Lessons learnt in Germany from the COVID-19 pandemic from an occupational safety and health perspective

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Report

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Erkenntnisse aus der COVID-19-Pandemie in Deutschland aus Sicht der Arbeitssicherheit und des Gesundheitsschutzes

Kurzreferat

Die COVID-19-Pandemie hat systemische Schwachstellen in Gesellschaften und am Arbeitsplatz offenbart und damit die Notwendigkeit koordinierter Maßnahmen und langfristiger Vorsorge deutlich gemacht. In diesem Zusammenhang haben sieben europäische Arbeitsschutzinstitutionen gemeinsam die aus der Pandemie gewonnenen Erkenntnisse zusammengetragen. Dabei haben sie sich an einem Fragenkatalog orientiert, der von der PEROSH-Arbeitsgruppe entwickelt wurde. Dieser Bericht präsentiert die Perspektive Deutschlands, wie sie von der BAuA auf der Grundlage einer Literaturrecherche und -analyse erstellt wurde.

Der Bericht skizziert die Struktur des deutschen Arbeitsschutzsystems und seine gesetzlichen Anpassungen während der Pandemie. Der Schwerpunkt liegt auf Maßnahmen und Testen am Arbeitsplatz, Leitlinien, Impfungen und weiteren Maßnahmen zur Infektionsprävention. Die Rolle der Digitalisierung bei der Ermöglichung von Fernarbeit und der Aufrechterhaltung der Verwaltung wird hervorgehoben. Der Bericht untersucht auch (langfristige) politische, soziale und technische Auswirkungen, einschließlich regulatorischer Änderungen und Veränderungen in der Arbeitspraxis.

Die wichtigsten Ergebnisse weisen auf die Bedeutung einer starken Integration von Arbeitsschutz in Organisationen, die Notwendigkeit, Ungleichheiten bei der Umsetzung zu beseitigen, und den Wert von Zusammenarbeit und Anpassungsfähigkeit in Krisenzeiten hin. Trotz der effektiven Zusammenarbeit der Interessengruppen und der Beiträge von Experten und Expertinnen waren Herausforderungen wie begrenzte Vorsorge, strukturelle Schwächen und Versorgungsengpässe offensichtlich. Der Bericht schließt mit strategischen Empfehlungen für zukünftige Krisen und Überlegungen zur künftigen Rolle von PEROSH.

Schlagwörter:
COVID-19, Lessons learnt, Lehren aus der Pandemie, Arbeitssicherheit, Gesundheitsschutz, Krise, Interessengruppen, BAuA, PEROSH, BMAS, Maßnahmen, Digitalisierung, Folgen, Berufskrankheiten, Long-/Post-COVID, Veränderungen, Herausforderungen

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Abstract

The COVID-19 pandemic exposed systemic vulnerabilities across societies and workplaces, underscoring the need for coordinated responses and long-term preparedness. In this context, seven European occupational health and safety (OSH) institutions collaboratively compiled lessons learnt from the pandemic, guided by a shared set of research questions developed by the PEROSH working group. This report presents Germany's perspective, as prepared by BAuA, based on literature review and analysis.

It outlines the structure of the German OSH system and its legislative adaptations during the pandemic, with particular focus on workplace measures and testing, guidance, vaccination, and further infection prevention measures. The role of digitisation in enabling remote work and continuity of administration is highlighted. The report also examines (long-term) political, social, and technical effects, including regulatory changes and shifts in work practices.

Key findings point to the importance of strong OSH integration within organisations, the need to address inequalities in implementation, and the value of cooperation and adaptability during crises. Despite effective stakeholder collaboration and expert input, challenges such as limited preparedness, structural weaknesses, and supply shortages were evident. The report concludes with strategic recommendations for future crises and reflections on PEROSH's role moving forward.

Keywords:
COVID-19, Lessons learnt, key lessons pandemic, occupational safety and health, crisis, stakeholders, BAuA, PEROSH, BMAS, measures, digitisation, consequences, occupational disease, Long-/Post-COVID, changes, challenges

This report for Germany is based on the following key questions and the objective of the PEROSH project. It is based on an analysis of literature on occupational health and safety in relation to the COVID-19 pandemic in Germany and, building on this, has identified several focal points for future preparedness. The report does not claim to be exhaustive and does not cover all topics, events and stakeholders in Germany.

The sources used are listed in the bibliography.

Some of the figures used in this report are only available in German. If you have any questions, please contact us.

Management Summary

The COVID-19 pandemic was a global crisis that disrupted societies, economies, and workplaces around the world, highlighting vulnerabilities and prompting urgent responses across all sectors. As of now, it is important to compile the knowledge and experiences made in order to be prepared for future crises. Therefore, representatives from 7 occupational health and safety organisations (Austria/AUVA, France/INRS, Germany/BAuA, Poland/CIOP, Sweden/SAWEE, The Netherlands/TNO, United Kingdom/HSE) formulated lessons learnt during the COVID-19 pandemic from an occupational health and safety perspective (Title “Lessons Learnt: How Different European Countries Addressed Occupational Health and Safety Challenges During the COVID-19 Pandemic”). Their experiences and findings will be consolidated in a joint report. The following key questions were formulated by the PEROSH working group. For better comparability, the following set of questions have been answered by the participating institutions and authors:

How did the countries respond technically and administratively/politically? Who were the country actors and what was the division of responsibilities between the different bodies?

What measures have been taken to address the organisational and psychosocial challenges of the COVID pandemic in the area of occupational safety and health? What were the main difficulties/challenges and strengths in each country?

Are there any measures that are sustainable or permanent? What impact have the OSH measures had on society and vice versa? What are the long-term effects of the pandemics on occupational safety and health in each country? How has the way we work changed?

Have the measures taken in the individual countries been evaluated? Are there any reflections on how each country responded and the impact of the measures taken? What role and strategy have PEROSH member organisations pursued in their national contexts to respond to the challenges of COVID-19 in the area of occupational safety and health?

What important considerations can we make for the future in the event of a new health crisis? What should PEROSH's role be?

BAuA's report is based on a review of relevant documents and literature.

It first presents general information about the preconditions in Germany, describing the occupational health and safety system (OSH), its stakeholders, and their responsibilities during the pandemic (**Chapter 1**.). An overview of COVID-19 related legislations illustrates both, the dynamics of the situation and the adaptability and cooperation between regulatory bodies to provide guidance and protection for employees. The chapter also highlights BAuA's role in research, policy advice, regulatory tasks and public information.

Chapter 2 presents a chronological account of the pandemic's progression, highlighting how public health considerations directly influenced work environments.

Chapter 3 describes the OSH measures taken in Germany. These include information and guidelines, as well as specific regulatory measures for workplaces such as company-based testing and vaccination programmes, short time work and sick leave rules. Companies were also required to implement infection protection measures, such as hygiene rules or organisational changes to reduce transmission. Digitisation was a key enabler of remote work and played an important role in managing the pandemic in public administrations. This chapter also includes insights into how infection control measures were received within companies.

Chapter 4 examines the consequences of the pandemic by reporting first findings on health-related effects. It also discusses political, social, and technical consequences, such as lasting changes in regulation, new forms of workplace cooperation and the acceleration of digitisation.

Ongoing challenges are addressed in **Chapter 5**. Company size, digitisation and also occupational characteristics influenced how infection protection measures were adopted and implemented. These inequalities are important to consider when designing future crises responses. The dynamic and unprecedented nature of the pandemic also posed major challenges. The report emphasizes that pre-existing structures – especially how occupational health and safety is embedded within companies – play a central role in dealing with unforeseen events.

Chapter 6 presents lessons learnt in terms of strengths and challenges. Public health and workplace-level infection control measures were central to the response. Germany's activities in expert committees, such as the Committee on Biological Agents, were crucial in designing effective measures. Adaptability based on new knowledge during the course of the pandemic, and cooperation between stakeholders, were key in protecting workers. However, structural challenges within the OSH system and limitations based on certain company characteristics sometimes reduced the effectiveness of the response. Other challenges included shortages of protective equipment and limited implementation of pandemic preparedness plans.

Chapter 7 summarizes the most important findings.

1 Background

1.1 Introduction to the project

The aim of the PEROSH project is to compile the experience gained in the participating European countries from an occupational health and safety perspective during the COVID-19 pandemic and to formulate the lessons learnt highlighting both strengths and challenges that can serve as guidance for future pandemics.

Representatives from occupational health and safety organisations in Sweden (SAWEE), France (INRS), the UK (HSE), Austria (AUVA), Poland (CIOP), the Netherlands (TNO) and Germany (BAuA) took part in the project. The participants initially prepared country reports based on a set of agreed key questions. The experiences of the individual countries will be consolidated in a joint report summarizing the “lessons learnt” from the COVID-19 pandemic and making them available to all interested stakeholders as recommendations for future pandemic preparedness.

1.2 General information about Germany

The following information is based on current data from the Federal Statistical Office:

- Area: 357,588 km^2
- Population 84.7 million at the end of 2023, 237 inhabitants per km^2
- Form of government: parliamentary federal state (Federal Republic of Germany)

Based on the Basic Law, federalism is the form of political organisation in the Federal Republic of Germany, consisting of 16 federal states that participate in federal legislation and administration as well as in EU matters via the German Federal Council.

1.3 Actors and stakeholders in Germany

1.3.1 The German occupational health and safety system

The EU Framework Directive 89/391/EEC of the European Council of June 12, 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work led to the German Occupational Health and Safety Act (ArbSchG) in 1996[1].

[1] Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work (ArbSchG) from 7 August 1996 (BGBl. I S. 1246), last amended by Art. 32 of the Act of 15 July 2024 (BGBl. 2024, Nr. 236).

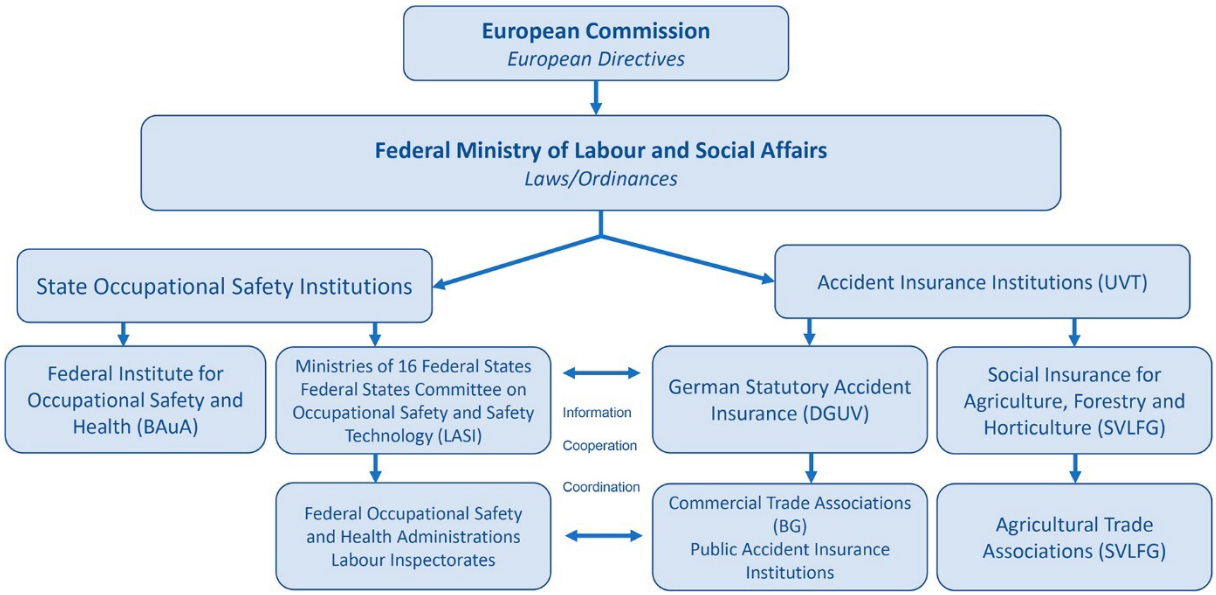

Fig. 1.1 The German occupational safety and health system (source BAuA)

The German occupational health and safety system is characterised by a dual and federal structure (see **Fig. 1.1**). It consists of the governmental occupational health and safety organisation (federal and state governments) and the self-governing accident insurance institutions. The state side (federal government and federal states) issues laws, ordinances and rules of state committees. The Federal Ministry of Labour and Social Affairs (BMAS) has set up state occupational health and safety committees[2] to implement the various occupational health and safety regulations.

The accident insurance institutions *(Unfallversicherungsträger – UVT)* issue their own accident prevention regulations following a needs assessment and with the approval of the federal and state governments.

Supervision and counselling of the companies is carried out by the supervisory staff of the responsible state supervisory authorities (federal states) and the accident insurance institutions (UVT).

The Joint German Occupational Health and Safety Strategy (GDA) was developed by the federal and state governments and accident insurance institutions in order to maintain, improve and promote the safety and health of employees through a coordinated and systematic approach to occupational health and safety. On the basis of jointly defined occupational health and safety goals, the GDA organisations will act in even closer coordination in the area of prevention in future.

[2] www.bmas.de/DE/Arbeit/Arbeitsschutz/Arbeitsschutzausschuesse/arbeitsschutzausschuesse-art.html?cms_templateQueryString=arbeitsschutzaussch%C3%BCsse&cms_showNoGesetzesstatus=true&cms_showNoStatus=true

Further information on the German occupational health and safety system can be found on the EU-OSHA website.[3]

1.3.2 Division of responsibilities during the pandemic

During the coronavirus pandemic in Germany, several political actors at different levels played a central role in managing the crisis. The Federal Government played a key role, with the Chancellery, the Federal Ministry of Health (BMG), the Federal Ministry of Labour and Social Affairs (BMAS) and the Federal Ministry of the Interior working closely together (see **Fig. 1.2**). The Federal Ministry of Health was primarily responsible for health policy measures, such as the procurement of vaccines, the imposition of lockdowns and hygiene measures as well as coordination with the health authorities of the federal states. The BMG is also responsible for infection protection and the "Protection against Infection Act" (IfSG)[4]. The statements of the BMG and the Robert Koch Institute (RKI), which is subordinate to the BMG, have guided action during the pandemic. Due to the dynamic development of the coronavirus pandemic, the IfSG had to be amended in March 2020 as the public health of the entire population was at risk. A paragraph on "epidemic situation of national significance" was added. The aim was to stabilise the healthcare system. To this end, the Federal Ministry of Health was authorised to take appropriate measures.

The BMAS played a key role in the social and labour market aspects of the pandemic. It developed measures to cushion the impact of the crisis on the labour market. The expansion of social benefits and support for particularly vulnerable groups also fell within the remit of the BMAS. The BMAS is responsible for occupational health and safety via the Occupational Health and Safety Act.

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[3] www.oshwiki.osha.europa.eu/de/themes/osh-system-national-level-germany and www.osha.europa.eu/de/about-eu-osha/national-focal-points/germany

[4] Protection against Infection Act (IfSG) from 20 July 2000 (BGBl. I S. 1045), last amended by Article 8v from 12 December 2023 (BGBl. 2023 I Nr. 359)

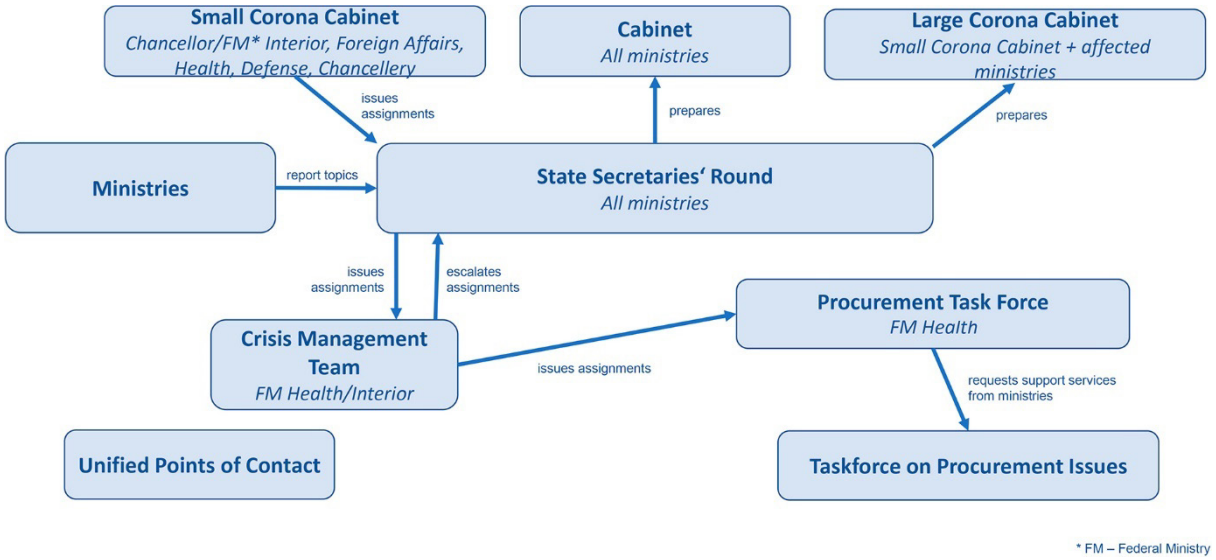

Fig. 1.2 Government action in the Corona crisis adapted from (www.bundesregierung.de/breg-de/aktuelles/regierungshandeln-covid19-1740548)

As the different responsibilities also resulted in different competences in the context of the pandemic, cooperation between the ministries was key in order to coordinate the measures in the best possible way. The BMG was authorised to coordinate the corona measures on a nationwide basis.

At federal level, the federal states were also significantly involved in the implementation of the measures through their minister presidents and responsible health authorities. Coordination between the federal and state governments took place at regular Minister Presidents' Conferences (MPK), at which decisions were made on measures such as school closures and curfews.

German crisis management during the coronavirus pandemic can be mapped on a macro, meso and micro level (Klinger et al., 2022). In terms of occupational health and safety, the BMAS corresponds to the **macro level**. The state occupational health and safety institutions and the accident insurance institutions (UVT) with the associated occupational health and safety administrations of the federal states and the employers' liability insurance associations form the **meso level**. Professional associations (e. g., of the public health service) and interest groups (e. g., trade unions) are also located here. The **micro level** can be understood as the companies, which may have set up their own crisis teams or taken specific/individual measures.

1.3.3 The national pandemic plan

Under the leadership of the Robert Koch Institute, a national pandemic plan (NPP) was drawn up in 2005, which was updated in 2017 (RKI, 2017). This plan also explicitly refers to pandemic planning in companies, administrations and other non-medical areas and thus takes into account the world of work as a source of further infections (Arens, 2021).

When the national epidemic situation came into force, companies were required to adapt and implement their pre-existing pandemic plans. They should include measures to minimise workplace infection risks (e. g., by interrupting chains of transmission), serving the dual purpose of securing the supply of essential goods and services to the population and preserving operational continuity and critical infrastructure. In addition to compliance with already regulated occupational health and safety measures, the following aspects should be considered when developing company pandemic plans (see NPP Part 1):

- Planning internal processes and personnel as well as external parties (e. g., customers, suppliers)
- Procurement of aids (protective equipment, disinfectants, etc.)
- Internal information policy for employees, e. g., on hygienic behaviour
- Involvement of occupational physicians and company doctors

These preparatory aspects must be concretised through the implementation of measures and process plans.

Pandemic plans in companies are very well suited to combining civil protection measures with occupational health and safety measures and to interrupting the overall risk of infection or chains of infection and slowing down the pandemic.

1.3.4 Responsibility of the BMAS for occupational health and safety during the corona pandemic

The Federal Ministry of Labour and Social Affairs (BMAS) is the highest federal authority in Germany responsible for the areas of labour market policy, labour law and occupational health and safety. The direct portfolio of the Federal Ministry of Labour and Social Affairs includes the Federal Labour Court, the Federal Social Court, the Federal Social Security Office and the Federal Institute for Occupational Safety and Health. The Federal Employment Agency is also under the legal supervision of the BMAS.

The Federal Institute for Occupational Safety and Health (BAuA) is a federal government departmental research organisation committed to occupational safety and health and humane work design. It is a subordinate authority of the BMAS.

A chronological list of political decisions and measures taken by the BMAS during the coronavirus pandemic can be found in **Table 1.1**, which is then referenced in **Chapter 3**. A detailed depiction of the events and a full list of all those involved or events is not provided, as it is not relevant for the further work of the overall report of the European countries involved in the PEROSH project.

Table 1.1 Compilation of political decisions and measures taken by the BMAS during the corona pandemic (not exhaustive)

What	When	Objective and area of application	What/How
Classification in risk group 3 by the German Committee on Biological Agents (ABAS) Infection risk according to Biological Substances ordinance (BioStoffV) § 3 paragraph 1 no. 3: "Biological agents that can cause a serious disease in humans and pose a serious risk to employees; there may be a risk of spread in the population, but effective prevention or treatment is normally possible." Addition of the labelling "Z" (zoonosis) as transmission from animal to human.	February 2020	Derivation of protective measures for activities involving SARS-CoV-2, especially in the healthcare sector, laboratory tests, etc.	– Choice of protective clothing and protective measures for employees who carry out activities in accordance with the BioStoffV – Basis for further political decisions also outside the BioStoffV (e. g., maternity protection) and basis for products of other occupational health and safety committees (ASTA, AfAMed)
Corona occupational health and safety standard with social partners, health and safety authorities of the federal states and accident insurance institutions	April 2020	Uniform national and cross-industry minimum standards for all employees and companies to ensure infection protection measures in the workplace	Review and adaptation of the risk assessment with regard to – Distance rules – Wearing masks – Hygiene measures – Ventilation concepts – Protection of risk groups – Home office and flexible working hours – Information and training – Organisation of work processes
Ordinance on deviations from the Working Hours Act due to the COVID-19 epidemic (COVID-19 Working Hours Ordinance – COVID-19-ArbZV)	April 2020	Coping with the extraordinary burden caused by the COVID-19 pandemic by maintaining public safety and order, healthcare and care, services of general interest and ensuring the supply of essential goods to the population.	– Deviation from the Working Hours Act in Section 14 (4) – Exception to maximum working hours (max. 12 hours), rest period (min. 9 hours), employment on Sundays and public holidays – In relation to certain activities in the areas of critical infrastructure (e. g., supply chains, medicines, healthcare, energy and water supply, agriculture, etc.). – Valid for a limited period of approx. 9 weeks from April to the end of June 2020

What	When	Objective and area of application	What/How
Setting up the Corona safety staff	April 2020	Implementation and further development of the Corona occupational health and safety standard Advice on changes to occupational health and safety standards during the course of the pandemic Coordination of necessary industry-specific concretisation	Weekly meetings of the BMAS with experts from the social partners, the health and safety authorities of the federal states, the accident insurance institutions and the scientific community
SARS-CoV-2 occupational health and safety regulations under the auspices of the ASTA	August 2020	To concretise the Corona occupational health and safety standard	Offer of occupational health screening (ArbMedVV) for activities in accordance with the German Ordinance on Biological Substances (BioStoffV), i.e., in healthcare facilities. When working from home (electronically), instruct employees on ergonomic workplace design, use of work equipment and the regulations on working hours, breaks and availability. Advising the employer on the establishment of company instructions for infection protection by company doctors. Protective measures for special workplaces and workstations as well as other special operational facilities (generally without sanitary facilities), e. g.: – Construction sites – Agriculture and forestry – External and delivery services, transport and journeys within the company, public transport – Accommodation
Occupational Health and Safety Control Act	December 2020		– Ban on labour contracts in the meat industry – Strict requirements for temporary labour in the meat industry – Minimum standards for the accommodation of employees – Introduction of an inspection quota for Germany

What	When	Objective and area of application	What/How
Occupational Health and Safety Ordinance, CoronaArbSchV	2021–2023	Reduction of the risk of infection in the workplace Health and safety in the workplace	– Operational infection protection based on a hygiene concept in accordance with the risk assessment – During the risk assessment, the employer must check the following measures in particular: 1. minimum distance of 1.5 metres between two people 2. ensuring hand hygiene, 3. compliance with coughing and sneezing etiquette, 4. the ventilation of indoor spaces in accordance with infection protection regulations, 5. the reduction of business-related personal contacts, 6. offer to work from home 7. offer free COVID-19 tests for employees who do not work exclusively from home – Provide and request the wearing of masks if the aforementioned measures are not sufficient or cannot be implemented to prevent infection – Offer immunisations during working hours

1.3.5 Role of the BAuA in the corona pandemic

1.3.5.1 Support of the BMAS through state health and safety committees

BMAS is advised on occupational health and safety issues by state occupational health and safety committees[5]. Their main task is to determine state regulations, whereby these concretise the specific legal provisions (ordinances and ArbSchG). The aim is to identify rules and proven scientific findings that correspond to the state of the art in technology, occupational medicine and occupational hygiene and ensure the safety and health of employees at work. The concretising rules are used by employers to derive protective measures as part of the risk assessment to be carried out in accordance with Section 5 ArbSchG. Due to their high technical quality, the rules have the so-called presumption of conformity, which fulfils the requirements of the occupational health and safety regulations. The rules are also used for enforcement action at federal state level.

The health and safety committees (see **Table 1.2**) are pluralistically composed in the form of so-called benches. There is a bench of employers, trade unions (employees), the federal states, the statutory accident insurance institutions and the scientific community. Each bench has the same number of members and deputies. The aim is to reach consensus decisions through the committees with the participation of all benches.

Table 1.2 State health and safety committees of the BMAS

Committee	Law/regulation/paragraph	Established since
Committee for Hazardous Substances – AGS	Ordinance on protection against hazardous substances: Hazardous Substances Ordinance – GefStoffV (§ 20)	1972
Committee on Biological Agents – ABAS	Ordinance on safety and health protection when working with biological agents: Biological Substances Ordinance – BioStoffV (§ 19)	1995
Committee for Operational Safety – ABS	Ordinance on safety and health protection in the use of work equipment: Ordinance on Industrial Safety and Health – BetrSichV (§ 21)	2002
Committee for workplaces – ASTA	Ordinance on workplaces: Workplace Ordinance – ArbStättV (§ 7)	2005
Occupational Medicine Committee – AfAMed	Ordinance on Occupational Health Care – ArbMedVV (§ 9)	2009
Committee for Safety and Health at Work – ASGA	Occupational Health and Safety Act – ArbSchG (§ 24a)	2021

[5] www.baua.de/EN/About-BAuA/Tasks/Committee-administration

The management of the health and safety committees is based at BAuA.

During the COVID-19 pandemic, ASTA, ABAS and AfAMed were heavily involved in the development of the coronavirus-specific regulations shown in **Table 1.1**.

BMAS formulated the coronavirus occupational health and safety standard in April 2020 and set up a coronavirus occupational health and safety team for the duration of the pandemic. The occupational health and safety standard was specified in the SARS-CoV-2 Occupational Health and Safety Ordinance. The Committee for Workplaces (ASTA) was in charge of this with the participation of the Committee on Biological Agents (ABAS) and the Committee on Occupational Medicine (AfAMed).

As early as February 2020, the ABAS classified SARS-CoV-2 as risk group 3 (risk group 3, shortly afterwards extended by the labelling “Z”). This classification was then used to derive occupational health and safety measures for activities involving biological agents, including the preparation of further documents, e. g., Technical Rules for Biological Agents (TRBA 255 “Occupational health and safety in the event of the occurrence of respiratory viruses with pandemic potential that are not sufficiently vaccine-preventable in the health service”) or recommendations, e. g., for diagnostics in laboratories or for vaccination centres. The responsible occupational health and safety actors at state level have also orientated themselves on the classification and taken measures. Other federal ministries have gradually followed suit, e. g., the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (BMFSFJ), which has drawn up specific rules for pregnant women through the Committee on Maternity Protection.

1.3.5.2 Legal and sovereign tasks

The Federal Institute for Occupational Safety and Health fulfils sovereign tasks with international activities in the field of the regulation of industrial chemicals and the authorisation and evaluation of biocidal products. As the Federal Centre for Chemicals (BfC), BAuA is the legally responsible authority for tasks within the framework of REACH, CLP and Biocides Regulations.

During the coronavirus pandemic, exceptional authorisations were issued for manufacturing of disinfectants due to the increasing demand for them. As a rule, these products are subject to strict regulations and must undergo a comprehensive authorisation procedure in accordance with the Biocidal Products Regulation (EU), as they can be harmful to health and the environment. During the coronavirus pandemic, BAuA was authorised to issue exemptions for certain disinfectants.

Under the Product Safety Act (ProdSG)[6], BAuA has a mandate to provide information to the authorities responsible for market surveillance in the federal states. For example, it provides information on the safety of articles of daily use and work equipment. This

[6] Product Safety Act (ProdSG) from 27 July 2021 (BGBl. I S. 3146, 3147), last amended by Article 2 from 27 July (BGBl. I S. 3146)

also includes personal protective equipment such as masks, gloves and protective suits, which were needed particularly frequently during the coronavirus pandemic and must fulfil the high requirements to ensure the safety and health of employees. Due to a shortage of PPE and supply bottlenecks, there were exemptions for procurement and production, so that BAuA increasingly fulfilled its duties under the ProdSG.

1.3.5.3 Research for work and health

As a departmental research organisation, BAuA's research is concerned with all issues relating to safety and health at work. The aim of the research is to recognise potential risks for employees at an early stage. Research into the opportunities for human-centred work design also plays an important role. In the course of the coronavirus pandemic, BAuA launched numerous research activities. On the one hand, this included monitoring occupational health and safety measures in companies, as well as the health consequences of the pandemic, using both qualitative and quantitative approaches, interdisciplinary approaches and reviews. On the other hand, the research also served to better understand the virus and its spread, which were important for the safe and healthy organisation of workplaces. BAuA's research is focussed on interfaces such as occupational health and safety and infection protection and highlights a wide range of interrelated design options (Biniok et al., 2025). Some of these BAuA research projects are outlined below.

BAuA played a key role in the (longitudinal) representative IAB study “BeCovid – Company survey on the gradual exit from the coronavirus shutdown in Germany” (Backhaus et al., 2022). Around 2,000 company managers from different sectors and company sizes provided information on how they deal with coronavirus in their companies. BAuA specifically addressed questions on occupational health and safety and infection protection measures, the implementation of home office and dealing with psychosocial risks.

BAuA also conducted a survey of occupational safety experts on the implementation of the SARS-CoV-2 occupational safety standards in companies in order to derive best practice recommendations from them (Eickholt et al., 2021). Using an online survey, telephone interviews and focus groups, occupational safety experts, company doctors, small business owners and supervisory institutions from selected sectors and all company size classes were asked about the implementation and effects of infection protection measures, promoting and inhibiting factors, comprehensibility and effectiveness of the regulations.

The NAKO Health Study, a population-based epidemiological cohort study in which various other research institutions throughout Germany are involved in addition to BAuA, has identified the SARS-CoV-2 infection probability for individual occupational groups and areas in the first wave of the COVID-19 pandemic (Formazin et al., 2022). Furthermore, the BAuA working time survey from 2021 also provided valuable insights

into the impact of the SARS-CoV-2 pandemic on the working hours of 20,000 employees in Germany (Backhaus et al., 2023), more on this in **Chapter 3.3**.

A systematic review by BAuA looked at work-related stigmatisation due to SARS-CoV-2 infections (Schubert et al., 2021). Existing scientific findings were supplemented by a practical interview study with nursing and medical staff in order to identify stigmatisation experiences and their consequences for the health of employees and to derive prevention strategies from them (Faller et al., 2022).

A secondary data analysis of the representative study SOEP-CoV of the German Socio-Economic Panel (SOEP)[7] by BAuA examined the implementation of personal and organisational occupational health and safety measures in companies. Employees were surveyed at two survey points in 2020 and 2021 (Meyer et al., 2021).

1.3.5.4 Research funding

In addition, there were various nationwide calls for funding at the time, with the aim of better understanding the pandemic and its effects.

In May 2020, BMAS called for expressions of interest in setting up research projects in the context of the coronavirus pandemic as part of the funding guideline for the “Promotion of research and teaching in the field of social policy” (BMAS, 2020). Funding was provided for research projects that identified social policy strategies for crisis management based on scientific principles.

In March 2020, the Federal Ministry of Education and Research (BMF) also launched a call for research funding into COVID-19 in the wake of the outbreak of SARS-CoV-2 in accordance with the guidelines for funding a “National Research Network for Zoonotic Infectious Diseases”. The focus here was on research into the biology and transmission of the virus, containment measures and clinical management, infection control and diagnostic/therapeutic approaches, i.e. research that generally reflected WHO's priorities (BMBF, 2020).

As part of the National Research Data Infrastructure (NFDI), KonsortSWD (Consortium for the Social, Behavioural, Educational and Economic Sciences) and RatSWD (German Data Forum) are developing principles for the use and management of research data in the social, behavioural, educational and economic sciences. Their website contains 350 empirical studies and projects on the effects of/the fight against the coronavirus pandemic on society (KonsortSWD, 2020–2024).

[7] www.soep-cov.de/de/studie/

1.3.5.5 Information for companies and occupational health and safety stakeholders

BAuA operates an information centre that serves as a competent information point for both occupational safety and health stakeholders in companies, statutory accident insurance institutions and state institutions as well interested citizens. The centre provides answers to specialist questions, for example from occupational safety specialists or staff and work councils. General OSH information and information from BAuA scientists can be obtained directly via the information centre. The information centre also provides support in the dissemination and procurement of BAuA publications.

The information centre receives both telephone and electronic enquiries. As an analysis of the enquiries received during the coronavirus pandemic shows, a particular focus was on providing information on the manufacture of disinfectants and protective clothing (see **Fig. 1.3**). The numerous enquiries received by BAuA during the pandemic were processed and made accessible in FAQs.

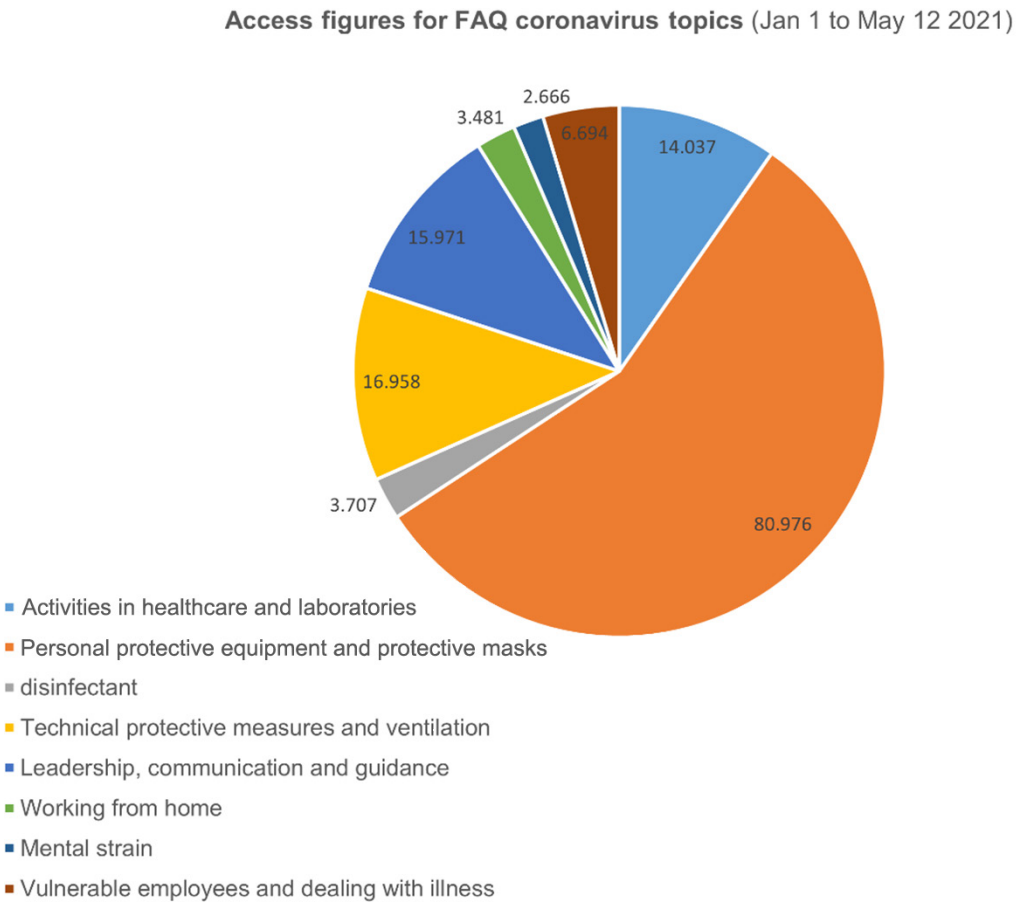

Fig. 1.3 Access figures for FAQ coronavirus topics on BAuA Homepage

2 Chronology and data of the SARS-CoV-2 pandemic in Germany

The Robert Koch Institute (subordinate authority of the Federal Ministry of Health) is responsible for infection protection, analyses notifiable diseases and evidence of pathogens in accordance with Section 4 of the Infection Protection Act (IfSG). Data is recorded by local health authorities and transmitted to RKI via the state health authorities (federal system). This reporting chain repeatedly leads to delays, which had an impact on the publication of case numbers (increase, decrease) during the pandemic.

The RKI has retrospectively divided the COVID-19 pandemic into eight epidemiological phases and six COVID-19 waves based on various parameters[8] (Tolksdorf et al., 2022). **Table 2.1** shows the phases and waves described below and the dominant SARS-CoV-2 variant for the years 2020 to 2022.

Table 2.1 Phasing to describe COVID-19 events in Germany 2020–2022 (as at September 15, 2022); *end of phase 8 not yet definable; VOC = Variant of Concern; cw = calendar week (Tolksdorf, Loenenbach & Buda, 2022)

phase	name	Start (cw)	end (cw)
0	occurrence of sporadic cases	5/2020	9/2020
1	first wave of COVID-19	10/2020	20/2020
2	summer plateau 2020	21/2020	39/2020
3	second wave of COVID-19	40/2020	8/2021
4	third wave of COVID-19 (VOC Alpha)	9/2021	23/2021
5	summer plateau 2021	24/2021	30/2021
6	fourth wave of COVID-19 (VOC Delta)	31/2021	51/2021
7	fifth wave of COVID-19 (VOC Omikron BA.1/BA.2)	52/2021	21/2022
8	sixth wave of COVID-19 (VOC Omikron BA.5)	22/2022	*

[8] Extract of parameters for retrospective phasing of the pandemic: PCR tests per 100,000 inhabitants, notifications in accordance with the Infection Protection Act (IfSG), 7-day incidence, 7-day R-value (Monday value), proportion of outbreak cases, weekly incidence (per 100,000) of hospitalised cases aged 60 and above.

2.1 Phase 0 – 1, first COVID-19 wave

The starting point was the first confirmed case of Severe Acute Respiratory Syndrome Coronavirus Type 2 (SARS-CoV-2) on January 27, 2020 in Germany (Schilling, Buda et al., 2021). Shortly afterwards, two cases occurred due to returnees from China. From mid-February 2020, further cases were added in connection with carnival celebrations and return journeys from ski resorts (especially Italy and Austria). This period corresponds to **phase 0** of the COVID-19 pandemic, in which isolated cases occurred in individual urban and rural districts. The first COVID-19 wave, **phase 1**, began in Germany at the beginning of March 2020. The disease burden of acute respiratory infections increased over the course of the pandemic. In the 1st phase of the pandemic, 80 % of all COVID-19 cases had a mild course of disease (Schilling et al., 2020). This meant that in addition to symptoms such as cough, cold, fever, sore throat and general signs of illness (e. g., weakness, muscle and limb pain), there was no pneumonia (pneumonia), hospitalisation or death. Infants, children and adolescents were rarely ill during this period. Initially, younger people aged 20 to 59 were more likely to fall ill (63 %), but as the disease progressed, more and more people aged 60 and above were affected and showed a severe course of the disease. There were also gender-specific differences in the severity of the disease: Men had more severe courses than women. In the 1st COVID-19 wave, cases occurred nationwide for the first time, but the south of Bavaria and Baden-Württemberg were particularly affected (Schilling, Tolksdorf et al., 2021). The main outbreak settings identified were retirement and nursing homes and hospitals. On March 16, 2020, the German federal government introduced comprehensive border controls and largely closed the borders to several neighbouring countries, including France, Austria, Luxembourg, Switzerland and Denmark (BMI, 2024). In addition, politicians reacted by cancelling events with more than 1,000 people, successively closing kindergartens (daycare centres) and schools, and finally imposing a nationwide lockdown on March 23, 2020 with comprehensive contact restrictions and far-reaching closures (including in the catering sector) (Schilling, Buda et al., 2021). On March 27, the Act on the Protection of the Population in the Event of an Epidemic Situation of National Significance was enacted. As part of this, the Federal Ministry of Health was authorised to issue regulations on quarantine, travel restrictions and the deployment of health services. Measures were also defined to ensure the supply of important medical products, personal protective equipment and medicines. Financial support measures for the healthcare system were also introduced in order to increase supply capacities and avoid bottlenecks. Measures to make medical care more flexible, e. g., through the use of telemedicine, were also adopted.

From April 8, a 14-day mandatory home quarantine was in place for travellers arriving from abroad. From the end of April, restrictions were gradually eased again as the number of cases fell: shopping in shops up to 800m² was possible again, some schools were reopened, playgrounds, museums, zoos, places of worship and catering establishments were reopened. In addition, the wearing of a face covering (everyday mask)

became mandatory nationwide for shops and public transport from April 29 (Schilling, Buda et al., 2021).

On April 16, 2020, the BMAS published the SARS-CoV-2 occupational health and safety standard, which was intended to ensure a nationwide, uniform, cross-industry minimum standard of occupational health and safety during the COVID-19 pandemic (BMAS, 2020a). The 1st COVID-19 wave ended in May 2020. From the end of February to mid-July, COVID-19 outbreaks were mainly attributable to sources of infection in private households (RKI, 2020).

On May 6, 2020, a nationwide “hotspot strategy” was adopted, according to which the federal states were allowed to implement additional local restriction measures from an incidence of 50 new infections per 100,000 inhabitants (within the last 7 days) (Bundesregierung, 2020c). This hotspot strategy was further specified in further resolutions in October.

2.2 Phase 2

The **2nd phase** from May (calendar week 21) to September 2020 was characterised by a significant decline in the number of cases, which is why contact-reducing measures were severely restricted. From the summer onwards, however, the number of cases rose in connection with the school holidays among travellers who had been infected abroad. From August, free tests were therefore initially offered or introduced for travellers from risk areas and later mandatory tests. Compared to phase 1, the number of tests was significantly higher from the second phase onwards (Schilling, Buda et al., 2021). In addition to travel-related cases, there were outbreaks in communal facilities (refugee and asylum seekers' homes, retirement and nursing homes, day care centres for the elderly) and in meat-processing companies. Outbreaks in communal facilities with elderly patients were associated with a high risk of severe and fatal outbreaks (RKI, 2020). Outbreaks in which the workplace is considered a likely infection environment were reported from mid-June in particular and are attributable to several large outbreaks in the meat processing industry.

RKI's voluntary Corona-Warn-App, a mobile app for contact tracing, was available in Germany from June 16, 2020. In June, the first “bridging aid” for small and medium-sized enterprises that had to suspend all or part of their business operations due to the pandemic was approved (BMWE, 2020).

On August 13, 2020, BMAS published the SARS-CoV-2 occupational health and safety rule, which was developed in cooperation with BAuA. The rule included infection protection measures for all sectors of the economy to reduce the risk of infection for employees in the workplace. The most important levers were Keeping your distance (A), hygiene concepts (H) and wearing everyday masks (A; together the letters make up the so-called AHA rule). It specified the SARS-CoV-2 occupational health and safety standard through additional operational infection protection measures

(Bundesregierung, 2020b) and was legally legitimised by the Occupational Health and Safety Act[9] and the resulting occupational health and safety ordinances relevant to the pandemic (Workplace Ordinance, Biological Substances Ordinance and the Ordinance on Occupational Medical Precautions).

Compared to the other phases, the average age of the reported cases was lowest in phase 2 at 33 years (Schilling, Tolksdorf et al., 2021).

2.3 Phase 3, second COVID-19 wave

The second COVID-19 wave, **phase 3**, hit Germany from autumn 2020 (end of September). It was more severe and lasted longer than the first COVID-19 wave (Schilling, Tolksdorf et al., 2021). In addition to the previous social distancing and hygiene measures, there has now also been an increased appeal for regular “ventilation” (L, which has resulted in the so-called AHA+L rule) in all private and public spaces (Bundesregierung, 2020e).

From October onwards, cases with exposure abroad fell compared to the summer as part of travel warnings for countries with a 7-day incidence of 50 per 100,000 inhabitants (Schilling, Buda et al., 2021). The proportion of cases with exposure abroad fell to a minimum of 1 % compared to the previous phases (Schilling, Tolksdorf et al., 2021).

From mid-October, free rapid antigen tests were implemented in care homes and hospitals as part of the national testing strategy. From November 2 to 30, a nationwide partial lockdown was in place with stricter regulations to combat the coronavirus pandemic. Accordingly, only a maximum of ten people from two households were permitted to stay in public (Bundesregierung, 2020a). Furthermore, people were called upon to refrain from travelling at home and abroad and the provision of overnight accommodation was prohibited. Institutions and facilities for leisure activities (e. g., recreational sports) and catering establishments were repeatedly closed. With the Coronavirus Testing Ordinance[10] (TestV), which came into force on December 2, the national testing strategy was adapted and extended testing options for vulnerable people, e. g., staff and residents in nursing homes, facilities for people with disabilities and hospitals, were permitted. The partial lockdown was intended to counteract the spread of SARS-CoV-2. Nevertheless, the extent of the second COVID-19 wave became clear over the winter of 2020/2021: the 7-day incidence rose to a peak of 210 per 100,000 inhabitants, severe courses of the disease and hospitalised cases increased significantly. In the first and second wave, severe courses of the disease occurred predominantly in people aged 60 and above, but were also found in people under 60. In view of the dynamic infection process, chains of infection were no longer traceable.

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9 www.gesetze-im-internet.de/arbschg/

10 www.gesetze-im-internet.de/coronatestv_2021-10/

As a result of these developments, a nationwide “hard” lockdown was repeatedly imposed on December 13, 2020. Tighter contact restrictions were imposed on retail and service companies in the catering, travel, leisure, sports and cultural sectors. Educational institutions were closed and companies were required to offer generous home office or company holidays, especially over the Christmas holidays until New Year. Wearing a face mask was mandatory in workplaces and business premises unless a minimum distance of 1.5 metres from other people could be maintained. Private gatherings with members of one's own household and one other household were permitted with a maximum of five people. Colleges and universities were to provide digital teaching programmes. Companies, businesses, the self-employed, associations and organisations affected by closures were to receive financial support from the federal and state governments. Economic sectors with “significant restrictions on their business operations”, e. g., the cultural and event industry, the travel industry and solo self-employed persons, were to receive “Bridging Aid III”. FFP2 masks were made available to protect vulnerable groups in hospitals, care homes and services, retirement homes and facilities for the disabled, and the testing strategy was adapted. Furthermore, home quarantine was reduced to 10 days in order to reduce the economic consequences (Bundesregierung, 2020d).

On December 27, 2020, nationwide vaccination campaigns were launched, which were prioritised according to risk groups with limited vaccine availability (Coronavirus Vaccination Ordinance, CoronaImpfV). Particularly vulnerable people in retirement and nursing homes were vaccinated the day before. Furthermore, the Act to Improve the Enforcement of Occupational Health and Safety (Occupational Health and Safety Control Act) was passed on December 30, 2020 in order to remedy shortcomings that became apparent in the meat processing industry during the Covid-19 pandemic.

At the turn of the year 2020/2021, there was a continuous decline in many parameters – with the exception of those indicating severe disease progression – due to public holidays and school holidays (Schilling, Buda et al., 2021). From January 20, 2021, the wearing of medical masks, surgical masks, masks of the KN95/N95 or FFP2 standards, became mandatory on public transport and in shops due to their better protective effect (Bundesregierung, 2021d). On January 21, 2021, the BMAS issued the SARS-CoV-2 Occupational Health and Safety Ordinance (CoronaArbSchV). Employers were required to develop operational hygiene concepts based on a risk assessment and to implement the necessary coronavirus protection measures. The contents of the ordinance related to updating risk assessments, reducing operational contacts, ventilation measures and partitions, hygiene concepts, compulsory masks and SARS-CoV-2 rapid tests as well as a “home office obligation”, provided there were no operational reasons to the contrary.

From the end of February, the parameters under consideration stagnated and phase 3 ended. The “hard” lockdown with nationwide restrictions was extended until mid-February (Bundesregierung, 2021d).

2.4 Phase 4, third COVID-19 wave (VOC Alpha)

RKI has retroactively scheduled the following **phase 4**, or the third COVID-19 wave, for the period between March and the beginning of June 2021 (Schilling et al., 2022). During this phase, gradual easing or various opening steps in the public sector were decided again depending on the (regional) incidence (Bundesregierung, 2021b). From this point onwards, vaccines as well as rapid and self-tests were available in higher quantities. Companies continued to be supported with extensive financial measures (restart aid for solo self-employed persons, extended November/December aid, increase in interim payments in bridging aid III, hardship fund) (ibid.).

From April 23 to June 30, 2021, the so-called “federal pandemic emergency brake” applied. According to this, additional infection control measures had to be taken if more than 100 new infections per 100,000 inhabitants occurred in a district on three consecutive days. These measures included contact restrictions, curfews from 10 p.m. to 5 a.m., individual outdoor sports with a maximum of two people or one's own household, limiting the number of customers in the retail trade for extended daily needs, catering only out-of-home sales or via “click&collect”, alternating lessons at schools with compulsory testing twice a week, closure of educational institutions (emergency care in daycare centres possible) from an incidence of 165 (BMG, 2021). With the new version of the CoronaArbSchV, the “home office obligation” was abolished on June 30, 2021 (BMAS, 2021b).

2.5 Phase 5

In the subsequent summer plateau, **phase 5**, from mid-June to the end of July 2021, all parameters declined. Here, rather mild processes occurred (Schilling, Tolksdorf et al., 2021).

2.6 Phase 6, fourth COVID-19 wave (VOC Delta)

From August 2021, **phase 6** or the fourth COVID-19 wave began. From August 23, the 3G rule applied, according to which only vaccinated, recovered or tested persons had access to the following facilities: hospitals, retirement and nursing homes as well as facilities for the disabled, indoor catering, sports and indoor events (Bundesregierung, 2021c). In addition, only vaccinated, recovered or tested persons were allowed to use body-related services (e. g., hairdressing, cosmetics, personal care) or accommodation services. Anyone who was neither vaccinated nor recovered had to present a negative rapid antigen test or PCR test. Children up to the age of 6, schoolchildren and people who could not be vaccinated or for whom a general vaccination recommendation had been issued were exempt from the 3G rule. Large events were permitted subject to the application of the 3G rule and corresponding hygiene concepts. The 3G rule could be lifted if the 7-day incidence in a district or district-free city remained stable below 35 (Bundesregierung, 2021c).

In the course of the fourth COVID-19 wave, two peaks in previously observed parameters were observed in mid-September and late November/early December (see 7-day incidence and hospitalisations). At the end of 2021 and the end of the fourth wave, these parameters steadily decreased.

On November 24, 2021, the Infection Protection Act (Section 28b IfSG) was amended. The “epidemic situation of national scope” was cancelled. Nevertheless, a number of standardised nationwide protective measures applied: 3G rule in local and long-distance public transport and air traffic, 3G rule in the workplace for both employees and employers with monitoring of testing obligations by employers, reintroduction of the obligation to work from home and the use of this offer by employees, additional testing obligations for vaccinated and recovered persons (2G-Plus) in facilities for vulnerable persons (e. g. care facilities, rehabilitation facilities, facilities for integration assistance).

At the beginning of December, the federal government decided to expand the group of people who are authorised to administer vaccinations (in addition to doctors, also pharmacists, nurses and dentists) (Bundesregierung, 2021a). In addition, the 2G rule, possibly 2G-Plus, now applies without restriction to access to cultural and leisure facilities and events (cinemas, theatres, restaurants, etc.) and in retail – with the exception of shops for daily needs. Strict contact restrictions apply immediately for unvaccinated and unhealthy people. At sporting, cultural and other major events, indoor and outdoor capacities were allowed to be between 30 and 50 per cent.

2.7 Phase 7, fifth COVID-19 wave (VOC Omikron BA.1 and BA.2)

At the end of 2021, there was a smooth transition from the fourth to the fifth COVID-19 wave, **phase 7**, and the (still) predominant Variant of Concern (VOC) micron. The RKI explains phase 7 as the point at which the pandemic became endemic (Tolksdorf, Loenenbach et al., 2022). Due to the high transmissibility of the Omikron variant, the low, very limited immunity of vaccinated and recovered people and the existing “vaccination gap” in Germany, the German government made further decisions on December 21, 2021 (Bundesregierung, 2021e): the vaccination campaign was intensified and children aged 5 to 11 could also be vaccinated with immediate effect. Contact restrictions now also applied to vaccinated and recovered people from December 28, but were slightly less strict than for unvaccinated people. Indoor dance events were banned and large nationwide events were only allowed to take place without spectators.

From the beginning of February 2022, there was a drop in some parameters (e. g., number of tests carried out per 100,000 inhabitants), which nevertheless remained at a high level and rose again very sharply over time (Tolksdorf, Loenenbach et al., 2022).

With the amendment to the IfSG on December 12, 2021, a rather controversial facility-based vaccination obligation for employees in the healthcare sector and in care facilities applied from March 15 to December 31, 2022 in accordance with Section 20a in

order to protect particularly vulnerable groups from COVID-19. Employees had to submit proof of full vaccination status, proof of recovery or a medical certificate in the event that they could not/should not be vaccinated. Health authorities could impose a ban on employment without the submission of such proof.

By March 2022, gradual steps towards reopening had been taken: contact restrictions were lifted and access to retail was made possible for everyone (with a mask requirement). Access to catering establishments, dance events and major nationwide events was also made possible again in accordance with the 2G-Plus or 3G rule. More spectators were once again permitted at major events. From March 20, the pandemic-related protective measures were lifted, including the home office rule (Bundesregierung, 2022b). From March or April (transitional regulation) to September 2022, basic protection was in place, which provided for a nationwide mask requirement in air and long-distance passenger transport as well as country-specific regulations depending on the infection situation. The 3G rule in the workplace and the mask requirement in local passenger transport have been cancelled.[11]

After the Easter holidays in mid-April 2022, most of the parameters declined again. However, the values previously collected during the 2020 and 2021 summer plateaus were significantly exceeded overall with the fifth COVID-19 wave. The reasons given for this are the high transferability of the Omikron variant, a high-test frequency and increased consultation behaviour within the population (Tolksdorf, Loenenbach et al., 2022). Although the Omikron wave had comparatively high incidences, there was a lower individual burden of disease (Bundesregierung, 2022a). Parameters previously used to assess the pandemic situation, such as the 7-day incidence, were supplemented from the fifth wave onwards by parameters for recording symptomatic and severe COVID-19 progressions. This was due to changed framework conditions: higher immunity in the population, higher vaccination rates and a weakened Omikron variant (ibid.). From May 1, 2022, a mandatory 5-day isolation for infected persons and a voluntary 5-day quarantine for contact persons applied (BMG, 2022).

The fifth COVID-19 wave ended in May 2022 and the SARS-CoV-2 Occupational Health and Safety Ordinance and Occupational Health and Safety Rule expired on May 25, 2022.

[11] Act Amending the Infection Protection Act and Other Laws on the Occasion of the Lifting of the Determination of the Epidemic Situation of National Significance of 18 March 2022 (BGBl. I, Nr. 466)

2.8 Phase 8, sixth COVID-19 wave (VOC Omikron BA.5)

The sixth COVID-19 wave and (so far) last **phase 8** began at the end of May 2022. Due to a public holiday at the end of May, most values fell and rose again noticeably from June. Nevertheless, some values (e. g., number of tests carried out) were noticeably below the level of phase 7, while others achieved similarly high values as in phase 7 (e. g., the positive rate of SARS-CoV-2 laboratory tests) (Tolksdorf et al., 2022).

At the time of conducting the report, no further update of the “retrospective phasing of the COVID-19 pandemic in Germany” was available from the RKI, meaning that an end to this phase could not yet be determined. As a result of the changed framework conditions outlined with regard to vaccination status and immunity, the measures to contain the incidence of infection were reduced in 2022. By the end of 2022, a significant proportion of the population had been infected with COVID-19 at least once (RKI, 2022). Between October 2022 and April 7, 2023, masks were still mandatory nationwide in air and public long-distance passenger transport and a mask and test verification requirement for access to facilities in the health and care sector.[12]

On October 1, 2022, a new version of the CoronaArbSchV came into force, which was lifted early on February 2, 2023 due to the favourable infection situation in Germany. Until then, the ordinance had been amended and adapted several times, which shows how dynamic the pandemic situation in Germany was.

The coronavirus protection measures in Germany expired in April 2023. On May 5 2023, the World Health Organisation (WHO) lifted the “international health emergency” (2023).

2.9 Influence of virus variants and vaccinations

It is important to note that different SARS-CoV-2 virus variants were circulating (see **Table 2.1**), which had a significant impact on the pandemic in Germany. The virus variants classified as variants of concern (VOC) Alpha, Delta and Omikron, for example, were characterised by high transmissibility, resulting in multiple and more severe waves of infection. Compared to the Alpha variant, the Delta variant was more contagious and more dangerous (RKI, 2022) and caused more severe courses of disease, which in turn led to a higher hospitalisation rate and a greater burden on the healthcare system (RKI, 2023b). The Omikron variant was again more contagious than the Delta variant in immunised individuals, but was not as severe (RKI, 2022). The effect of vaccinations or the adaptation of vaccines and vaccination strategies was also largely dependent on the prevailing virus variants. With Omikron, there was an increase in so-called vaccine breakthroughs, i.e. symptomatic COVID-19 diseases occurred despite

[12] Act to Strengthen the Protection of the Population and Particularly Vulnerable Groups against COVID-19 of 16 September 2022 (BGBl 2022 I, Nr. 1454)

the recommended full immunisation (Tolksdorf et al., 2022). The continuous observation and assessment of the characteristics of new SARS-CoV-2 virus variants on the course of the pandemic played a significant role in determining political action in Germany. The increasing immunisation of the population as a whole as a result of having contracted COVID-19 should also not be underestimated.

2.10 Data collected on the SARS-CoV-pandemic

The BMG portal (https://infektionsradar.gesund.bund.de/de/covid) provides up-to-date digital health information on diseases, prevention, care and health. The illustration in the following chapter is interactive so that the acutal figures can be called up in the graphics.

2.10.1 Consultation incidence, 7-day incidence, number of infections and positive COVID-19 tests

Over the course of the first COVID-19 wave, the disease burden of acute respiratory infections increased, which was reflected, among other things, in the rising incidence of visits to doctors in private practice due to an acute respiratory illness per 100,000 inhabitants (consultation incidence). In mid-March 2020, in the 12th calendar week, a weekly number of 2223 outpatient consultations for such initial illnesses was determined (Schilling, Buda et al., 2021). Similarly, the 7-day incidence rose from 1.1 at the beginning of March to 43 at the end of March/beginning of April. The same applied to PCR tests per 100,000 inhabitants. While there were 77 PCR tests at the beginning of March, by the end of March/beginning of April there were already 501 with a positive rate of SARS-CoV-2 laboratory tests (PCR) of 9 %. The peak of the first wave was 35,000 COVID-19 cases reported per week at the end of March 2020 (Schilling, Buda et al., 2021). However, these figures are only partially reliable, particularly in the first phase of the pandemic, due to multiple testing and insufficient testing capacity. The number of cases declined from the end of April. From the summer of 2020, the number of 7-day incidences due to infected travellers from abroad increased continuously and was over 5 in the 31st calendar week (end of July). At the end of December 2020, the 7-day incidence reached a peak of 210 per 100,000 inhabitants in the course of the second COVID-19 wave (Schilling, Tolksdorf et al., 2021). During this time, the average weekly incidence nationwide was 118 cases per 100,000 inhabitants. The number of cases fell at the beginning of 2021. At the end of February, the 7-day incidence remained at a high level.

At the end of July and beginning of August 2021, the incidence of COVID-19 in combination with a severe respiratory disease (outpatient and inpatient) exceeded the threshold from previous waves. As a result, the RKI stated an end to the summer plateau for this period (Schilling, Buda et al., 2022). By the end of 2021, the 7-day incidence had risen to a value of 485 at the end of November in the course of the fourth COVID-19 wave (BMG, 2024a). With the fifth wave and the highly contagious omicron variant of SARS-CoV-2, the 7-day incidence reached a peak of 1,610 COVID-19 cases

on February 10, 2022 (ibid.). From February 2022, the 7-day incidence and the consultation incidence (outpatient) of acute respiratory diseases and acute respiratory diseases with a COVID-19 diagnosis initially fell (Tolksdorf et al., 2022). By the end of March, the 7-day incidence had risen to a maximum of 1,962 laboratory-confirmed COVID-19 cases (BMG, 2024a). This was followed by two more peaks at the end of July with 915 COVID-19 cases and in mid-October 2022 with 890 cases. Overall, the 7-day incidence, the consultation incidence due to acute respiratory diseases and those with a COVID-19 diagnosis (outpatient) fell significantly compared to phase 7.

When the coronavirus protection measures expired on April 7, 2023, the 7-day incidence was 21.1 COVID-19 cases and there were 38,368,891 infections associated with COVID-19 in Germany (RKI, 2024).

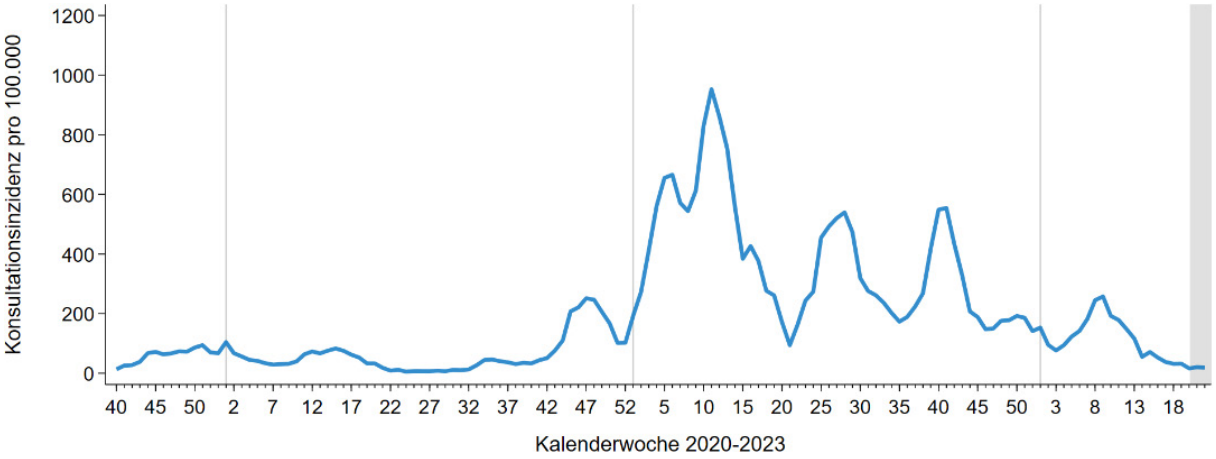

Fig. 2.1 Weekly incidence of doctor consultations for a new ARE (ICD-10 codes J00-J22, J44.0, B34.9) with an additional COVID-19 diagnosis (ICD-10 code U07.1) from week 40/2020 to week 22/2023. Note: please note that these are consultations for all acute respiratory diseases (ARE) including COVID-19 (ICD-10 code U07.1) in (outpatient) doctors' surgeries. www.rki.de/DE/Themen/Infektionskrankheiten/Infektionskrankheiten-A-Z/C/COVID-19-Pandemie/Situationsberichte/Wochenbericht/Wochenbericht_2023-06-08.pdf?__blob=publicationFile&v=1

2.10.2 Hospitalisations

In the first wave of COVID-19, around every second case among people aged 80 and above was hospitalised (Schilling et al., 2020). The incidence among hospitalised cases aged 60 and above and the number of hospital admissions with severe acute respiratory infection (SARI) and COVID-19 diagnosis increased. The number of hospitalisations with COVID-19 at the beginning of April 2020 was 7.6 per 100,000 inhabitants in the last 7 days (BMG, 2024b).

From May to September 2020, a significant decline in hospitalisations was observed due to the summer plateau. The situation came to a head with the second COVID-19 wave and the proportion of hospitalised COVID-19 cases with severe acute respiratory infection rose to a maximum of 72 %, as did the 7-day incidence of hospitalised cases in people over 60 years of age (to 11.4 per 100,000 in mid-December) (Schilling, Buda et al., 2021).

At the beginning of August 2021, the weekly total hospitalisation rate exceeded the threshold value recorded at the beginning of previous waves, meaning that the end of the summer plateau can be seen here (Schilling, Buda et al., 2022). In phase 6, the hospitalisation incidence rose to values that exceeded the threshold values recorded in previous COVID-19 waves. By the end of November 2021, the hospitalisation rate in the last 7 days had risen to a peak of 13.4 (BMG, 2024b).

From February 2022, the incidence of hospitalisation initially fell in children and adults under the age of 60 (Tolksdorf et al., 2022) as well as the hospitalisation incidence of severe respiratory diseases with a COVID-19 diagnosis. From calendar week 9 (end of February/beginning of March), however, there was a noticeable increase in the incidence of hospitalisation among the above-60s. Overall, the number of hospitalisations with COVID-19 fell steadily again until June to values of around 3 per 100,000 inhabitants in the last 7 days, rising again to 13.4 by calendar week 30, until there was a significant decline in hospitalisations with a COVID-19 diagnosis at the beginning of September 2022. On October 12, a peak of 21.7 hospitalisations with COVID-19 was observed. Since then, the hospitalisation incidence has fallen despite two further peaks, which were still evident in the winter of 2022/2023. With the expiry of the coronavirus protection measures, the number of newly hospitalised COVID-19 cases per 100,000 inhabitants within 7 days was most recently 4.0 (BMG/RKI data from October 22, 2024).

2.10.3 Intensive Care Units

In phase 2, there was a significant decline in the number of intensive care beds occupied by COVID-19 cases. This changed with the second COVID-19 wave and the proportion of COVID-19 cases treated in intensive care increased, with the weekly average number of cases at the end of December 2020 being 5,643 (Schilling, Buda et al., 2021). One in three hospitalised patients between the ages of 35 and 59 with COVID-19 and severe acute respiratory infection required intensive care (Schilling, Tolksdorf et al., 2021). At the beginning of January 2021, the proportion of occupied intensive care beds with COVID-19 cases reached a maximum of 21.7 % of all operable intensive care beds, fell again to 10.3 % by March 2021 and then rose again to 19.2 % by the end of April 2021 (BMG, 2024c). By the summer, there was a significant decline in the number of intensive care beds occupied by COVID-19 cases (1.4 % at the end of July). In December 2021, at the peak of the fourth COVID-19 wave, the proportion was back up to 19.9 %. From February 2022, new admissions of patients diagnosed with COVID-19 fell and no longer reached the previous year's level. The

percentage of occupied intensive care beds with COVID-19 cases in relation to all operable intensive care beds was 3.7 (BMG, 2024) when the pandemic measures expired in April 2023.

2.10.4 Deaths

During the first COVID-19 wave, around one in three COVID-19 cases died among people aged 80 and above (Schilling et al., 2020). In the period between the beginning of 2020 and the beginning of 2021, the proportion of deaths among reported cases was around 3 % overall, differentiated by age at around 12 % for those aged 60 and above, around 0.15 % for adults under 60 and around 0.01 % for children (0 to 14 years) (RKI, 2022). Between the 2021 and 2022 coronavirus waves, the proportion of reported cases that died was around 0.1 %, meaning that there has been a significant decline compared to the first two COVID-19 waves (ibid.).

The weekly number of COVID-19 deaths was 444 compared to 6,045 shortly after the coronavirus vaccination programme started in January 2021 (BMG, 2024). When the coronavirus protection measures expired in April 2023, there were 171,411 deaths related to COVID-19 in Germany (RKI, 2024).

2.10.5 Vaccination rates

The first vaccines were administered at the end of December 2020. At the beginning of March 2021, up to 200,000 vaccinations were carried out per day (Bundesregierung, 2021b). Three quarters of the population had received basic immunisation by February 2022 (RKI, 2022).

When the legal framework for coronavirus protection measures expired, 77.9 % of the population had received a vaccination dose. Of these, 76.4 % have received basic immunisation, 62.6 % have received an additional booster vaccination and 15.2 % have received at least two booster vaccinations. 22.1 % of the population were not immunised (BMG, 2023).

3 Measures

3.1 Cross-company information services offered by OSH stakeholders

Germany's occupational health and safety stakeholders developed a large number of aids and products that they made available to their target groups online. DGUV, for example, provided guidance on organisational measures in the workplace through its 'Recommendations for Travelling Abroad for Work-Related Reasons' (DGUV, 2020) which served as a clarification of the SARS-CoV-2 occupational health and safety standard. The same applied to the guideline “on counselling and monitoring during the SARS-CoV-2 epidemic” of the National Conference on Occupational Safety and Health (NAK) for the occupational safety actors of the federal states and accident insurance institutions during company visits (NAK-GS & BAuA, 2020). It was also necessary to minimise the risk of infection for particularly vulnerable groups, such as young people, expectant and breastfeeding mothers, and employees with disabilities. In these cases, in addition to the recommended protective measures, additional individual precautions were implemented where necessary.

Shortly after the start of the pandemic, various information services were provided by inter-company occupational health and safety organisations. Around two-thirds of companies were aware of the guidance materials offered by trade unions and accident insurance institutions. This proportion increased when more internal stakeholders – particularly occupational safety specialists – were involved in developing the measures. The comprehensibility and the obligations for employers resulting from the information are clearly presented according to the majority of companies. However, many companies find the company-specific implementation challenging (Steidelmüller & Robelski, 2021). Another study shows that the (corona-specific) regulations in particular were met with a high level of awareness in the companies. Nevertheless, information from Robert Koch Institute and the accident insurance organisations was frequently used when implementing measures (Adolph et al., 2021). Other regulations, such as the COVID-19 Working Hours Ordinance (COVID-19-ArbZV) issued by the BMAS (BMAS, 2020b) were far less well known (Backhaus et al., 2021).

3.2 Regulatory measures

3.2.1 Company testing and vaccination programmes

The continuously updated Corona Occupational Health and Safety Ordinance defined new requirements for the company-level implementation of COVID-19 testing. Accordingly, companies were urged to offer their employees a test twice a week. Data from a representative survey indicates an increase in the number of tests offered from 60 % (end of March/beginning of April 2021) to 92 % (July 2021). In this context, there are differences in company size: according to an employee survey, micro-enterprises with

fewer than 10 employees were less likely to offer coronavirus tests than larger companies (Bonin & Rinne, 2021). In addition, the employee survey shows that the uptake of testing is declining (ibid.). The Coronavirus Vaccination Ordinance (CoronaImpfV) broadened the scope of vaccinations occupational physicians were authorised to provide. In July 2021, almost two thirds of employees stated that their employer offered vaccination at the workplace. The survey also shows that among those who confirm their immunisation, around a fifth have taken up the vaccination in a company context (Bonin & Rinne, 2021). A study of employees from Baden-Württemberg also shows that vaccination in the workplace was viewed positively and that aspects such as the quick availability of appointments and the possibility of being vaccinated during working hours favoured this. In-depth qualitative interviews with company stakeholders such as doctors themselves also indicate a positive assessment. Nevertheless, the vaccination offers were associated with an increased workload and additional organisational effort (Wagner et al., 2023).

The 3G rule for workplaces was introduced at the beginning of autumn 2021. This means that access to the workplace was only possible if a) a vaccination certificate was available (“Vaccinated”), b) a past infection could be proven on the basis of antibodies (“Recovered”) or c) a current COVID-19 test was available (“Tested”). In this context, Wanger et al. (2023) show that this rule was associated with an evasive effect and that some employees evaded their obligations by taking more sick leave (Wanger & Weber, 2023). Taking into account that not every company employs a company doctor or obtains their services externally, the data from the company survey “Companies in the COVID-19 crisis” from the summer of 2021 shows that around 30 % of companies with a company doctor offered their employees the vaccination (Bellmann et al., 2021). Uncertainty regarding the consequences under liability law, excessive costs or a lack of qualified personnel were cited as reasons by companies that did not offer their employees the vaccine (Bellmann et al., 2021).

3.2.2 Short-time work

Short-time work is considered an important political instrument to support companies in the event of temporary and unavoidable loss of work due to economic reasons or unavoidable events (Sections 95 et seq. SGB III) and already existed before the pandemic. The instrument applies to all employees who pay social security contributions and if the company registers short-time working. The aim is to keep employees in work by temporarily reducing their working hours and avert redundancies. A number of conditions must be met in order to be eligible: for example, only companies with at least one employee can notify the Federal Employment Agency in writing of a significant loss of work and pay. In the month in question, at least one third of the employees must earn more than 10 % less pay. In addition, certain personal requirements must be met for example, the employee must hold a position subject to compulsory social insurance and the employment must not have been terminated. The funding period is generally 12 months, but can be extended for up to 24 months. The subsidy amounts to 60 % of

the net loss of earnings, or 67 % if there are children living in the household. The ordinance on extended access to short-time working allowance expired on June 30, 2023.

During the pandemic, a temporary special regulation (Section 421c SGB III) was issued and the benefit rates for receiving short-time working allowance were further adjusted and increased: from the fourth month of short-time working, 70 % (77 % with children) and from the seventh month 80 % (87 % with children) of the net loss of earnings could be reimbursed if there was a loss of earnings of at least 50 % in the respective payroll period. The regulation on the higher benefit rates when receiving short-time working allowance applied until June 30, 2022 (Kagerl & Kruppe, 2024).

The CoronaArbZV suspended key provisions of the Working Hours Act for a short period of time (e. g., maximum daily working hours, rest periods, work on Sundays and public holidays). This political measure was intended in particular to maintain supply as well as public safety and order (see **Table 1.1**). From an occupational science perspective, numerous findings suggest that clear and applicable rules play a central role – particularly in emergency situations – in safeguarding employees' health and performance. Empirical data from the company survey "Companies in the COVID-19 crisis" indicates that only around a fifth of companies were aware of the CoronaArbZV and that it was only applied by 4 % of companies (Backhaus et al., 2021).

The proportion of employees on short-time work has increased rapidly since 2020 and reached a peak in April with just under six million short-time workers and 609,680 companies in which short-time work was realised (Bundesagentur für Arbeit, 2024). This coincides with the start of the first lockdown in Germany. By October 2020, the number of short-time workers had fallen by more than half to 2,020,650 (stable summer plateau). In February 2021, the 2nd lockdown (from December 2020 to February 2021) saw a repeated increase in the proportion of short-time workers to 3,358,070, although this was well below the previous year's level and then fell continuously. At the turn of 2021/2022 and in January 2022, there was another slight increase in the number of people on short-time work (846,880) due to the highly infectious coronavirus variant and ongoing pandemic-related restrictions. The proportion of short-time workers was therefore around a quarter of the previous year's figure. In February 2023 – and thus shortly before the end of the pandemic – 157,140 employees were on short-time work, which corresponded to only around 2.6 % of the almost 6 million short-time workers in April 2020.

From December 2020 to April 2021, 40 % of employees on short-time work received the increased benefit rates of the short-time work allowance, as a representative study shows (Kagerl & Kruppe, 2024). Employees with low incomes, from the hospitality and arts, entertainment and recreation sectors, in personal and commercial service occupations and in small businesses were particularly likely to take advantage of the increased benefit rates.

3.2.3 Sick leave

Due to the coronavirus pandemic, various special regulations were made regarding the number of children's sick leave days, which were legally legitimised by the IfSG. For 2020, children's sick leave days were doubled from 10 to 20 working days per parent and child (under 12 years of age). Single parents could take 40 working days per child. In 2021, it was 30 days per parent and child, and 60 days per child for single parents. With an amendment to the Infection Protection Act (Section 56 (1a)) of April 23, 2021, parents were also entitled to the extended pandemic-related child sickness benefit if their child was not ill but had to be cared for at home due to the closure of childcare facilities or schools as a result of the pandemic. For 2022, these regulations were extended until the official expiry of the coronavirus protection measures. From April 8, 2023, the regular children's sick days applied again.

These special arrangements were part of the measures to overcome the challenges of the pandemic and support families who were particularly affected by the closure of educational institutions (BMFSFJ, 2021).

3.3 Workplace measures within companies

The aim of occupational infection prevention is both to avoid operational infection risks and to maintain operational efficiency (Arens, 2021). Based on data from the investigation of the infection environment, it can be determined for the first months of 2020 that around 11 % of infections could be attributed to the work environment and that an average of 14 people per outbreak were affected therein (Buda et al., 2020). This means that there is a significant need for action to protect against infection at the workplace.

The measures taken during the coronavirus pandemic can be structured according to the TOP principle as depicted in **Fig. 3.1**.

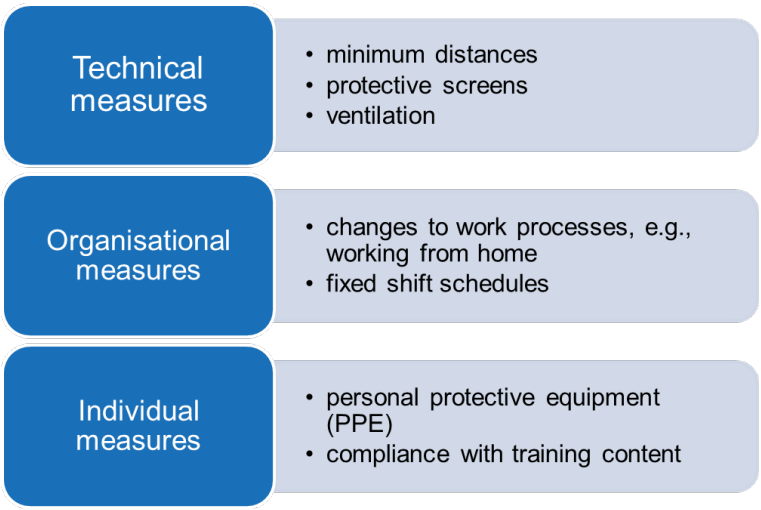

Fig. 3.1 TOP principle for occupational safety and health during the pandemic

Accordingly, companies should primarily use **technical (T) measures** to prevent infection or the spread of the virus in their premises. Technical measures include, for example, checking air conditioning and ventilation systems, installing protective screens or other measures to ensure that the recommended minimum distance of 1.5 meters can be maintained. **Fig. 3.2** shows the proportion of companies implementing various technical measures to prevent infection in the workplace (Robelski et al., 2021).

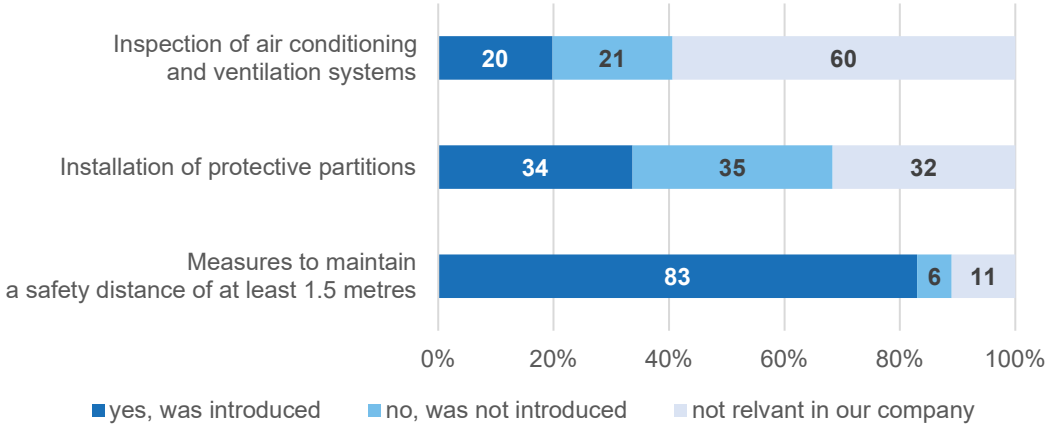

Fig. 3.2 Measures for the design of the working environment according to the company survey "Companies in the COVID-19 crisis" (extrapolated figures, rounding errors possible, $n_{unweighted}$ = 1,532–1,552) (Robelski et al., 2021)

In addition, **organisational (O) measures** have also played a key role in combating the virus in the workplace. These include, for example, the reorganisation of shift and break schedules, but also the option of working from home to reduce the frequency of contact in the workplace. At the beginning of the pandemic, a quarter of companies had already introduced new or extended conditions for working from home as can be seen in **Fig. 3.3**.

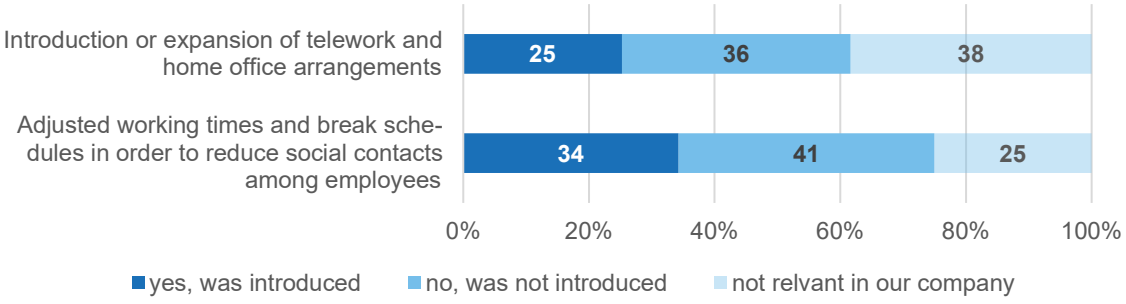

Fig. 3.3 Measures to reduce contact according to the company survey "Companies in the COVID-19 crisis" (extrapolated figures, rounding errors possible; $n_{unweighted}$ = 1,550–1,554) (Robelski et al., 2021).

Increased cleaning activities were already reported by almost 60 % of companies in 2020. Adapted company regulations, e. g., with regard to entering the workplace in the event of symptoms of illness, also represent concrete organisational measures that

have been taken up by companies according to the results of a company survey depicted in **Fig. 3.4**.

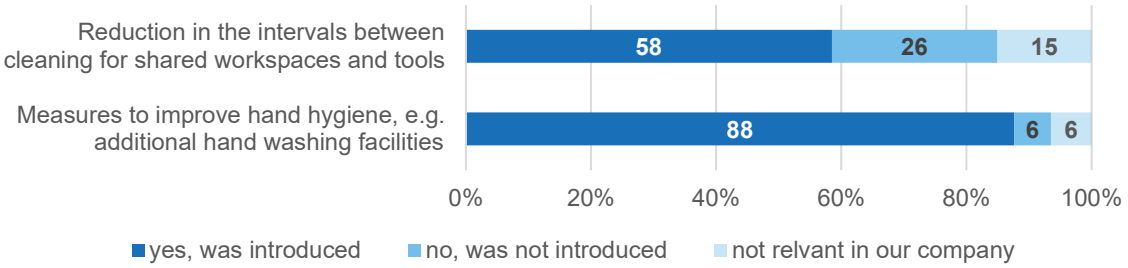

Fig. 3.4 Hygiene and cleaning measures according to the company survey "Companies in the COVID-19 crisis" (extrapolated figures, rounding errors possible; $n_{unweighted}$ = 1,547–1,554) (Robelski et al., 2021).

The **personal (P) measures** include wearing personal protective equipment (PPE), but also observing the contents of the instructions with regard to dealing with hygiene, ventilation and distancing regulations as well as monitoring personal health (see **Fig. 3.5**). Employees have a duty to co-operate in accordance with ArbSchG § 15.

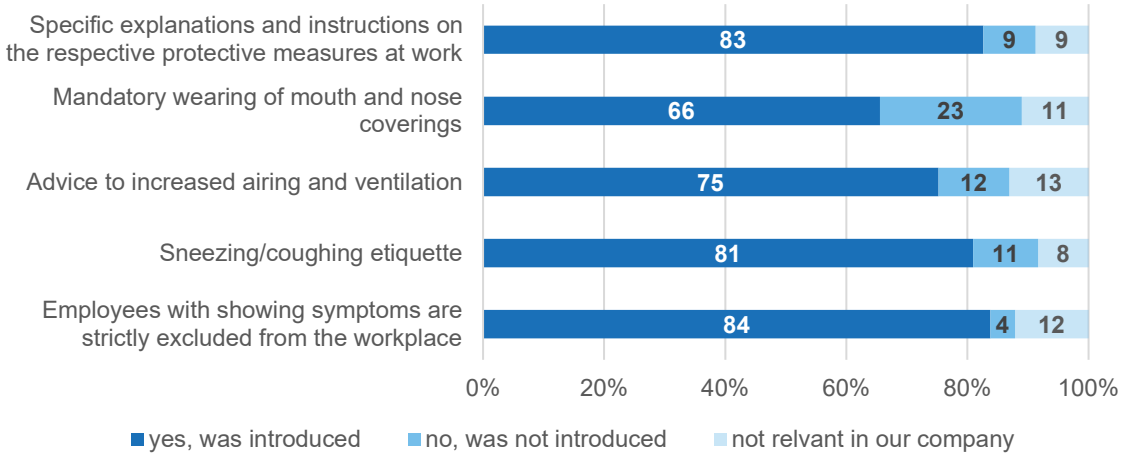

Fig. 3.5 General rules of conduct according to the company survey "Companies in the COVID-19 crisis" (extrapolated figures, rounding errors possible, $n_{unweighted}$ = 1,550–1,553) (Robelski et al., 2021)

Overall, there is a new emphasis on personal protective measures with regard to the measures, which places compliance with measures such as social distancing rules or the wearing of masks primarily on the responsibility of employees. As **Fig. 3.6** below shows, there are also differences in the occupational safety measures described by employees depending on the course of the pandemic (BAuA, 2021).

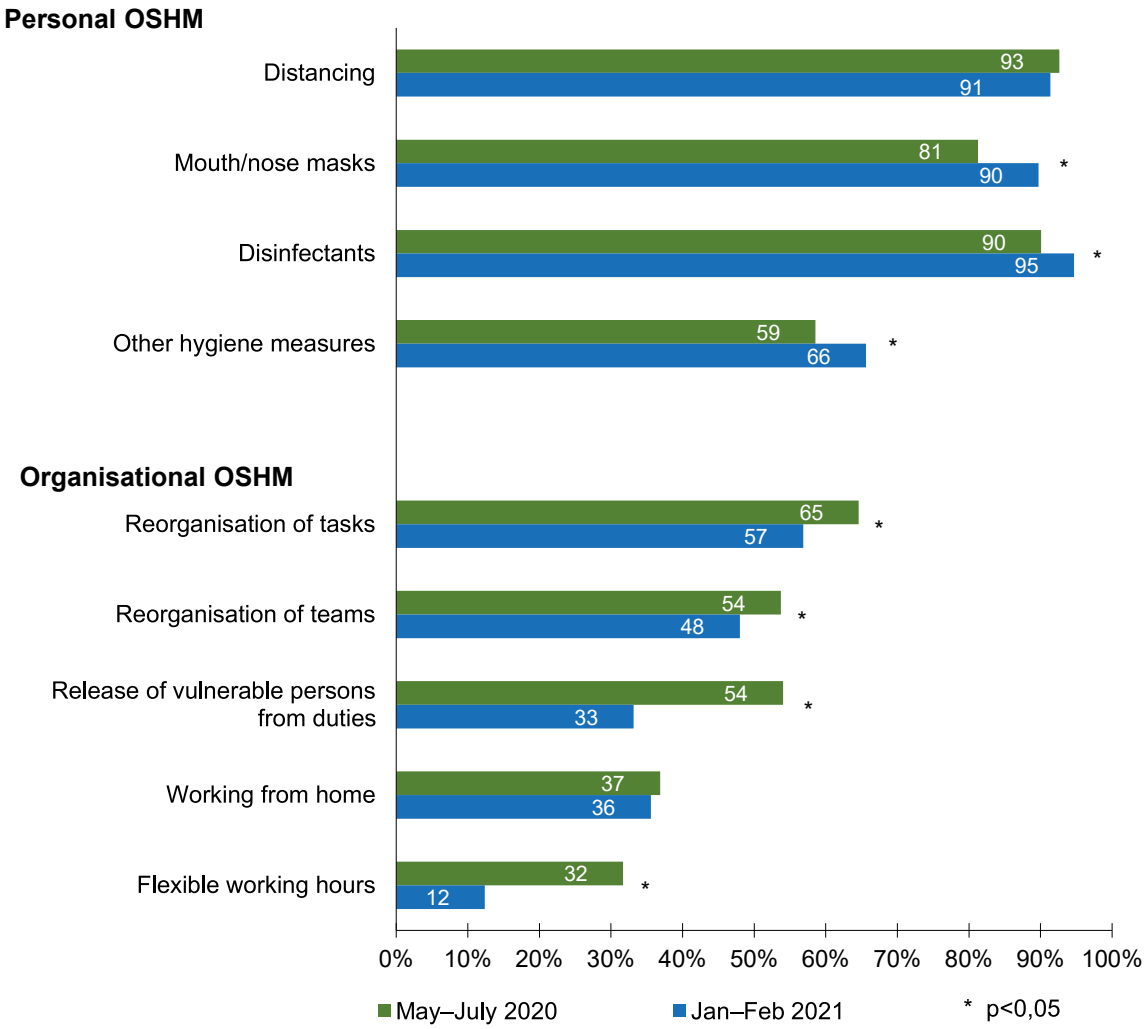

Fig. 3.6 Occupational health and safety measures according to employees (SOEP-CoV) in comparison from 2020 ($n_{unweighted}$ = 909) to 2021 ($n_{unweighted}$ = 2,596) (Meyer, Robelski, Tisch et al., 2021)

3.4 Stakeholders in the companies

In many cases, measures are implemented at the company level by the management (Robelski et al., 2020). The responsible OSH specialists are involved in just under half of the companies. Initially, the proportion of companies in which employee representatives were also involved in the development and implementation of measures appears to be low. However, this shows an effect of company size, which means that many companies do not have employee representation (Steidelmüller & Robelski, 2021).

The coronavirus pandemic has prompted many companies and company managers to deal with mentally stressful work situations. With regard to measures for dealing with mental stress, it is striking that around 80 % of companies rely primarily on the involvement of managers or supervisors, who should take into account the pandemic-related stress experienced by employees (Hoffmann et al., 2021). However, it is clear that not

all company stakeholders have been equally involved in infection prevention at the workplace (Guhlemann et al., 2022; Robelski et al., 2020).

Offers to make working hours more flexible or regulations to limit working hours and availability in the home office are mentioned by less than half of the companies (Hoffmann et al., 2021).

3.5 Digitisation

According to the companies, this digitisation push will be maintained or even expanded beyond the pandemic, e.g. with regard to tools for digital collaboration, employee training and the use of digital documents (Streim & Meinecke, 2021). In many cases, this is the prerequisite for protective measures such as working from home to be successful.

Due to federalism, there are time-consuming reporting chains from the Public Health Service (ÖGD) to the RKI, which led to delays in, for example, the timeliness of the reported infection figures. A survey of local health authorities on their crisis management in the years 2020–2022 by RKI (Mock et al., 2023) revealed, among other things, that the communication structures at federal and state level were one of the main challenges during the pandemic, alongside a lack of staff. In addition to the lack of timely accessibility, the digital structures of local health authorities for case and contact person management were not in place, making it difficult to exchange personal data. Digital networking in the public health service is now being promoted and expanded through various digitisation programmes (e.g., SurvNet[13] , DEMIS[14] , Agora[15]) at federal and state level. Strengthening the ÖGD to cope with future crises is absolutely essential and goes beyond digital communication structures (Mock et al., 2023).

3.6 Acceptance and (perceived) implementation of the measures

In an early phase of the pandemic, it became apparent that the majority of companies had taken measures to protect workers and prevent infection (Robelski et al., 2020). However, in the first year of the pandemic, less than a third of companies confirmed the introduction of special measures for particularly vulnerable employees and measures that take individual stress into account (Robelski et al., 2020).

Numerous measures were also implemented in companies during the second wave of the pandemic and in spring 2021. Both the SARS-CoV-2 occupational health and safety standard and the SARS-CoV-2 occupational health and safety rule were known

[13] SurvNet: RKI software for health authorities and state offices for recording, analysing and forwarding notification data in accordance with the IfSG

[14] DEMIS: German Electronic Reporting and Information System for Infection Protection according to IfSG www.gesundheitsamt-2025.de/digitalisierung/demis

[15] Agora: Communication and collaboration platform for the ÖGD

to the majority of respondents in an empirical study (Casjens et al., 2021). Overall, there are differences in the implementation of the measures between the companies, both in terms of industry sector and company size (Robelski et al., 2020). In addition, a dependency on the existing occupational health and safety culture and the commitment of managers can be observed in the implementation of the measures (Guhlemann et al., 2022). A study from the perspective of a labour inspectorate also confirms a high level of compliance among companies with regard to the implementation of mandatory testing and vaccination and with regard to the adaptation of risk assessments (Regierungspräsidium Gießen & HMSI, 2022).

During the pandemic, the companies themselves took the situation as an opportunity to change their attitude to occupational health and safety and its organisation (Backhaus, 2022). In 2021, 44 % of all companies rated working from home as very or somewhat positive since the start of the pandemic. The implementation of protective measures such as the provision of masks or staying away from the workplace in the event of symptoms of infection is also being considered by many companies beyond the pandemic. This shows that there is growing awareness of the issue (Tisch et al., 2021). However, the extent to which this effect will be long-lasting remains to be seen. More than half of the companies also see an increase in the importance of occupational health and safety and plan to take it more into account in operational decisions. Even more companies are striving for greater employee involvement in occupational health and safety (Tisch et al., 2021).

With regard to employees, in July 2021 – around 1.5 years after the start of the pandemic – the majority of employees rated the protective measures taken by their employer as “just right” (Bonin & Rinne, 2021). At this point in time, there are differences in the assessment, especially between employees who mainly work from home and those who spend a maximum of half of their working hours at home office. Data from the socio-economic panel also shows that employees describe a high level of compliance with regard to the implementation of protective measures within companies. Both in spring/summer 2020 and at the beginning of 2021, the majority of employees rated the protective measures taken as appropriate. However, there are clear differences between occupational groups, with employees in social and cultural service professions in particular rating the measures as not far-reaching enough (Meyer et al., 2021).

4 Consequences

4.1 Health

4.1.1 COVID-19 as an occupational disease / occupational accident

Annex 1 of the Occupational Diseases Ordinance (BKV) lists infectious diseases under the number BK 3101. Since 2021, a COVID-19 disease of employees in the health service, in welfare care, in a laboratory or through other activities with a similar risk of infection (e. g. in hairdressing or cosmetic treatments) who have demonstrably been infected with SARS-CoV-2 in the course of their professional activity is now also considered an occupational disease (BMAS, 2021a; DGUV, n.d.). The following requirements must be met for recognition as an occupational disease: Affected persons must have clinical symptoms of the disease, provide proof of testing and, finally, show consequential health damage from the SARS-CoV-2 infection (e.g., PCS). Furthermore, contact with infectious persons or substances must have taken place in the course of their work (DGUV, n.d.).

SARS-CoV-2 infection can also be classified as an occupational accident (AU) if it occurred in the context of the occupational or insured activity (employment, (high) school attendance, performance of certain honorary positions, assistance in the event of accidents, etc.), but the requirements for an occupational disease are not met (ibid.). Other relevant factors for this insurance case are the number of proven infections in the direct working environment, the frequency of usual personal contact and spatial conditions such as ventilation and climatic conditions. Here too, employees must show clinical symptoms of the infection and document these and intensive occupational contact with infectious persons accordingly. If employees have had close contact with infectious persons on the journey to and from work and have contracted COVID-19 as a result, this can also be classed as an accident at work. If applicable, a SARS-CoV-2 infection that occurred as a result of a company-related visit to the canteen or a company-related stay in communal rooms and accommodation can also constitute an accident at work (DGUV, n.d.).

Table 4.1 below illustrates the increase in suspected and recognised cases of occupational disease and notifications of sick leave due to COVID-19 over the course of the pandemic.

The table shows the current status of insurance business since the start of the pandemic at each reporting date. The values given for a month therefore always include the values for the previous months. Accordingly, the value for December 31, 2020, for example, also reflects the insurance business for the entire year.

Around 75 % of all insurance claims related to COVID-19 as an occupational disease were reported by the German Social Accident Insurance Institution for the Health and Welfare Services (BGW), compared to other statutory accident insurance institutions

(Struve & Schudmann, 2024; Nienhaus & Schneider, 2022). This is understandable given that the BGW has the most insured persons from the health and social professions – and therefore from personal services and interpersonal service work. Here, it was primarily the hospital and care (homes) sectors that received most reports of suspected occupational illness in connection with COVID-19 (ibid.). From 2020 to 2023, COVID-19 became the most frequently reported occupational disease at the BGW, as **Table 4.1** shows.

Table 4.1 Occupational diseases and occupational accidents in connection with COVID-19 (source: DGUV, 2024)

Date	Occupational diseases				Occupational accidents		
	Suspicion report	Cases decided	Cases acknowleged	Deaths	Reports	Insurance claims	Deaths
31.12.2020	30.369	23.443	18.649	14	12.223	4231	5
31.12.2021	182.669	162.636	121.145	86	38.214	13.835	96
31.12.2022	477.115	430.175	303.462	123	71.708	24.786	175
31.12.2023	541.848	514.364	356.682	136	79.385	26.855	200
31.03.2024	545.035	518.608	358.641	139	79.673	26.958	200
30.06.2024	546.235	521.372	359.763	141	80.119	27.069	200

As can be seen in **Table 4.2**, before the pandemic, the BGW received around 1,000 suspected reports of occupational infectious diseases **per year**, which increased to 8,000 suspected reports (on COVID-19) **per week during** the peak phases of the pandemic (BGW, n.d.). Since 2021, the BGW has been providing increasing benefits for medical treatment and pensions in connection with COVID-19 as an occupational disease due to the pandemic (BGW, 2024b). Due to the massive, unprecedented workload, the BGW was forced to provide additional staff resources and request support from other accident insurance institutions (BGW, n.d.).

However, it has been stated that reports of COVID-19 as an occupational disease have been declining sharply again since the first half of 2023 compared to the previous year (DGUV, 2023).

Table 4.2 Development of the most common occupational diseases 2019–2023 in the German Social Accident Insurance Institution for the health and welfare services (BGW); source: German Social Accident Insurance Institution for the health and welfare services (BGW, 2024a)

Suspected cases	2019	2020	2021	2022	2023
Spinal disorders	3.296	2.365	2.971	3.074	3.100
Infectious diseases	921	21.783	111.780	228.249	54.547
Of which: TBC Hepatitis COVID-19 remaining	 352 53 - 516	 293 51 20.897 542	 94 33 111.126 527	 103 38 227.496 612	 180 50 53.558 759
Respiratory diseases	377	296	217	204	217
Skin diseases	6.427	6.327	6.147	4.904	5.104
other diseases	1.171	1.073	1.194	1.397	1.783
total	12.192	31.844	122.309	237.828	64.751

4.1.2 Long-/Post COVID

The Association of the Scientific Medical Societies in Germany (AWMF) defines the following in its S1 guideline Long/ Post-COVID (Koczulla et al., 2022): Affected persons who are still suffering from health complaints four weeks after an acute SARS-CoV-2 infection are referred to as long COVID or post-acute consequences of COVID-19. If the symptoms persist for more than 12 weeks (in children and adolescents for more than two months), they are referred to as post-COVID syndrome (PCS). The exact causes of the disease are still unknown. The majority of those affected suffer from symptoms that require treatment and severely impair their everyday life (including social and/or working life) and quality of life. PCS can occur even after asymptomatic or mild SARS-CoV-2 infection. The COVID-19 disease itself is described as a “multi-organ disease with a broad spectrum of manifestations” (Koczulla et al., 2022, p. 10). The symptoms of both COVID-19 disease and PCS are correspondingly unspecific. However, those affected often suffer from pathological exhaustion, known as fatigue. There is currently neither a specific diagnostic procedure nor a specific drug therapy. The disease is treated purely symptomatically.

No reliable information can be provided on the prevalence of PSC symptoms due to the heterogeneity of the underlying study populations. It is stated that with the nationwide start of vaccination campaigns from December 2020 and the prevalence of the Omikron variant in Germany, the prevalence of PCS has declined noticeably. Those affected often experience spontaneous recovery or a significant improvement in symptoms over time.

In addition to medical rehabilitation (if outpatient treatment appears insufficient), people of working age who are affected should also receive measures for participation in working life or occupational integration management (BEM).

The number of post-COVID medical rehabilitations utilised has doubled from 10,000 in 2021 to around 21,000 in 2022 (DRV, 2023). No statements can be made for 2020 due to the later introduction of ICD-10 codes for the classification of PCS. The necessary extension of the length of stay for almost half of the rehabilitations is noteworthy. As a result, the regular authorisation period for PCS rehabilitation has been adjusted in the meantime and extended to four weeks in some cases (depending on the indication).

In 2021, 30.5 % of rehabilitants came from the occupational fields of health, social work, teaching and education. The average figure for all German Pension Insurance rehabilitants with PCS was 17.7 %. Analogous to the findings of the BGW (**Chapter 4.1.1**), it can be seen that sectors and occupations in interaction work had/have a higher risk of infection and consequently claimed significantly more benefits from accident and pension insurance.

The assessment of socio-medical performance capacity showed a clear trend for 2021: the vast majority of rehabilitants had no restrictions in their last occupation (90 %) or on the general labour market (94.5 %) at the end of rehabilitation, but the performance capacity of some rehabilitants fell to less than 3 hours in their last occupation (7 %) and on the general labour market (2.9 %).

It is not yet possible to estimate the effects of functional and ability limitations caused by PCS on the ability to work due to the still insufficient knowledge of the development of the disease, therapy and prognosis (DRV, 2023). The occupational, educational and training incapacity of individuals affected by PCS is regarded as a significant future challenge (Koczulla et al., 2022).

4.1.3 Psychosocial challenges

Employees who worked from home more frequently experienced deadline or performance pressure, time constraints, and increased expectations to be accessible or work-related contact compared to employees who worked exclusively in the office (Entgelmeier & Tisch, 2023).

The increase in psychological stress, particularly at the start of the pandemic, has now been analysed many times (Hettich et al., 2022). Constant availability, work

intensification, reduced social contact with colleagues and managers – and thus less social support – are cited as key risks associated with time- and location-flexible work (Backhaus & Beermann, 2021). Although there has been an optimisation of workload during the pandemic (Entgelmeier et al., 2023; Picker-Roesch et al., 2023) it is evident that mobile working carries greater health risks for employees compared to stationary, screen-based office workstations (Wechsler et al., 2024).

It also shows that the risk of occupationally associated infection with SARS-CoV-2 had an impact on mental health (Casjens et al., 2024).

An increase in feelings of loneliness has also been observed in the general population (Hettich et al., 2022) which are presumably associated with the restrictions in the private and professional context.

4.2 Excursus: Care-related professions

In the BAuA Working Time Survey 2021, employees in care-related professions reported being particularly affected by the pandemic. Both working time flexibility and mobile working were less feasible in these professions, with longer and atypical working hours. A “particularly unfavourable stress profile consisting of high demands and little flexibility in terms of working hours” was reported and a (very) good state of health was reported less frequently (Nold & Backhaus, 2023).

A qualitative interview study with “outpatient caregivers” points to changes in the demands of work organisation and tasks, for example due to increased hygiene measures or new rules and regulations. These increased quantitative demands, but also emotional demands, contribute to increased stress levels and the description of depressive symptoms. Resources such as communication and social support help to maintain motivation even during the coronavirus pandemic (Mojtahedzadeh, Wirth, Nienhaus, Harth, & Mache, 2021).

An increase in mental stress and increased work intensity is reported for outpatient care (Petersen, Müller, & Melzer, 2024).

A narrative review looked at the challenges faced by nursing staff in (acute) inpatient long-term care during the COVID-19 pandemic in Germany. Many challenges, such as an inadequate staffing ratio and work overload, already existed before the pandemic began, but have worsened over the course of the pandemic. This was largely due to quarantine regulations and additional staff absences due to illness as well as the need for additional work. This led to an increase in mental stress and strain (e. g., generalised anxiety disorder and burnout) and an increase in presenteeism. The unpredictability of work, high flexibility requirements and inadequate opportunities for recovery emerged as particularly critical working conditions (Zink, Wendsche et al. 2024).

In acute inpatient care (hospitals), a third to half of healthcare professionals (nurses, doctors and paramedics) suffered from significant psychological stress such as anxiety and depression in the first wave of COVID-19. Those affected also showed an increased tendency to absenteeism. Subjective membership of a risk group and the irregular wearing of PPE were identified as risk factors. One third of those surveyed did not wear/ were unable to wear the recommended PPE to the required extent during patient contact (Roethke et al., 2021).

A 2-year multicentre longitudinal survey also came to the conclusion that depression and anxiety among care workers in Germany increased significantly during the course of the pandemic and were above the level of the general population (Grasmann et al., 2024).

Many healthcare workers complain of long-lasting symptoms and reduced quality of life long after a SARS-CoV-2 infection (Peters, Dulon, Westermann, Kozak & Nienhaus, 2022).

The high mortality rate in the nursing professions (Nienhaus & Schneider, 2022) points to the implementation/derivation of special occupational health and safety measures for occupational groups and sectors with a particularly high risk of infection (Formazin et al., 2022). In addition, a health-promoting work design (in inpatient care) is recommended in order to minimise stress risks (Zink, Wendsche & Melzer, 2024).

4.3 Changes at the political level

In the meat processing industry, critical conditions led to the introduction of new laws regulating the employment and housing of workers. Accordingly, companies with more than 50 employees are no longer permitted to employ subcontracted workers in production facilities. Temporary agency workers are also prohibited. This government action marked one of the strongest labour market policy interventions in years (Neuhauser & Birke, 2023). The Occupational Health and Safety Control Act also includes the introduction of binding quotas for the performance of factory inspections by state supervisory bodies.

In addition, BMAS continues to appeal to the implementation of proven protective measures with its “Recommendations [...] for the prevention of respiratory infections such as influenza, flu-like infections and COVID-19” even after the abolition of the SARS-CoV-2 Occupational Health and Safety Ordinance (BMAS, 2023). Partition walls and protective screens as a technical measure to protect employees in contact with patients and customers can still be found in healthcare facilities and the retail sector, for example.

During the COVID-19 pandemic, employees were able to take sick leave by telephone in order to contain the spread of infection. This regulation was extended several times until it expired on March 31, 2023. At the behest of the Bundestag, the Federal Joint

Committee (G-BA) – as the highest decision-making body of the joint self-administration in the German healthcare system – has converted this special regulation on sick leave by telephone into a permanent regulation. According to the Incapacity for Work Directive (last amended on December 7, 2023), since December 8, 2023, the first determination of incapacity for work may now again be made after a medical history/examination by telephone, whereby it may not exceed a period of five calendar days. A telephone assessment of incapacity for work requires that the insured person does not exhibit severe symptoms and is personally known to the medical staff (Section 4 para. 5.5a). The same applies to certificates of the child's illness. The same requirements apply as for sick leave for adults.

As described in **Section 3.2.3**, children's sick days were increased due to the pandemic. This option will remain available to employees even after the pandemic: in 2024 and 2025, 15 working days per child and parent can be claimed for each child under the age of 12, and 30 working days per child for single parents. Compared to the level before the pandemic, the number has thus been increased by 5 working days per child and parent and by 10 working days per child for single parents (Section 45 SGB V para. 2a).

These regulations support parents in reconciling family and career now that the special coronavirus regulations have expired.

4.4 Social changes

The feared exodus of nursing staff or career change did not materialise (Kunaschk & Stephan, 2024).

The SARS-CoV-2 pandemic has had a particularly strong impact on some economic sectors and industries. The example of the hospitality industry shows how serious the impact has been: a quarter of employees subject to social security contributions have moved to other sectors (logistics & retail) since 2020 – despite political support. The pre-pandemic level has not been reached, also in terms of the type of employment relationships. Before the pandemic, there was an increase in employment subject to social security contributions, whereas after the pandemic, there was an increase in mini-jobs again (Schmid & Stracke, 2023).

Another longitudinal study also confirms these findings (Bauer, Keveloh, Mamertino & Weber, 2023). Between 2019 and 2021, there were major sector-specific changes in unemployment, particularly in the areas of transport and logistics, food and catering occupations, trade occupations, occupations in business management and organisation and manufacturing occupations (ibid.). There was also a change in application behaviour: Employees from severely affected sectors were now applying more frequently for vacancies in sectors that were hardly affected and/or those where demand has increased, e. g. in healthcare, retail and software and IT service providers. It was also observed that more highly qualified employees applied for vacancies with a lower

level of qualification. The SARS-CoV-2 pandemic has therefore triggered restructuring processes in the labour market, the after-effects of which are not yet foreseeable (Bauer, Keveloh, Mamertino & Weber, 2023).

Similarly, it can be seen that the various flexibility instruments in the labour market (e. g. external instruments such as hiring, dismissals, fixed-term contracts and internal instruments such as work organisation, collective agreements and wages, working hours) had an impact on marginally employed workers, fixed-term employees and temporary workers, solo self-employed workers and contracts for work and services, but also employees in occupations relevant to supply (Struck, Dütsch, Fackler & Hohendanner, 2021) which are also indirectly linked to their occupational health and safety (e. g. no opportunity to work from home, less access to PPE).

Disease progression and also post-Covid syndrome require greater capacities in the area of rehabilitation and, if necessary, adapted concepts in the area of workplace integration (Peters et al., 2022).

Barriers in the field of telemedicine have been removed and positive examples, e. g., from intensive care, show the potential of cross-border cooperation (Boklage et al., 2023).

Despite increased attention during the coronavirus pandemic and the expressed intention to attach more importance to occupational health and safety in the future, there is little evidence to date that lasting changes are being made to occupational health and safety (Overbeck-Gurt, Moeltner, Weigelt, Hällfritzsch & Klim, 2023).

The feared trend of a pandemic-related sustained increase in gender-specific inequality in care work has currently not been confirmed and is back to pre-pandemic levels (Jessen, Kinne & Wrohlich, 2024).

Gender-specific employment and income risks emerged, as a brief expert report on the effects of the coronavirus crisis on family and working life (as of November 2020) revealed (Bonin et al., 2020). According to this report, unemployment among women was higher than among men from March (1st lockdown) to October 2020. It is assumed that this is due, among other things, to the excessively high proportion of women in marginal employment – especially in the service industries (hospitality and accommodation), which have been severely affected by the pandemic. In addition, marginally employed persons are not entitled to short-time working benefits (ibid.).

Single parents and family carers who were in paid employment suffered from additional burdens and work-life balance conflicts (Bonin et al., 2020). Single parents had to manage childcare largely on their own and sometimes did not even have external emergency childcare when they were entitled to it. In addition, they often work at atypical off-peak times, meaning that they were unable to take advantage of the emergency childcare offered at daycare centres or schools. As a result, they increasingly took time

off work or leave of absence, which in turn led to an increase in the risk of poverty. Family carers also suffered from the loss of formal and informal support services, which they now had to compensate for. Employers avoided new hires (Bonin et al., 2020).

4.5 Technological changes

The COVID-19 pandemic is being discussed as both a cause and an accelerator of digitisation in the world of work. Companies, especially small businesses and the (solo) self-employed, have undertaken fundamental reorganisation processes: they have digitised business processes, offered new products and services online and generally expanded their online presence (Boockmann et al., 2021; Overbeck-Gurt, Moeltner, Weigelt, Hällfritzsch & Klim, 2023).

A higher degree of digitisation and “globalisation” before the pandemic (as well as fewer family business structures) contribute to greater resilience to the effects of the pandemic (Bürgel, Hiebl & Pielsticker, 2023).

4.6 Changes in the world of work

It is evident that numerous measures have led to lasting changes. Particularly with regard to the flexibilisation of working hours and place of work, numerous studies confirm long-term implementations, investments made or concrete intentions (Overbeck-Gurt, Moeltner, Weigelt, Hällfritzsch & Klim, 2023). This is accompanied by permanent changes and adaptation measures in the area of human resource management and employee training, e.g., in digital skills, progress in the area of digitisation, e.g., the provision of hardware and software (see **Chapter 3.5**).

4.6.1 Flexibilisation of working hours

Data from the BAuA working time survey, which is conducted on a representative basis every two years, show that half of employees reported a change in working hours during the coronavirus pandemic. Specifically, around a fifth of employees stated that they had experienced shorter working hours and around a quarter of employees stated that their working hours had been extended (Nold & Backhaus, 2023). For many employees, the pandemic also meant experiencing atypical working hours (before 7 a.m. and after 7 p.m. as well as at weekends) for the first time.

Both formal and informal collaboration are rated as worse with higher proportions of hybrid work (Entgelmeier et al., 2023).

4.6.2 Flexibilisation of the place of work

The proportion of employees working from home increased significantly compared to before the pandemic and continued to rise during the course of the pandemic. In the meantime, the home office potential was almost exhausted (Backhaus, 2022). Occupational health and safety and infection protection through working from home was a

measure that was to be expanded even after the pandemic, especially in large companies. The focus was often on meeting the needs of employees (e. g., more flexibility, better work-life balance). However, it should not be neglected that negative effects are expected, particularly in terms of communication between employees and with managers (Backhaus, 2022).

Around 15 % of employees switched from the company workplace to working from home for the first time (Nold & Backhaus, 2023).

In the context of flexible working, company agreements are an important instrument for mitigating the negative consequences of working from home. If agreements are in place, working hours, for example, are also better recorded (BAuA, 2022).

The increased scope of location-flexible work and, in particular, working from home is accompanied by new dangers, for example through an increase in remote presenteeism (Schmitz, Bauer, & Niehaus, 2023). Moreover, there is evidence suggesting that mobile screen work, even after brief exposure, may result in physical strain caused by inadequate work equipment, varying workplace conditions, and unfavorable body postures (Wechsler et al., 2024). As a study has shown, the increase in working from home leads to an increase in work-related sitting time and therefore poses new challenges for workplace health promotion (Wallmann-Sperlich et al., 2024).

Another after-effect of the pandemic is that many employees continued to experience reduced contact with their colleagues and work-privacy conflicts at the end of 2022 (Casjens et al., 2024).

However, more recent developments show an increased discussion about the return to working in presence (on site in the office).

5 Ongoing difficulties and challenges

5.1 The problem of inequality

5.1.1 Company size and SME

One difficulty was that small and medium-sized companies in particular, which often have less established occupational health and safety structures, have frequently implemented fewer measures and have less knowledge of how to find regulations. Knowledge of the recommendations in smaller companies is less widespread and there is also less support from occupational safety specialists (Steidelmüller & Robelski, 2021).

Nevertheless, practical guidelines can provide a low-threshold offer here (Tausch & Adolph, 2021).

5.1.2 Digitisation

Slow progress in digitisation by local governments is noted, so that digital tools and channels were not available in times of lockdown and entire institutions had to close, e. g., citizen-related services such as building and licensing authorities (Kuhlmann & Franzke, 2022). Schools were also inadequately prepared for the switch from face-to-face to distance learning, which in turn increased the demands on employees working from home with school-aged children (Lewalter, Diedrich, Goldhammer, Köller & Reiss, 2023).

5.1.3 Occupational and educational differences (e. g., in care) in relation to working conditions

According to data from the Socio-Economic Panel, the pandemic-related changes in income and working hours are not the same for the entire labour force (Schröder et al., 2020). It also shows that there is a correlation between the level of education and socioeconomic status (measured by disposable household income) and vaccination status and coronavirus infection (Bartig, Beese et al., 2023).

Analyses relating to the use of online training courses in the adult cohort of the National Educational Panel Study also indicate a correlation between educational level and the use of online learning opportunities. This is such that academics in particular benefit from work-related online offers, which can lead to polarisation (Kleinert, Zoch, Vicari & Ehlert, 2021).

On the one hand, home office capacities have increased significantly and remain at a higher level than before the pandemic. However, it should also be noted in this context that people who are unable to work from home (which is often associated with a lower level of education and wages) in particular experience a higher “vulnerability” in relation to the consequences of COVID-19 (Alipour, Falck & Schüller, 2023). Inequality in both

the acceptance of the measures and the perceived risk of infection was found for various forms of office work and production-related activities (Soeder et al., 2022). At company level, one challenge was therefore to address the (perceived and actual) inequalities and develop solutions for all employees. This inequality is also reflected in other data. For example, work-related differences in the incidence of illness were observed during the first four waves. These show that employees in health-related professions were particularly affected at the beginning of the pandemic and that protective measures were inadequate. In the later waves, more illnesses were observed in production-related occupations. This also shows a link to the level of requirements, in the sense that helpers in particular had higher incidence rates than other occupational groups. “Thus, over the course of the pandemic, a reversal of the social gradient in COVID-19 disease risk to the disadvantage of workers in socially disadvantaged occupational groups is emerging along these two vertically structured occupational classifications” (Guțu, Schaps et al., 2023, p. 781). Similarly, data from the BAuA working time survey also show that employees in critical occupations (essential workers) often work under less favourable working conditions. This applies to income, (atypical) working hours and the ability to maintain distance (Dütsch, 2022).

It has also been shown that the pandemic has exacerbated existing precarious workloads (and social inequalities) in the so-called “systemically relevant” sectors/high-risk industries (e. g., meat industry, seasonal work, logistics, healthcare) (Schmucker, 2021; Sommer, Backhaus & Tisch, 2021).

Measures such as the short-time working allowance also secured employment, but also had a “status-securing effect for dependent employees in normal employment relationships”. People with less market power were more affected by company flexibilisation instruments and government containment measures, which had an impact on their social security (Struck et al., 2021).

Overall, these results indicate that access to protective measures, but also the consequences of the coronavirus pandemic, were strongly dependent on factors such as education level and income.

5.2 Dynamics and novelty of the events

Due to the dynamic nature of the infection process, recommendations and procedures for combating the pandemic changed very quickly. Regulations were sometimes contradictory, impractical or ineffective (Kuhlmann & Franzke, 2022). This is illustrated above all by the widely changing recommendations on wearing a face mask during the course of the pandemic – “from scarves to FFP-2 masks”. A distinction is made between mouth-nose covers, mouth-nose protection/medical face masks, filtering half masks, respirators with replaceable filters and face shields (Thelen, 2020). At the beginning of the pandemic, when there were not enough protective masks available, people were advised to wear a (textile) face covering. It was also permitted to wear scarves, shawls and similar products, which have an uncertain protective effect

compared to medical masks (Allmendinger et al., 2022) so that their use is only recommended in the private sphere (Thelen, 2020). Later, FFP2 masks were also made available to the general population. It should be noted that no universally valid recommendation for wearing FFP2 masks can be made – only in settings with an increased risk of infection, e. g. in healthcare facilities (Allmendinger et al., 2022). Maintaining a certain balance between continuity and consistency of information proved to be challenging.

As impressively demonstrated, the acceptance of businesses to implement appropriate hygiene and infection prevention measures was high (see **Chapter 3.6**). Nevertheless, business closures could not be prevented. In the course of the pandemic, there was also a certain disillusionment (“pandemic fatigue”). It was therefore highly relevant to maintain the motivation of companies and employees to support regulations and measures for the indefinite duration of the pandemic (Guhlemann et al., 2022).

It was necessary to keep pace with the new developments and constant changes. This required complex coordination between all responsible bodies, committees and crisis teams, which also had to ensure fast, effective and standardised external communication. Coordinating and bringing together the various occupational health and safety stakeholders (scientific institutions, ministries, authorities, etc.) represented a major challenge for occupational health and safety in Germany, which has an above-average institutionalised structure (Botey Gaude et al., 2022).

Another challenge was that existing occupational health and safety regulations no longer applied in view of the unprecedented infection situation. Previously, infection protection measures and regulations applied to specific activities, e. g., in healthcare, laboratories, etc. (TRBA 250). Now these were no longer sufficient, as the risk of infection suddenly applied to all (physical) interactions between employees themselves, with customers, etc. in all sectors of the economy.

5.3 Structural challenges

Federalism in Germany, which allowed for different implementation strategies by the federal states, made it difficult to quickly standardise a nationwide approach (Pergande, 2020). “Resolving” this supposed contradiction between the binding nature and flexibility of local actors' actions was extremely challenging at a political level.

Another relevant difficulty was formulating recommendations for dealing with COVID-19 that were both universally applicable and took vulnerable groups into account. For example, it was unclear how to deal with particularly vulnerable people in the SARS-CoV-2 pandemic (e. g., employees with previous illnesses, older employees or employees with little knowledge of the German language), for whom, in contrast to young people, expectant/nursing mothers and disabled employees, no specific occupational health and safety regulations exist(ed) (Biniok et al., 2025).

6 Lessons learnt

Occupational health and safety measures were probably able to protect employees – measured in terms of illnesses – but the measures could not be implemented equally in all occupations (Guțu, Schaps et al., 2023). Measures such as closing shops and comprehensive contact restrictions curbed a higher increase in cases at the beginning of the pandemic (Aravindakshan, Boehnke, Gholami & Nayak, 2020).

The crisis management of local actors during the pandemic, which was based on the agile implementation of decentralised and targeted measures, is considered effective (Kuhlmann & Franzke, 2022).

From an overarching perspective, which concerns the cooperation of the various social partners in the area of occupational safety and health, there is a dilemma on the part of the trade unions. While, on the one hand, central government positions concerning their members and their protection at work were shared, on the other hand, very differentiated opinions (e.g. with regard to vaccinations) and a lack of clarity about what role trade unions can play in times of crisis emerged during the pandemic (Thomas, Dörflinger, Yon & Pletschette, 2022).

The higher benefit rates for short-time work arrived where they were needed, namely among low earners and employees from sectors of the economy particularly hard hit by the pandemic (Kagerl & Kruppe, 2024). It is concluded that short-time work is therefore an extremely effective instrument for stabilising the labour market during the crisis (Bonin, Eichhorst, Krause-Pilatus, Rinne & Jungnickel, 2021; Christl, De Poli, Hufkens, Peichl & Ricci, 2023; Schludi, 2023).

6.1 Strengths

It is fundamentally positive that knowledge about the emergence and development of pandemics was already available worldwide before the SARS-CoV-2 pandemic. The continuous scientific examination of the dangers posed by pathogens and the role of the spread of pathogens with zoonotic potential by wild animals is established worldwide. The risk of new combinations of these pathogens and thus the risk of the emergence of pathogens with pandemic potential has already been brought into focus by annually recurring waves of influenza (flu waves) with ever new mutations and also by the emergence of avian and swine flu since the early 2000s. The development of a global infection event (pandemic) is therefore only a matter of time and preparation for this is essential. Germany has had a national pandemic plan since 2005, which was updated for the first time in 2017 and is now being revised again in the wake of the SARS-CoV-2 pandemic (RKI, 2017).

The structures for dealing with infectious pathogens and protecting the population have been in place for decades in the area of infection control and occupational health and safety, so the government and the relevant ministries (BMG and BMAS) took action

early on at the start of the pandemic. It is striking that many legal regulations came into force in Germany during the pandemic in order to keep pace with the progressive development of the infection rate and thus ensure the implementation of measures.

For activities involving biological agents (biological substances), the Committee for Biological Agents (ABAS) was founded in 1995 to draw up rules for the handling of biological substances and to establish them for the healthcare sector, for example. The protective measures applied are based on the categorisation of biological substances into risk groups. In February 2020, the ABAS classified SARS-CoV-2 in risk group 3 (see **Table 1.1**). Building on this, the BMAS developed the Corona Occupational Health and Safety Standard in April and subsequently specified it in the SARS-CoV-2 Occupational Health and Safety Rule. In contrast to individual sectors, it quickly became clear that all companies need standardised rules.

The occupational health and safety regulations were developed in cooperation with the various occupational health and safety committees at BMAS and were well known among companies and company managers with occupational health and safety responsibilities. The comprehensibility, practicability and (presumed) effectiveness of the rules and guidelines were rated highly (Tausch & Adolph, 2021). The products of the other committees also enjoyed and continue to enjoy a high level of trust. In particular, the rapid development and provision of customised products and guidelines was welcomed. This ensured that the companies were able to act.

The continuous review, readjustment and adaptation of regulations/necessary occupational health and safety and infection protection measures to the incidence of infection during the pandemic enabled operational processes to be maintained and the health of employees to be protected.

The cooperation and assumption of responsibility of all actors involved in occupational health and safety at both institutional and company level was of central importance for the organisation of work under pandemic conditions (Sommer et al., 2021). At company level, the actors (e. g., employers, OSH specialists, company doctors, managers, works/staff councils, employees) should take joint responsibility for the effectiveness of occupational safety measures. The expertise of specialist occupational safety actors, e. g., occupational safety specialists and company doctors, can support the implementation of company-specific occupational safety measures – as unexpected crisis situations make them particularly necessary.

The research shows that there was a high level of willingness on the part of companies to implement occupational health and safety and infection prevention measures. To ensure that rapid action can be taken to protect employees in future emergencies, knowledge of the company's occupational health and safety tools should be strengthened. This includes, for example, the use of company agreements, the involvement of occupational health and safety specialists and employees, and the provision of

company pandemic plans. In this context, the importance of a well-designed occupational health and safety organisation should be emphasised.

Overall, there is a greater awareness of occupational safety measures, e. g., with regard to company regulations for dealing with symptoms of illness, which can also be maintained beyond the pandemic (Tisch et al., 2021). Awareness of the actual occurrence of a pandemic with far-reaching consequences has also been raised among employees, various stakeholders and the population as a whole.

Federalism enabled the federal states to find regionally adapted solutions depending on the incidence of infection (see 3G rule depending on the 7-day incidence in a district) (Pergande, 2020).

Germany played a central role in the development of one of the first vaccines against SARS-CoV-2 authorised in the EU (BioNTech-Pfizer), so that the vaccination campaign could start just 10 months after the start of the pandemic (Bundesregierung, 2023). This was followed by a high level of vaccine production and organisation. Access to vaccines was initially prioritised, but as vaccine availability increased, Germany was able to achieve a high vaccination rate (see **Chapter 2**).

Germany reacted relatively early to the pandemic with extensive (lockdown) measures, particularly during the first COVID-19 wave. This slowed the spread of the virus and prevented deaths (RKI, 2023a).

6.2 Challenges

As the coronavirus pandemic clearly shows, a pandemic poses major challenges for the entire world, as almost every continent was affected. Coping with a pandemic emergency affects the entire population in all aspects of life.

In Germany, the different responsibilities of various ministries for infection control (BMG) and occupational health and safety (BMAS) and other relevant aspects posed a challenge. Concepts must be developed and followed up to ensure the rapid involvement of all relevant ministries and stakeholders. This also includes, for example, the preparation of a comprehensive crisis team that can start work ad hoc in an emergency (participation of all stakeholders) and addresses all aspects of a pandemic (“government pandemic roadmap”). The immediate involvement of the scientific community should also be taken into account. On the one hand, this enables better integration of existing expertise (e. g., with regard to occupational safety and infection protection for a specific group of pathogens). On the other hand, new findings that influence the development of measures can be incorporated quickly. Institutions anchored in science such as BAuA can also access established communication structures (e. g., information centre or GDA portal) and reach important target groups such as companies and employees quickly (e. g., via the BAuA homepage). This is particularly relevant, as informing the population about (possible) upcoming measures and, above all, their

benefits (e. g., containing the spread, preventing severe courses of the disease due to a lack of medication and vaccines) is a key element of crisis communication.

The easing of the international emergency should also mark the start of an intensive review. On the one hand, this concerns the retrospective evaluation of measures, decisions and scientific findings (e. g., abstracting from possible new pandemic pathogens in relation to risk group categorisation according to the German Ordinance on Biological Substances). On the other hand, it should include the continuation and stabilisation of important lines of research so that new findings and products are available in the next hazardous situation. In the area of occupational safety, for example, this could include further research and learning from the experiences of other countries in the area of PPE (consistent use of ventilated helmets, as in the UK). In this context, the importance of institutions that conduct research into occupational health and safety comes into play once again.

In the course of the coronavirus pandemic, occupational health and safety also faced the particular challenge of established protection principles being put to the test. The great importance of individual protective measures such as wearing masks had to be set in an appropriate relationship to technical and organisational measures e. g., creating personnel resources). In addition, the great individual responsibility should not be neglected, as the protective measures were not only for one's own safety, but also for the safety of employees, patients and one's own family. Even if civil protection is the guiding principle in times of a pandemic, it must be taken into account that a large part of the population is part of the labour force. Therefore, the world of work and occupational health and safety must be involved in good time, and existing occupational health and safety regulations must be followed.

In this context, it became apparent that not all employees were able to benefit equally from company and state protection measures. It is therefore particularly important for occupational health and safety to identify relevant target groups and develop tailored concepts in order to avoid further polarisation (Overbeck-Gurt et al., 2023). As part of this, measures for vulnerable groups must also be derived from the coronavirus pandemic. The pandemic also showed that measures such as the closure of school and childcare facilities led to an additional burden on parents, with the compatibility of work and family life and the gender-equitable division of labour being restricted in particular (Bonin et al., 2020). These measures can also have significant psychosocial consequences for children and adolescents (Allmendinger et al., 2022).

It is recommended to regularly monitor infection control, especially in sectors with precarious working conditions in terms of hygiene (Allmendinger et al., 2022).

The non-visual perceptibility of infectious agents causes difficulties. This goes hand in hand with an understanding of basic hygiene measures, such as the AHA rules during the pandemic.

Rules – in particular with regard to occupational health and safety – should always be controllable. This requires better staffing in the supervisory authorities and adapted monitoring concepts (e. g., with regard to working from home). Furthermore, this requirement applies not only to the verifiability of rules and laws at an institutional level, but also to those responsible in companies. In practice, for example, it has proved difficult to monitor the testing or vaccination status of employees in companies.

The political system of federalism in the Federal Republic of Germany posed a challenge for the uniformity, communication and verifiability of compliance with rules and measures. Consideration should therefore be given to the extent to which, for example, reporting chains can be simplified and critical infrastructure maintained. The digitisation of administration and the healthcare system play a special role here and should be driven forward.

In the event of new crises (with infectious diseases), both working on site/in a workplace and crisis-related changes in work settings (such as location-flexible, hybrid working) should be considered equally (Guhlemann et al., 2022) in order to avoid the inequality problems outlined above and to enable all employees to work as safely and healthily as possible. In this case, it is advisable to provide flexibility tools for employees who are unable to work from home, for example (Backhaus, 2022).

The glaring shortage of “essential medical supplies” such as protective masks, personal protective equipment, medical devices and medicines at the beginning of the COVID-19 pandemic revealed an urgent need for action and led to the creation of an explicit legal basis for a national reserve (Section 5 (4) IfSG) for the first time. In addition, sufficient resources for emergencies (personnel, tests, laboratory capacities) should be kept available.

A thorough reappraisal of the coronavirus pandemic in Germany has not yet been successful. The German government's determination to prepare for the next pandemic on the basis of a consistent review should be positively reinforced. What has been learnt should be further tested outside of a pandemic, emergency drills should be carried out regularly at all levels and measures should be prepared with courage. Gaps should be identified and closed in the interests of all in preparation for a new national infection situation.

The following table summarises key areas of action and measures that can play an important role in occupational safety and health and serve as preparedness in the event of a new pandemic risk situation.

Table 6.1 Exemplary lessons learned in the course of the COVID-19 pandemic

Measure/ Field of action	considerations	Necessary steps	priorities
Lessons learnt	+ Ensure compliance in a new epidemic situation + The ability to react quickly in order to actively intervene in events		Dealing with the corona pandemic
Political system/ federalism	+ Decisions scalable and adaptable to regional differences – Traceability, controllability only possible to a limited extent	Identify gaps in responsibilities	Sharpening of responsibilities in coordination with the federal states and deposit for the future
Legislative changes related to the pandemic, e. g. in the IfSG, in the Occupational Health and Safety Control Act, etc.	+ Permanent anchoring creates a basis for the next pandemic + Time advantage for quick action	Ensure controllability and feasibility on the part of both institutional and operational stakeholders	Check whether further action is required (e. g., with regard to stockpiling PPE)
Regulations and state rules in occupational health and safety	+ Quick regulatory aid in case of need (e. g., COVID-19 ArbZV) + Orientation for e. g., occupational safety measures or linking with civil protection measures + Ensuring the binding nature of requirements – Time-consuming preparation process does not keep pace with the dynamic development of the pandemic in terms of infection protection requirements	If necessary, accelerate coordination processes through exceptions that are defined in the inter-pandemic phase	Regulation texts and regulations ready for the next pandemic Implementation of applicable regulations
Population-wide measures such as lockdown and school closures	+ Reduces the spread of pathogens and thus outbreaks – “Side effects” such as additional workload or gender-equitable distributions – Consequences of isolation	Careful handling of advantages and disadvantages	Keep in mind for the next pandemic
Stocking up on personal protective equipment / securing production facilities in your own country	+ Independence from markets + Fast access – Cost factor	Retention and production in own country	Set up storage and distribution centres

Measure/ Field of action	considerations	Necessary steps	priorities
Set up permanent crisis teams; strengthen crisis management	+ Fast responsiveness + Effective coordination, cooperation and communication – Ties up resources	Hold and update	Identify stakeholders Create structures in e. g., federal ministries for terminal/pandemic infection situations
Strengthening the role of the BAuA	+ Sound findings and research for human-centred work design + Established communication structures and perception as a reliable institution in the world of work – Insufficient capacity for research and communication tasks	An occupational health and safety committee has been set up with the ASGA, which can take on a coordinating role Expand personnel capacities in the committees and also in communication Use digital tools such as chatbots to intercept enquiry peaks	Establish a permanent interface between infection protection and occupational health and safety, particularly with regard to research (workplace-related infectious diseases) Establish internal structures/processes for the next emergency, follow up and carry out exercises Establish an interface for emergencies with BMAS
Improve communication with the population and businesses	+ comprehensibility and transparency of measures and decisions and thus compliance + Creating confidence for future pandemic or endemic infection situations –Challenging in inter-pandemic phases	Consider communication differences before / during / after the pandemic Sharpening responsibilities	Raise awareness and understanding (e. g., through information campaigns), create trust through risk communication vs. crisis communication, explore new avenues (e. g., media use)
Science	+ Sound knowledge and expertise already available + Immediate research based on available data – Maintaining contact, possibly for years	Immediate involvement in decision-making processes Dealing with experts	
Digitisation of authorities/administration	+ Facilitated data exchange and shortened processes/reporting chains + Improve cooperation at different levels – Data protection often problematic	Investment requirements Do not rely on individual solutions, but take a holistic view of systems Consider parallel crises (e. g., pandemic and cyber-attacks)	Advancing and testing established and expanded systems Establish emergency systems Create exceptions for data protection for research purposes

Measure/ Field of action	considerations	Necessary steps	priorities
Monitoring (digital)	+ Creating a solid data basis for research + Systematic collection of relevant current reporting and surveillance data, data exchange and data security	See above	See above
Maintain capacities to work from home	+ Enables contact reduction – From an occupational health and safety perspective: psychosocial stress if the design is inadequate	For companies: Provide technical equipment with software and hardware If necessary, limit time periods if the situation at home does not allow you to work well	Create a legal basis to ensure certainty of action for companies and employees
New flexibility models	+ Reduce the feeling of inequality between employees with different presence requirements – Feasibility in operational reality unclear – Risk of abuse to circumvent health and safety standards	Must be accompanied by research	Taking social changes into account
Occupational health and safety organisation (BASO)	+ Good BASO as a protection factor: dynamic derivation and adaptation of various occupational safety and infection protection measures are facilitated	Provide information Remove controls Expanding digital tools for support	Utilising the positive effects of the COVID-19 pandemic on occupational health and safety

7 Summary and outlook

Based on the reporting situation, it can be summarised that the coronavirus pandemic has had an enormous impact on the world of work in Germany. Companies and employees showed a high level of willingness to implement occupational safety and infection prevention measures and to adapt concepts according to the respective conditions, dynamics and information situation. Many government measures have had a fundamental impact. Nevertheless, many dependencies and interrelationships have been underestimated, which have led to an increase in inequalities in some areas.

As the emergency subsided, an increase in the importance of occupational health and safety could be observed. However, of the much-predicted “new normal”, it is primarily the increased prevalence of working from home that seems to be holding true. A fundamental rethinking in occupational health and safety and sustainable concepts for new crisis situations do not appear to be gaining acceptance. At this point, institutions such as BAuA and networks such as PEROSH can contribute to keeping knowledge about measures available and accessible by providing information tailored to the target group and at the same time working towards sustainable changes in the world of work (e. g., improved occupational health and safety organisation, greater dissemination of risk assessment, participation-oriented processes, company agreements and company pandemic plans). This requires stronger networking and communication structures in operational practice, with stakeholders in occupational health and safety and in politics. The actions of occupational health and safety committees can play an important role and act as a bridge here. This applies not only at a national level, but should also be seen as an opportunity to strengthen international cooperation. Especially in times of pandemics, recommendations do not stop at national borders, but can have a greater protective effect across national borders.

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