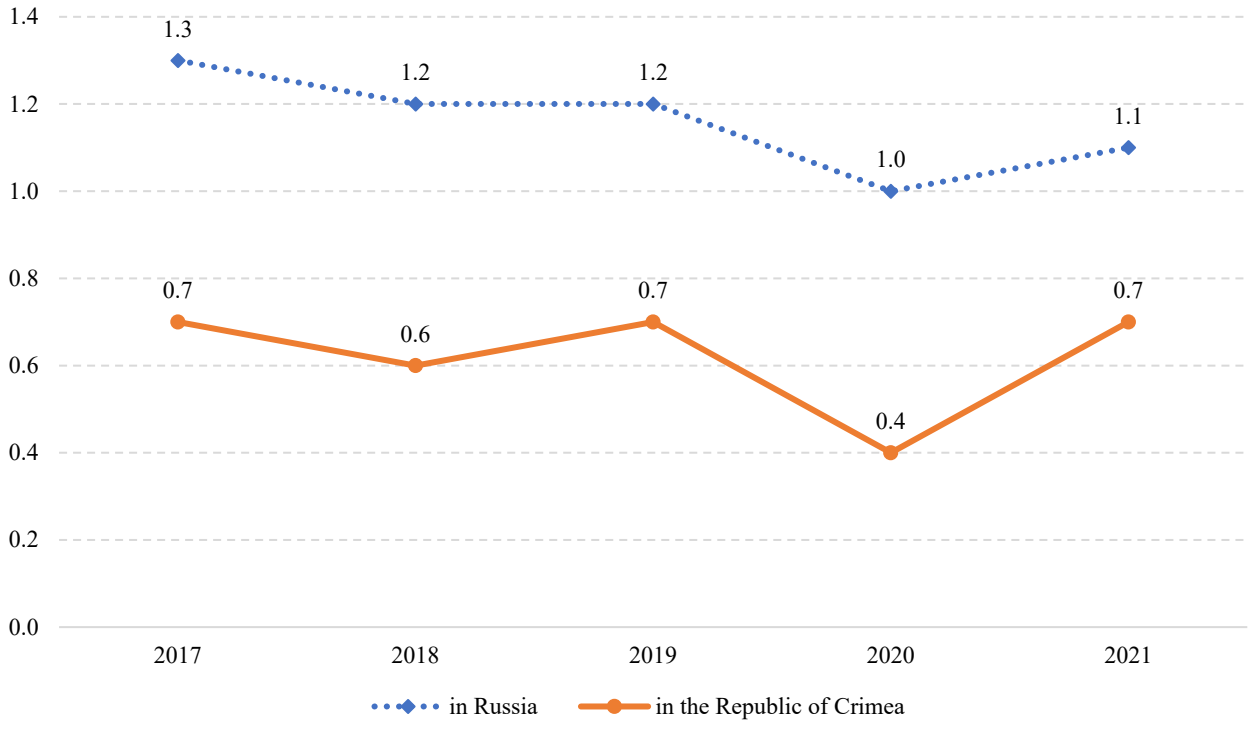
– there were more fatal injuries (by 33% in the Russian Federation and by 50% in the Republic of Crimea);

– the share of fatal injuries increased by 27% in the Russian Federation and decreased by 14% in Crimea (a sharp increase in the total number of victims was accompanied by a decrease in the proportion of fatal victims).

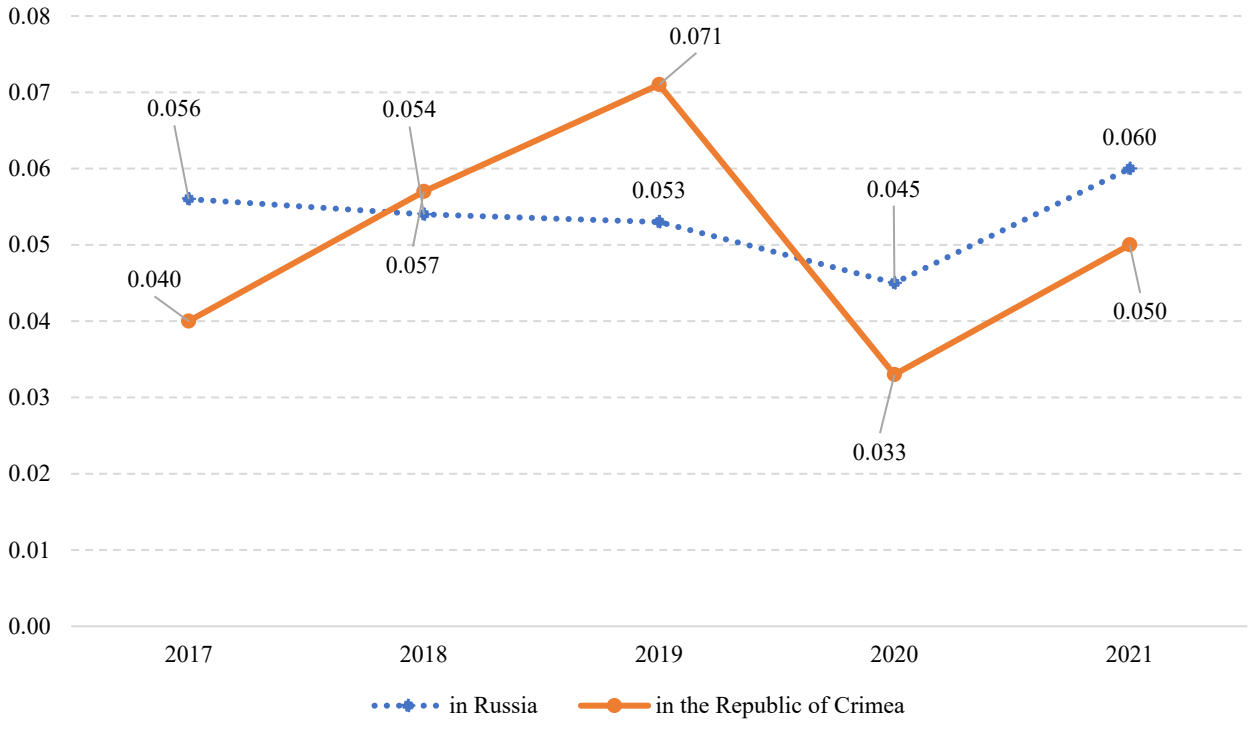
The high growth rates in the number of accidents in 2021 could be explained by the low base of 2020. Due to pandemic restrictions, injuries decreased significantly in 2020, leading to an unprecedented decrease in economic activity. Many industries saw businesses operating at reduced or partial capacity.

In general, in Russia in 2017–2021, the absolute number of victims with disability and death decreased by 18%. However, the number of deaths increased by 6% during this period. In Crimea, the number of people injured with disability also decreased by 18%. In 2021 (compared to 2017), the number of work-related deaths increased by 22%.

Let us consider relative Crimean indicators for victims with disability and death (per 1,000 employees). In this case, we used information on the types of economic activity included in the Rosstat sample. So, in 2017 and 2021, the same indicator was recorded — 0.7 people per one thousand employees (Fig. 3 *a*). However, the number of deaths per one thousand people employed in Crimea increased by 20%, and in Russia as a whole — only by 6% (Fig. 3 *b*).



a)



b)

Fig. 3. Dynamics of injury rates per 1000 employees in the Republic of Crimea and in Russia in 2017–2021: *a* — victims with disability for one working day or more and with fatal outcome; *b* — victims with fatal outcome

Thus, the dynamics of the total number of occupational injuries in the Republic of Crimea corresponded to the all-Russian dynamics. However, a comparison of relative indicators showed that in fact the level of occupational injuries in Crimea remained unchanged over the years, and the level of fatal injuries increased more than in the whole country (Fig. 3). At the same time, funding for occupational safety measures in both the Russian Federation and in the Republic of Crimea increased (Fig. 4).

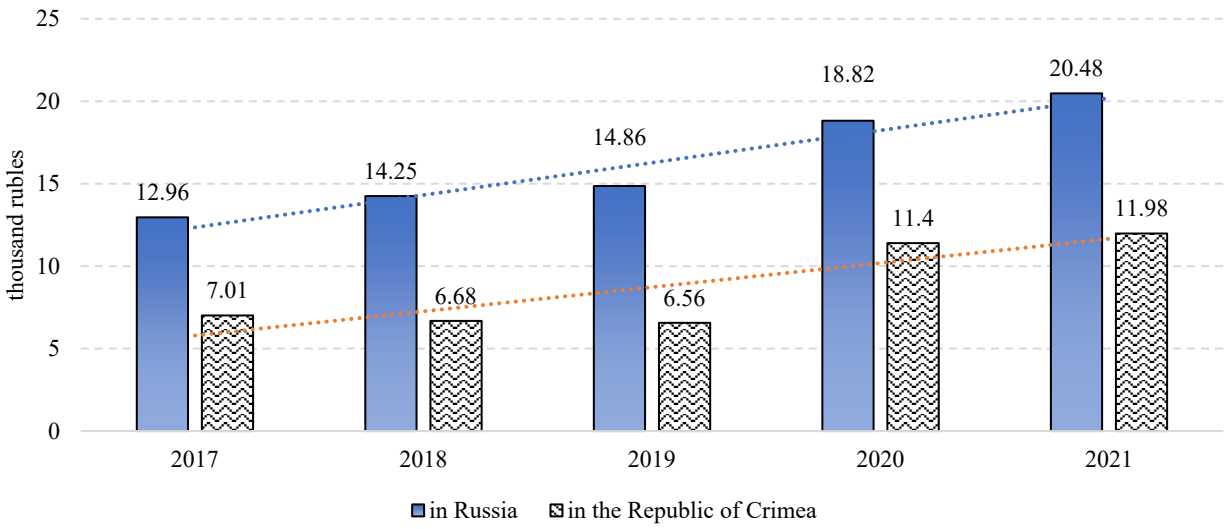


Fig. 4. Dynamics of the volume of financing for occupational safety measures per employee from 2017 to 2021, thousand rubles

As it can be seen from Figure 4, occupational safety costs in Crimea increased by 70%, from 7 thousand rubles per employee in 2017 to 12 thousand rubles in 2021. In general, an increase of 58% was recorded in Russia, from 13 thousand rubles to 20.5 thousand rubles.

It is easy to see that the amount of funds allocated to occupational safety in Crimea in 2021 was about 1.7 times lower than the national average. The highest values of fatal injuries in Crimea were recorded in 2018 and 2019. In the same years, the difference between the regional and Russian levels of financing for occupational safety measures was maximum. In Crimea, 2.2 times less was spent per employee than the national average. One possible explanation was the lack of resources to provide occupational safety.

Relative OI indicators (per 1 000 employees) in the region were noticeably lower than the average for the Russian Federation. So, in 2021, per 1,000 employees, the number of injured in the industries of the Republic of Crimea turned out to be 36% lower, and the number of fatalities was 20% lower (Fig. 3). However, we believe that this was not due to the effectiveness of occupational safety measures, but rather to the regional structure of industrial injuries by type of economic activity. The low number of victims was generally characteristic of the Southern Federal District. This is due to the lower number of people employed in industry, mining, and manufacturing enterprises. A significant part of the population of the southern regions worked in the service sector.

Discussion and Conclusion. In the period from 2017 to 2021, funding for occupational safety measures at enterprises in Crimea and Russia as a whole increased. At the same time, the rates of fatal OI increased, and in Crimea this trend was more pronounced than the national average. Apparently, the field of management needs more advanced methods for evaluating the effectiveness of measures. In the annual ranking of the subjects of the Russian Federation in terms of compliance with labor legislation[5] the Republic of Crimea moved from the third place in 2017 to the 42nd place in 2018. In 2019, the region took the 20th place. The list was compiled by the Federal Ministry of Labor. It also ranked the activities of the relevant regional executive authorities. According to the results of 2021, Crimea was ranked 60th out of 85 subjects of the Russian Federation in this list.

It is certainly necessary to thoroughly study and analyze the issues of OI prevention at construction sites in Crimea. This is evidenced by the almost twofold excess of the number of victims of accidents in the construction industry in the Republic of Crimea compared to the national average.

The highest number of fatalities is recorded in the construction and agricultural sectors of the republic. Therefore, these sectors require more effective environmental protection measures, improved methods for preventing workplace accidents, and adequate indicators to assess the dynamics of occupational safety and health [11].

In general, the results of the presented work indicate positive changes in ensuring industrial safety in the Republic of Crimea. This opens up prospects for further research and the application of the data obtained. The data can be used to develop indicators of industrial safety, tools for forecasting and analyzing occupational safety at the regional and national levels. An interdisciplinary approach to the problem of occupational injuries opens up prospects for the promotion of new methods for preventing accidents at work.

[5] *Rating of Executive Authorities on Labor of the Subjects of the Russian Federation on the Implementation of State Management of Labor Protection.* Ministry of Labor of Russia. URL: https://eisot.rosmintrud.ru/formirovanie-rejtinga-sub-ektov-rossijskoj-federatsii-po-urovnyu-soblyudeniya-trudovogo-zakonodatelstva-i-bazy-obraztsov-luchshej-praktiki1 (accessed: 24.12.2023). (In Russ.).

One of the ways to improve the prevention of occupational injuries in the region is through the development of continuous education in the field of occupational safety. This includes training and retraining of specialists in secondary vocational and higher educational institutions [12]. The information collected on injury rates in different sectors of the regional economy could be incorporated into training programs in subjects such as “Life Safety” and “Occupational Safety”.

Current dynamics are partly related to the integration of Crimea after 2014. Indicators are given in comparison with the national ones. It is logical to assume that the results of this scientific work can be used more widely when forming a strategy for the development of occupational safety in new regions of the Russian Federation.

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