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Covid-19 measures and the impact on work and workers in the Netherlands: lessons learned

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Summary

Covid-19 measures and the impact on work and workers in the Netherlands: lessons learned

Since the start of the covid-19 pandemic, a series of measures were implemented by the Dutch government to change population behaviors and limit social contacts from February 2020 onwards. The main argument underlying the measures was to prevent an overload of the healthcare system, particularly the intensive care units. In this report, we identify the measures that had an impact on work and workers in the Netherlands, describe the support for and compliance to these measures, and describe their impact on working conditions, health and well-being of workers. Therefore, a literature review was conduction in national and international literature, supplemented with national data on the impact of the pandemic.

This report is part of a larger study 'Lessons Learned from the Pandemic, a European comparison', conducted by PEROSH, a European network of Research Institutes in the field of Occupational Safety and Health. The aim was to describe the impact of Covid-19 measures on workers and their work situation in eight countries (Austria, France, Germany, Italy, the Netherlands, Poland, Sweden, United Kingdom). A comparative analysis of these countries will be published in a separate report.

In the Netherlands, multiple measures were taken during the pandemic, which were tightened and relaxed as the situation and knowledge about covid-19 evolved. Several of these measures also impacted work and working conditions, for example temporary closure of sectors, requirement to wear face masks, hygiene measures and gathering limitations. Some measures were specifically aimed at workers or at particular sectors. The measure that impacted a large number of the working population was the urgent advice from the government to work from home when possible.

Decisions regarding measures were made by the Covid-19 Ministerial Committee (MCC-19), that contained all members of the cabinet. This committee was primarily advised by the Outbreak Management Team (OMT), which consisted mainly of medical experts. On September 1st, 2022, a second advisory committee was established, the Societal Impact Team (MIT). The MIT's advice focused on the social, societal and economic impact of the Covid-19 measures. Support for most measures fluctuated throughout the pandemic, mostly in sync with the number of infections, hospitalizations and ICU admissions.

The extent to which measures were *implemented* during the pandemic varied across sectors. Approximately half of the workers in the Netherlands worked from home during the entire pandemic. Remote working was particularly present in sectors such as financial and business services, ICT and public administration. Generally, dismissals, adjustments of working hours, and mandatory days off were most common in the transport sector, while withdrawal of leave was highest among healthcare workers. Working in fixed shifts was most common in the industry sector, while limiting the number of people at the worksite was most common in ICT and business services. Workers in the construction industry most often reported that Covid-19 measures were not implemented at their worksites. Through a linkage of the NWCS-COVID-19 cohort with test results from the Municipal Health Services over the period June 2020 – August 2021, it was shown that a higher percentage of workers had at least one positive Covid-19 test when companies had implemented none of the Covid-19 measures compared to companies where at least one measure was implemented.

Additionally, the percentage of workers with Covid-19 was lower when working from home was possible and when a limited number of people at the worksite was allowed.

Differences in *compliance* with the measures also differed across sectors, mostly due to the type of work and whether close physical contact was required. Social distancing from colleagues, patients and students was most difficult in healthcare and education, while social distancing from customers was challenging in food- and accommodation services. As a result, personal protective equipment was most often used in these sectors.

The percentage of *on-site workers* experiencing high job-strain and unacceptable behavior from external parties and colleagues decreased at the onset of the pandemic, but the former returned to pre-pandemic levels. The experience of high emotional demands decreased in the first period of the pandemic but returned to pre-pandemic levels as well. Social support from management and colleagues remained high during the entire pandemic. Notably, nearly one-third of healthcare workers indicated that the pandemic had made their work more physically demanding. *Remote workers* spend more time behind their screen during the entire pandemic than before. Consequently, the percentage of remote workers with regular repetitive movements increased as well as sedentary behavior during working time. The percentage of remote workers experiencing high emotional demands decreased during the pandemic but returned to pre-pandemic levels while the percentage of remote workers with high-strain jobs remained stable. Social support from both supervisors and colleagues remained consistently high throughout the pandemic.

The perceived general health of on-site workers increased at the beginning of the pandemic but returned to pre-pandemic levels at the end. Emotional exhaustion in this group decreased initially but rose towards the end. Repetitive Strain Injuries decreased during the pandemic and remained low. Remote workers. The perceived general health of remote workers also increased at the beginning of the pandemic and remained slightly higher than pre-pandemic levels by the end. Emotional exhaustion did not change for this group of employees, and the number of remote workers with RSI (Repetitive Strain Injury) complaints decreased slightly

This report also presents findings from an international literature review of reviews on the impact of measures on work- and health-related outcomes of workers during the pandemic. The majority of studies examine remote working, while a few others focus on lockdowns or work-site closure, social distancing, school closures or wearing personal protective equipment. The reviews included a wide variety of work- and health-related outcomes, ranging from musculoskeletal problems, physical inactivity, anxiety and depression, skin problems, to concerns about career prospects and work-life balance. In general, the findings are mixed

Reflecting on the results, we can formulate four lessons learned.

Lesson 1: By collecting more data at the occupational level and linking it to data on infections, the role of work in the spread of the virus becomes more apparent, and vulnerable groups of workers can be identified earlier.

Data collection at occupational level on the impact of measures on working conditions and workers health and wellbeing, as well as data on support of and compliance with measures of workers was limited,, fragmented and not shared in the Netherlands. Therefor it was difficult to draw conclusions about the role of the work environment in the spread of the virus, nor about vulnerable groups. Since half of the workers continued working on site this is a limitation.

Lesson 2: Involving occupational experts in the advisory teams can ensure better consideration of vulnerable groups of workers

The SARS-Cov-2 virus posed a risk on the health of workers, and measures to control the pandemic impacted working conditions as wel as the health and wellbeing of workers. Not all work environments were able to effectively enforce general governmental measures. By involving occupational experts in the advisory teams the impact of measures on work can be taken in to account. It will also alow for more specific measures tailored to individual workplaces.

Lesson 3: Structured knowledge exchange among experts can contribute to a better support of employers

Protecting workers from health risks at work, such as the health risk of the SARS-CoV-2 virus is one of the obligations for employers, as established in the Occupational Health and Safety Act. Since worksites differ, a variation in protective measures is needed. The Labour Authority and sector organisations can play a role in defining specific needs. A more structured collaboration among occupational health experts and general health experts can improve knowledge on prevention of infections at the workplace.

Lesson 4: Workers, managers and employers were able to adapt quickly to working from home, but knowledge on the long term. effects are needed.

The transition to remote work went very smootly in the Netherlands. Employers and workers demontrated their ability to quickly adapt to a new situation. Manageing workers remotely was challenging, but workers experienced support from their co-workers as well as from their supervisors. The positive experience with remote working increased hybrid working after the pandemic. It is important to continue monitoring the long-term effects of this trend.

Contents

1 Introduction

The corona pandemic began in December 2019 in Wuhan, China, and was officially recognized as a pandemic by the World Health Organisation (WHO) in March 2020 (WHO, 2020). In the Netherlands, the first patient with Covid-19 was determined on February 27, 2020, and the number of infections increased very rapidly since then. On March 6, 2020, the first patient died due to Covid-19 in the Netherlands.

Like other countries, the Netherlands implemented a series of measures to change population behaviors and limit social contacts outside the household to flatten the infection curve (RIVM, 2024a). These measures had far-reaching consequences for the general population, but also for the working population. Multiple measures had a major impact on the working conditions of workers and, through this route, on health and well-being of workers. Both general measures and measures targeting specific sectors or occupational groups were taken. In this report, we identify the measures that had an impact on work and workers in the Netherlands, describe the support to and compliance with these measures, and describe the impact of these measures on working conditions, health and well-being of workers.

As this report described the direct impact of the measures on work and working conditions of workers, and therewith on the health of workers, the direct effects of Covid-19 infections on workers' health, such as long covid, are out of the scope of this project. We also exclude the effects of measures on the labor market position of workers (e.g. loss of income, unemployment rates).

This report is part of a larger study 'Lessons Learned from the Pandemic, a European comparison', conducted by PEROSH, a European network of Research Institutes in the field of Occupational Safety and Health. The aim was to describe the impact of Covid-19 measures on workers and their work situation in eight countries (Austria, France, Germany, Italy, the Netherlands, Poland, Sweden, United Kingdom). A comparative analysis of these countries will be published in a separate report in 2025.

1.1 Objective and research questions

The aim of this study is to provide insight into the impact of the measures taken during the Covid-19 pandemic on working conditions, well-being and health of workers in the Netherlands. The following research questions are answered to achieve this aim:

1. Which Covid-19 measures were taken in the Netherlands that directly affected the work or the working conditions of workers?
    a. What was the timeline of the measures of the pandemic?
    b. Which occupational groups and sectors were particularly affected by the measures?
    c. What were the main arguments for the measures?
    d. Who were involved in decision-making?
2. What was the level of support and compliance of the measures?
    a. What was the support of different measures over time in the general population?

   b. What was the compliance toward these measures in companies and by workers?
   c. Did support and compliance differ across sectors?
3. What was the impact of the measures on working conditions and health of workers?
   a. Are there differences between sectors or other groups of workers?

2 Methods

2.1 Study population

The population in this report includes all workers, defined as all people who participate in paid employment. Therewith, this group includes employees, self-employed, freelancers, and other forms of employed people who carry out an economic activity to generate income.

2.2 Methods and data used for answering the research questions

Several methods and datasets were used to answer each of the research questions (see table 2.1) In the following paragraph, we describe in detail the chosen methods and datasets per research question.

Table 2.1. Methods and datasets used to answer research questions.

Research question	Research method	Data sources
1 Which Covid-19 measures were taken in the Netherlands that directly affected the work or the working conditions of workers?	Primary research in national databases and national documents	RIVM corona dashboard, Documents at the website of the Dutch government Statistics Netherlands
2 What was the level of support and compliance of the measures?	Primary research in national databases and national documents	Data from the Corona Behavioral Unit (RIVM) , NWCS-COVID-19 (TNO)
3 What was the impact of the measures on working conditions and health of workers?	Literature review	International literature included in Scopus (including Pubmed) and Embase

Research question 1: Overview of measures and the process of decision making

To provide an overview of Covid-19 measures which directly affected the work and working conditions, the national government's timeline of measures taken during the pandemic was used, which has been published by the National Institute for Public Health and the Environment (RIVM). This timeline provides a complete overview of the policy measures implemented by the Dutch government in response to pandemic developments. Three researchers (KB, SB, SvZ) independently selected the measures related to work or working conditions in this timeline, and these selections were discussed and determined in the project team. Measures were relaxed or tightened during the pandemic, and these adjustments within the measures were also described in the overview. The measures were taken within a specific context of the pandemic. We used four indicators to describe the context of the development of the pandemic: daily infection numbers, daily hospital admissions, vaccination numbers and number of deaths.

This data is published in the Corona dashboard[1] (RIVM 2024b) and by Statistics Netherlands (CBS). Government policy documents were used to describe the process of decision making and who were involved.

Research question 2: Support for and compliance with the Covid-19 measures

Data from dynamic cohort from the 'Corona Behavioral Unit' of the National Institute for Public Health and Environment were used to describe support for and compliance with measures among the general Dutch population. Data from the Netherlands Working Condition Survey Covid-19 (NWCS-COVID-19) of TNO were used to describe the measures implemented in companies and employees' compliance with these measures.

The dynamic cohort was initiated by RIVM and the Municipal Health Services, which started in August 2020 to monitor the acceptance and compliance to the measures as well as the health of the participants (van den Boom, 2023). For the current project, the measurements from April 2020 to March 2022 were used.

The NWCS-COVID-19 cohort study is a follow-up cohort study of the annual NWCS 2019 (Hooftman et al., 2020) among Dutch workers between the age of 15 and 74 years with questions on a variety of topics such as compliance, working conditions and health. (Oude Hengel, 2023). For the current project, we used data from pre-pandemic measurement (November 2019) and the four measurements during the pandemic (June 2020, November 2020, March 2021, November 2021) The study population consists of 15,855 workers, who filled in at least the baseline and one follow-up measurement. These results are previously published in Dutch reports during the pandemic. This study summarized the results from these reports.

Research question 3: the impact of the measures on working conditions and health

Research on the effects of a specific Covid-19 measure on working conditions or health is difficult to draw as multiple measures were applied in the same period in a complex and dynamic context. Using data from the NWCS-COVID-19 cohort study, we present an overview of the working conditions and health status of employees at different moments during the pandemic. This data is retrieved from reports published during the pandemic, whereby the reports differentiate between on-site workers (those who primarily worked on location during the pandemic) and remote workers (those who primarily worked from home). This data is also linked to data from the Municipal Health Services on infection rates in the period (1 June 2020 to 31 August 2021).

Furthermore, a literature review was conducted to gain insight into the impact of the measures on working conditions and health. The literature review focused on the effects of measures on work, working conditions and health of workers. We searched international databases (Scopus) using a targeted search strategy based on specific keywords (Appendix 1). Given the volume of articles on specific topics, we focused on international systematic literature reviews published between 2019 and summer 2024.

[1] An interactive website displaying all relevant figures related to the pandemic (Weekcijfers coronavirus SARS-CoV-2 | RIVM_.

We included the following inclusion criteria:

1. **Type of study:** reviews focused on the effects of measures related to the Covid-19 pandemic on work and working conditions and their impact on the health and well-being of workers.
2. **Target population:** Workers, defined as individuals engaged in paid employment or professional activities, including self-employed individuals and freelancers.
3. **Study design:** reviews based on published empirical research (quantitative, qualitative, or mixed-method).
4. **Language:** English or Dutch.

After eliminating duplicates, 1,529 articles were included for screening (see Appendix 2). Title and abstract screening was conducted by multiple researchers (KB, SB, SvZ), after which 93 articles were selected for full-text review. Ultimately, 32 systematic literature reviews were included.

3 Covid-19 measures in the Netherlands

3.1 Overview of Covid-19 measures

3.1.1 Lockdowns

The lockdown was the most strict measure, which was announced three times during the pandemic: an intelligent lockdown, where staying at home was strongly recommended but not mandatory, from March 23 to June 1,2020, a partly lockdown from 14 October which was directly followed by an entire lockdown from December 15, 2020, to June 5, 2021, and an entire lockdown from December 19, 2021, to January 26, 2021. A lockdown involved a set of measures including general measures, specific measures including working from home and the closure of specific sectors. The general measures, specific measures and closure of sectors are described in the next paragraphs

3.1.2 General measures

Table 3.1 shows an overview of the general measures that were applied to the entire Dutch population in the Netherlands. The general measures that also impacted work and working conditions included general hygiene measures, social distancing, face masks, gathering limitations, and evening clock. In the following paragraphs each measure will be explained, with a focus on how it influenced work and working conditions.

Table 3.1 Overview of general measures that affected work and working conditions.

	Hygiene Measures	Measures included regular handwashing, mask-wearing in public spaces, and enhanced sanitation in businesses. Public facilities increased cleaning protocols, and individuals were encouraged to cover coughs and sneezes.
	Social distancing	People had to maintain a 1.5-meter distance in public spaces. This rule applied to both indoor and outdoor settings, with exceptions for household members.
	Face masks	Face masks became crucial in settings where social distancing wasn't possible, such as healthcare, public transport, and retail environments. Masks were required to reduce virus transmission.
	Gathering limitations	Restrictions for indoor and outdoor groups to reduce transmission. Initially, only small groups were allowed, with stricter limits during infection peaks.
	Evening clock	A curfew, or "evening clock"required people to stay indoors from 9:00 PM to 4:30 AM to reduce COVID-19 spread. Exceptions were limited to essential reasons, and fines were imposed for violations.

Hygiene Measures

Hygiene measures were applied during the entire pandemic. A key focus was on promoting proper hand hygiene, with people instructed to wash their hands more frequently and thoroughly. Additionally, the public was advised to follow good respiratory etiquette by sneezing and coughing into the elbows and using disposable tissues.

In an effort to minimize physical contact, citizens were also asked to stop shaking hands. These changes significantly impacted daily work routines, workplace interactions, and overall organizational practices, requiring both employers and employees to adapt to new ways of working while prioritizing health and safety. Employers had to provide facilities for increased hand washing, educate staff on proper hygiene practices such as respiratory etiquette and tissue use.

Social distancing

In the Netherlands, the advice was to keep a social distance of 1,5 meter to others outside the household during almost the entire pandemic. These measures significantly altered the physical and social aspects of many workplaces, requiring adaptations in both workplace design and work culture to ensure compliance with the 1.5-meter distance regulation. Employers had to redesign workspaces to ensure the 1.5-meter distance could be maintained between employees and between employees and customers/students etcetera. This often resulted in reduced workplace capacity and changes to office layouts. In public-facing businesses, the rule affected customer capacity, with restrictions like one visitor per 5 square meters in shops. Furthermore, the measure required significant changes in workplace behavior, affecting how colleagues interacted and collaborated.

Overall, several sectors struggled to adapt to the 1.5-meter rule, leading to reduced capacity, revenue declines, and, in some cases, temporary closures. Sectors dependent on personal contact or large groups of people, including personal services and accommodation and food services, were the most severely affected.

Face masks

Face masks became a crucial health measure, especially in settings where social distancing was not feasible. The Dutch government initially took a cautious approach to face mask recommendations. In June 2020, non-medical masks became mandatory on public transport for those aged 13 and older. The government's stance evolved in late September 2020, when it was advised to wear non-medical masks in all public indoor spaces in cities like Amsterdam, Eindhoven, Rotterdam and The Hague. A significant shift occurred in early October 2020, following a parliamentary debate. Prime Minister Rutte then "urgently advised" all citizens above the age of 13 years to wear face masks in public indoor spaces, including shops, cafes, museums, government buildings, and schools. Wearing facemasks became mandatory from 2020 December 1st.

Masks were especially important in high-risk environments, such as healthcare settings, public transport, and retail or service industries, where close contact or large gatherings made distancing difficult. Workers need to wear masks when social distance cannot be guaranteed, in schools (except primary schools) and during interactions with customers or colleagues. Different types of masks were used depending on the setting: medical-grade masks, like surgical and N95 masks, were prioritized for healthcare workers, while cloth masks were recommended for the general public. The supply of surgical and N95 masks was limited at the beginning of the pandemic. Consequently, these masks were initially available only for hospital workers, and not for other workers in the health care or other sectors.

Gathering limitations

Gathering limitations were implemented as a key strategy to control the spread of the virus. Initially, in March 2020, large gatherings of over 100 people were banned, quickly followed by more stringent measures that prohibited all events and public gatherings. As the situation evolved, restrictions were placed on smaller groups, with public gatherings limited to no more than three people at one point. Household visits were also restricted, allowing only one guest per day during certain periods. These gathering restrictions were not static; they were regularly adjusted based on the current infection rates and overall pandemic situation.

For businesses that remained open, the gathering limitations resulted in reduced office capacity, with fewer employees allowed on-site at any given time, which accelerated the adoption of remote work for many companies and employees. Industries that rely on large gatherings or close personal contact (e.g., events, hospitality, personal services) were more severely impacted, leading to layoffs or reduced hours for workers in these sectors.

Curfew (evening clock)

On January 23, 2021, the Dutch government introduced an enforced curfew that required the public to remain indoors from 9:00 PM to 4:30 AM. It was abolished on April 20, 2021. The curfew brought several challenges for workers, particularly those with shifts ending close to or after the curfew start time. Essential workers, including healthcare professionals, police officers, and others, were exempt from the curfew for work-related reasons. Delivery services, such as restaurants offering home delivery, were also allowed to operate after curfew. All these workers were required to carry official government forms to prove their exemption if stopped by authorities. Some businesses, particularly in the service and retail sectors, had to adjust their operating hours to ensure employees could get home before the curfew began.

Essential workers

Special arrangements of these general measures were made for people with so-called essential occupations. In the Netherlands, out of approximately 9.0 million employed people in 2019, about 3.1 million were considered essential (Table 3.2). Essential workers were permitted to send their children to childcare or school even when these facilities were otherwise closed. Initially, emergency childcare was available only for households where both parents were essential workers, or for single-parent households where the parent was an essential worker. However, the government later expanded eligibility to allow households with just one essential worker to access this service.

Table 3.2 Essential sectors in the Netherlands during the Covid-19 pandemic.

Sector	Description
Staff working in critical processes	National transport, distribution and production of electricity, Regional distribution of electricity, Gas production, national transport and distribution of gas, Regional distribution of gas, Oil supply, Internet and data services, Internet access and data traffic, Voice services and text messaging, Geolocation and time information by GNSS Management, Drinking water supply, Flood defenses and water management, Air traffic control, Vessel traffic service, Transport of persons and goods by (main) railway infrastructure, Transport by (main) road network, Large-scale production/processing and/or storage of chemicals and petrochemicals, Storage, production and processing of nuclear materials, Retail transactions, Consumer financial transactions, High-value transactions between bank, Securities trading, Communication with and between emergency services through the 112 emergency number and C2000, Police deployment, Personal and organizational record databases, Interconnectivity between record databases, Electronic messaging and information disclosure to citizens, Identification of citizens and organizations, Military deployment
Healthcare and care	Including the production and transportation of medicines and medical devices.
Education	Teachers and support staff who are needed to provide distance learning, childcare at schools and exam supervision.
Public transport	
Food supply	This should be understood in the broadest sense and includes supermarkets, deliveries to supermarkets, the food processing industry and related transport, the collection of products from farms, deliveries of animal feed and other products to farms and access for harvest workers.
Transportation of fuel	Including coal, oil, petrol and diesel.
Refuse and waste collection	
Childcare	
Media and communication	In so far as this work relates to providing society with necessary information about the current situation.
Emergency services	Control room processes, fire services, ambulance services, Regional Emergency Medical Services (GHOR), safety regions' crisis management.
Essential government processes	Central, provincial and municipal government, such as payment of benefits and allowances, population affairs, consulates, embassies, custodial institutions and forensic clinics.
Essential support or facilities services	For example, cleaning, building security, supervisory authorities, IT for one of the crucial sectors or processes listed above.

Source: Government of the Netherlands (COVID-19: childcare for children of people working in crucial sectors | Publication | Government.nl).

3.1.3 Working from home

The Dutch government strongly advised people to work from home as much as possible during the pandemic. This was not a law, but a strong recommendation. At the start of the pandemic (June 2020), almost half of the employees were able to switch (partly) their working location to home (Hooftman et al., 2020). This sudden shift marked a significant transformation in work culture, as many organizations quickly adapted to remote work arrangements to ensure business continuity and employee safety amidst the health crisis.

It should be noticed that for around half of the workers it was not possible to work from home (for example health care workers, assembly line workers, garbage collectors). In June 2021, the Dutch government relaxed the working from home guidelines advising workers to work from home for half of their working hours. This guidance was changed in September 2021 recommending that workers work from home when possible and in the office when necessary. By November 2021, the advice was further restricted, urging workers to work entirely from home when possible. On March 15, 2022, the advice to work from home was fully lifted, as one of the final measures in the Netherlands. Despite the relaxation of these measures, working from home has become a lasting change, with the majority of workers who were able to work from home continuing to do so, at least partly.

3.1.4 Sector-specific measures

In addition to general measures, sector-specific measures have also been taken. Table 3.3 gives an overview of sectors that were influenced by these specific regulations.

Table 3.3. Sectors influenced by specific measures.

Flow-through locations	Museums, zoos, and stores limited the number of visitors and mandated one-way walking routes. Many locations had timed entry slots to control crowd flow and implemented clear signage, floor markings, and sanitization stations. Face masks and online reservations became mandatory.
Culture, sport and recreation	Cultural venues had limited seating capacities, mandatory reservations, and sometimes remained closed for extended periods. Sport facilities had reduced capacities and strict hygiene protocols. Team sports and contact sports were heavily restricted.
Education	The education sector transitioned to online learning, with schools closing and classes moving to virtual platforms. Measures included smaller class sizes upon reopening, social distancing guidelines, and mandatory face masks in secondary education.
Food and beverage industry	The food and beverage industry faced closures and strict capacity limits upon reopening. Many businesses adapted by emphasizing takeaway and delivery services while implementing outdoor seating and hygiene protocols.
Childcare	Childcare facilities remained open for essential workers but faced strict health guidelines, including limited group sizes and increased hygiene measures.
Contact professions	Contact professions that couldn't comply with the 1.5-meter rule, such as massage therapists and beauty salons, remained closed. Upon reopening, they were required to implement a registration obligation for clients, alongside strict hygiene measures and limited appointment availability.

Flow-through locations

During the pandemic, flowthrough locations experienced several regulatory changes. Initially, during the first lockdown in March 2020, they were closed to prevent virus spread. As restrictions eased, they reopened with measures such as time slots, visitor caps, and mandatory 1.5-meter distancing. Over time, visitor limits were lifted, but distancing remained mandatory. Time slot reservations were later required to reduce infections. ‘Click & collect’ services were introduced to limit in-store contact, followed by in-person shopping by appointment with customer limits. During lockdown mandatory closing times were enforced and only ‘click & collect’ were allowed for non-essential stores. As the situation improved, initial easing allowed stores to reopen with mask requirements and distancing.

Further easing extended opening hours, and eventually, normal pre-Covid closing times resumed as infection risks reduced.

Culture, sport, and recreation

Regulations for culture, recreation, and sports for adults were progressively tightened and relaxed. Initially, large gatherings were banned, with all events eventually prohibited. Over time, some activities like food markets, trade shows, and sports matches for adults were allowed under strict conditions.

Reopening followed, with events allowed under conditions such as proof of entry, mask mandates, and capacity limits. As restrictions eased, outdoor festivals and sports events returned to full capacity, while non-seated indoor events remained limited. Later, stricter rules were reinstated, including event bans and venue closures, before allowing reopening with mandatory health measures like proof of entry and distancing.

Education and daycare

Schools in the Netherlands faced three national closures for primary and secondary education during the pandemic. The first closure began on March 16, 2020, with primary schools reopening on May 11, while secondary schools remained closed until June 2. This first closure lasted for about eight weeks for primary schools and 11 weeks for secondary schools.

The second closure took place from December 16, 2020, to February 8, 2021, adding another seven weeks of closure. A third closure, described as an extended Christmas break, occurred from December 14, 2021, to January 10, 2022, lasting about four weeks. In total, primary schools experienced roughly 18 weeks of closure, while secondary schools closed for around 20 weeks. Throughout this period, daycares also faced intermittent closures, often providing emergency care for children of essential workers and vulnerable families. Daycares initially closed on March 16, 2020, partially reopened on May 11, and fully reopened on June 8, 2020. They closed again from December 15, 2020, to February 8, 2021, with a final reopening on April 19, 2021, for after-school care. Strict health protocols, such as mask mandates, quarantine policies, and social distancing, were regularly applied to keep childcare and education open whenever possible, helping minimize disruption to children's education and support working parents.

Food and beverage industry

Initially, with the first rise of the pandemic in March 2020, all restaurants, bars, and cafes were closed to prevent infection, although takeaway and delivery services remained available. Shortly thereafter, coffee shops were permitted to offer takeaway as well.

In June 2020, cafes and restaurants gradually reopened under strict conditions, including limited opening hours, mandatory reservations, health checks, and maintaining a 1.5-meter distance. Throughout 2020, the regulations fluctuated, with some periods of reopening followed by the reintroduction of additional restrictions, such as earlier closing times, registration requirements, and limits on group sizes.

By June 2021, hospitality venues fully reopened with additional safety measures in place. In September 2021, the requirement for seating at a distance was lifted, though proof of vaccination or a negative test was mandated for entry.

By late January 2022, cafes and restaurants were allowed to open again from early morning until late evening with similar health protocols. Finally, by February 2022, all venues were able to operate normally, without restrictions on seating or entry requirements, marking a full return to regular operations.

Contact professions

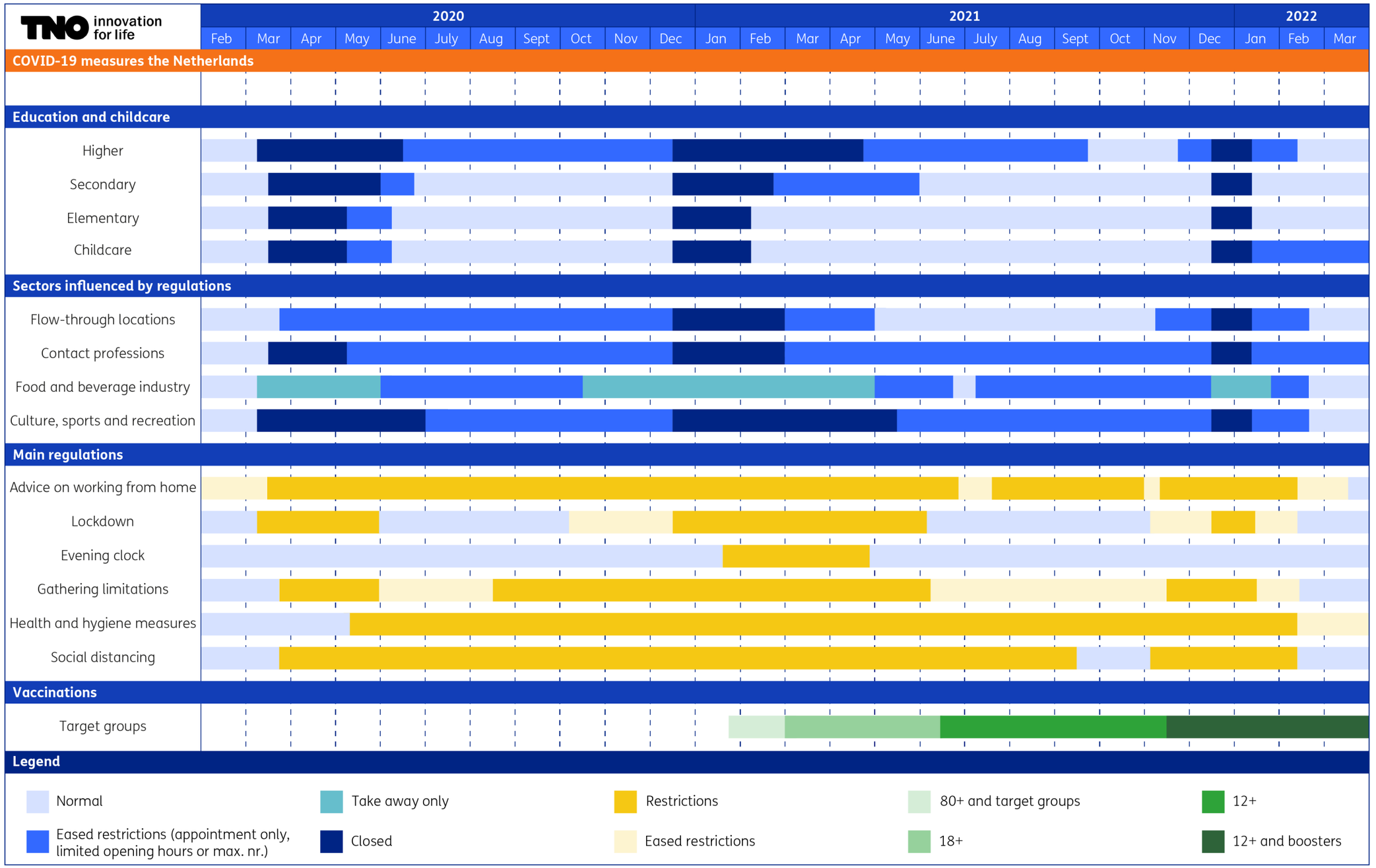
In March 2020, advisory measures were introduced for personal care professions. By May 2020, most of these professions were allowed to resume operations. Later, registration requirements were established for contact professions. However, in December 2020, the prohibition on non-medical contact professions, such as hairdressers and beauticians, was reinstated. In March 2021, most contact professions were permitted to resume, excluding sex work. In December 2021, all non-medical contact professions had to close again. In January 2022, they were allowed to receive clients until 5 PM with a mask mandate. Finally, by March 2022, contact professions were allowed to operate without any restrictions.

To sum up, Figure 3.1 provides an overview of the timeline of lockdowns, highlighting the key measures implemented during the pandemic. It also details the timeline of sector-specific regulations and closures. More details on specific measures taken per sector can be find in Appendix 4.

3.1.5 Vaccinations

The Dutch COVID-19 vaccination program commenced on January 6, 2021, and was rolled out in phases, prioritizing groups based on risk factors and age. Initially, the focus was on reducing severe morbidity and mortality. The first to receive the vaccine were healthcare workers working in nursing homes, followed by people living in these houses. Thereafter, staff from disability and home care sectors and workers in the acute care in hospitals were vaccinated. These groups were all vaccinated in January. All other health care workers are able to receive their first vaccination in April 2021.

Regarding the general working population, people from 60 years and older vaccinated, starting with the oldest age groups from February 2021. People in the age group 18-60 received their first vaccination from May 2021, starting again with the oldest age groups first. In July 2021, adolescents aged 12-17 years have been eligible for vaccination. In 2021, it is estimated that 86.0% of those aged 18 and over completed the primary series of vaccination (RIVM 2022). On November 18, 2021, the first booster campaign was launched, prioritizing healthcare workers and those aged 60 and above. By March 4, 2022, a second booster was offered to adults aged 60 and older.


TNO innovation for life
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COVID-19 measures the Netherlands
Education and childcare
Higher
Secondary
Elementary
Childcare
Sectors influenced by regulations
Flow-through locations
Contact professions
Food and beverage industry
Culture, sports and recreation
Main regulations
Advice on working from home
Lockdown
Evening clock
Gathering limitations
Health and hygiene measures
Social distancing
Vaccinations
Target groups
Legend
Normal
Take away only
Restrictions
80+ and target groups
12+
Eased restrictions (appointment only, limited opening hours or max. nr.)
Closed
Eased restrictions
18+
12+ and boosters

3.2 Reasons for introducing and relaxing measures

The introduction and relaxation of measures is essential to have maximum control on the balance between the burden of the intensive care unit on one hand and to minimize the burden on society on the other hand (Onderzoeksraad voor Veiligheid, 2023).

3.2.1 Arguments for the introduction of measures

The main argument underlying the measures in the Netherlands was to prevent the overloading of the healthcare system, particularly the intensive care units. This meant that hospitals and healthcare facilities had to be able to provide quality care to both Covid-19 patients and other acute care. A key indicator throughout the pandemic was the capacity of the Intensive Care in the Netherlands. Another priority was to protect vulnerable and elderly people in society. Older people and those with underlying health problems were at higher risk of serious complications and death from Covid-19.

As the situation and knowledge about the virus evolved the reasons and motivation for implementing measures changed accordingly over the course of the pandemic. At the beginning of the pandemic, the uncertainty was high because the number of new cases of people infected with Sars-Cov-2 increased exponentially, it was difficult to identify the sources of infection, and there was lack of scientific knowledge on transmission risk factors. Due to a lack of testing capacity, not everyone could be tested during the first phase of the pandemic, whereby it became essential to reduce the number of contacts to limit the spread of the virus. As the pandemic progressed, knowledge increased rapidly on the spread of Sars-Cov-2 as well as on human behavior. For example, scientific studies showed that the risk of being infected with Sars-Cov-2 was much higher in indoors than outdoors environments, which led to a review of measures. Measures could thus be more targeted, including maintaining social distance and wearing face masks.

3.2.2 Arguments for the relaxation of measures

The main argument for relaxation of the measures was once again the pressure on the healthcare system, and especially the IC. This pressure changed over time due to the measures taken, but also by seasonal effects, new Sars-Cov-2 variants, vaccinations, and immunity. For example, as the number of hospitalization due to Covid-19 was low in the summer of 2020 and testing was possible for everyone, several measures were relaxed. As the pandemic persisted, the socio-economic impacts became more important to consider when announcing and relaxing measures, also because the need for social interactions increased. An increase in knowledge about the spread of the virus also played an important role here. However, measures were only eased when the capacity of the healthcare system was not at risk of being overwhelmed.

3.3 Decision-makers

3.3.1 Decision making at the level of the Dutch cabinet

Decision-making during the pandemic was vested in the Crisis Management Ministerial Committee (MCCb) in the first phase and then in the Covid-19 Ministerial Committee (MCC-19).

The MCCb is a Dutch ministerial council, in a crisis situation charged with coordinating and making urgent decisions on a package of measures. The MCCb was established for the Covid-19 pandemic in March 2020. Permanent members in the MCCb are the Prime Minister, the Minister of General Affairs and the Minister of Justice and Security. In June 2020, decision-making on Covid-19 consequences and control was transferred to the Covid-19 Ministerial Committee (MCC-19). The MCC-19 took decisions on the measures to control the virus, but also on measures to prevent the negative medium- and long-term societal consequences of the virus. All members of the cabinet were members of the MCC-19.

The council of ministers was advised by several institutes such as the Outbreak Management Team OMT), Netherlands Bureau for Economic Policy Analysis, Netherlands Environmental Assessment Agency, and the Netherlands Institute for Social Research. The OMT was the main advisor for the government, and from the second half of 2022, the Societal Impact Team was also involved.

3.3.2 The Outbreak Management Team

The Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM) has an advisory and coordinating role in controlling infectious diseases in the Netherlands (RIVM 2024c). At the start of the pandemic, RIVM convened the OMT to provide the best possible medical-epidemiological advice at that time to control the pandemic (RIVM 2023a). The advice of the OMT was provided to the Ministry of Health, Welfare and Sport (VWS) through the Administrative Reconciliation Consultation (National Government 2022a). The OMT did meet frequently, depending on the severity of the pandemic. Finally, the OMT provided more than 80 pieces of advice.

The OMT consisted of several permanent members, including the director of the Centre for Infectious Disease Control, who also chairs the OMT, the head of the National Coordination of Infectious Disease Control, and an infectious disease physician from a GGD (RIVM 2024c). Additionally, a number of participants from organizations or associations that play an important role in infectious disease control (RIVM 2020, RIVM 2024c) were also members of the OMT Covid-19. This includes participants from the Dutch Society for Intensive Care, the Society of Geriatrics Specialists, the Dutch Society of Pediatrics and several centers of the RIVM.

3.3.3 Societal Impact Team

From the second half of 2022, when the peaks with the highest infection rated of the pandemic had already passed, a second advisory committee was established alongside the OMT, the Societal Impact Team (MIT) (National Government 2022b, National Government 2022c). The MIT's advice focused on the social, societal and economic impact of the Covid-19 measures, and on mitigating the societal and economic impact of measures to combat SARS-CoV-2.

They paid special attention to people in a vulnerable position and groups for whom the impact was high. This includes, for example, young people, people in a low socio-economic position, people with pre-existing conditions, and vulnerable entrepreneurs.

The MIT consists of permanent members and expert members who can be invited to participate in meetings. The permanent members of the MIT are economists, sociologists and behavioural experts. Additionally, the MIT consulted knowledge institutes such as Netherlands Environmental Assessment Agency, and the Netherlands Institute for Social Research for their advice. MIT also asked input from experiences of different groups of people (e.g. workers, people with physical disabilities, young people).

3.4 Support for and compliance with the Covid-19 measures

3.4.1 Support for and compliance with Covid-19 measures in the general population

Support for the Covid-19 measures

Figure 4.2 shows the support for Covid-19 measures during the pandemic among the general population. In 2020, the support for a number of measures was relatively high as more than 80% of the participants supported measures such as sneezing in elbows, washing hands, and not shaking hands. However, from February to October 2021, the support for most measures gradually decreased. While the general health and hygiene measures stayed above 80%, the figure showed a clear drop for social distancing and avoiding handshaking. This might be explained by the fact that the number of infections, hospitalizations and ICU admissions was relatively low during this period (see Appendix 3), From October 2021, however, support for many measures increases again, which also corresponds with the increase in infections and hospital admissions.

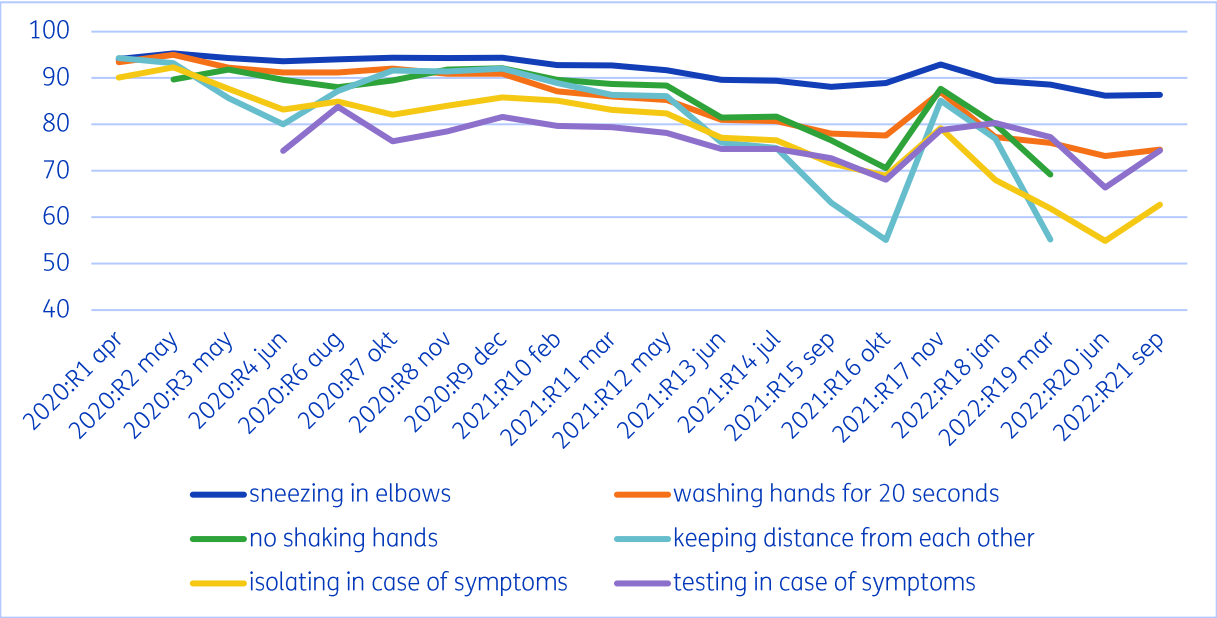

Figure 3.2 Changes in support. 2020:R1 apr means year of measurement round 1 and month of measurement. y-axis represents the percentage of participants that support a specific measure Source: RIVM (2023b).

Compliance with the Covid-19 measures

The compliance towards avoiding shaking hands is very high with nearly 100% in the first 18 months of the pandemic (Figure 4.3). Compliance towards the general health and hygiene measures are stable during the pandemic, as 70%-80% of the participants mentioned to follow this measure during the entire period. However, the compliance with the health measures (i.e. isolation at home in case of symptoms) and testing in case of symptoms was in general lower than the compliance towards the other measures, and this fluctuated over time (see Figure 3.3).

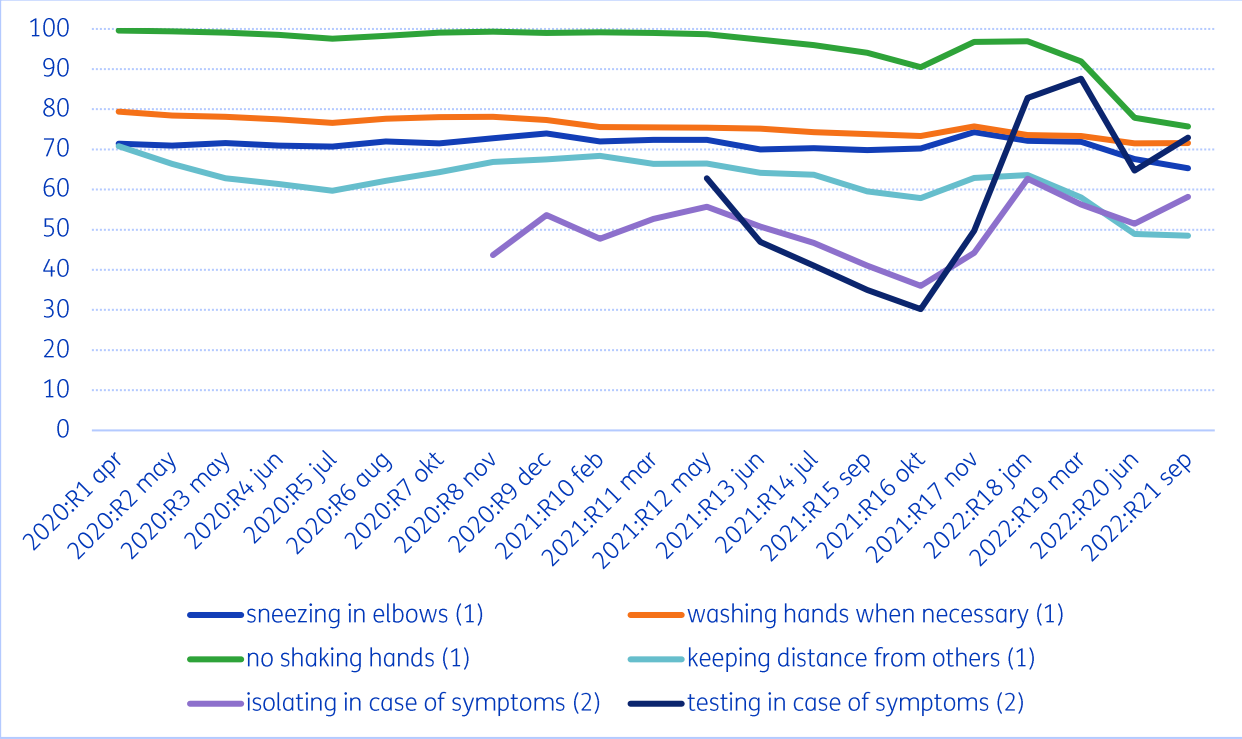

Figure 3.3 Changes in compliance to several measures2020:R1 apr means year of measurement round 1 and month of measurement. y-axis represents the percentage of participants that comply to a specific measure Source: RIVM (2023c).

3.4.2 Compliance to Covid-19 measures within the working population

The description on compliance to the Covid-19 measures within the working population during the pandemic is based on previous published Dutch reports. These reports are referenced in the text.

Measures taken by the employers

The majority of the workers mentioned that the general health and hygiene measures, including regular hand washing and social distancing, were implemented in their companies (79%-84%, Table 3.4). Also, a relatively high proportion of workers mentioned that their employer facilitated working from home (60%-64%) and restricted the number of people allowed at the workplace at the same time (40%-49%). Table 4.4 shows that measures taken from a socioeconomic perspective by employers, such as withdrawal of leave and dismissal, were less commonly mentioned by workers (Oude Hengel et al., 2022).

Table 3.4 Covid-19 measures taken according to employees.

	Mid 2020	End 2020	Early 2021	End 2021
General covid-19 measures (e.g. washing hands, social distance)	78.9%∇	84.1%Δ	81.8%	82.5%
Working from home	62.4%	63.4%Δ	63.3%Δ	59.4%∇
(Partly) dismissal	3.4%	4.5%Δ	4.0%Δ	2.0%∇
Maximum number of people in the company at the same time	--	48.4%Δ	47.1%Δ	39.6%∇
Adjustment of working hours	21.0%Δ	14.0%∇	16.1%	11.4%∇
Mandatory to take leave or holidays	11.8%Δ	8.2%	7.7%	3.9%▼
Revoke of leave or holidays	4.8%Δ	3.1%	2.7%∇	1.9%∇
Separation of groups of employees (e.g., working in shifts)	32.3%▲	24.6%	24.0%	16.0%▼
No Covid-19 measures in the company	3.7%	2.8%∇	3.3%∇	6.6%Δ
Other Covid-19 measures in the company	13.2%Δ	11.4%	9.8%∇	10.0%∇

Source: NEA-COVID-19 (TNO). ▲ and ▼: p<0.05, significantly high (low) percentages and/or means (two-sided), and Cohen's d is at least 0.20 Δ and ∇, p<0.05, significantly high (low) percentages and/or means and Cohen's d is less than 0.20.

The extent to which measures were implemented during the pandemic varied across sectors and largely depended on the type of work carried out (Oude Hengel et al., 2020; Oude Hengel et al., 2021; Oude Hengel et al., 2022). Generally, dismissals, adjustments to working hours, and mandatory days off were more common in the food and accommodation services (e.g., bars, restaurants) and the transport sector. Workers in industries involving a significant amount of blue-collar work worked more often in fixed shifts. Workers in ICT and business services, which mainly involve white-collar work, more frequently reported measures such as limiting the number of people allowed at the worksite. Remote working was particularly present in sectors with mainly white-collar workers such as financial and business services, ICT and public administration.

Withdrawal of leave was highest among healthcare workers due to the high pressure in this sector and the scarcity of personnel. Healthcare workers also most frequently reported the implementation of general Covid-19 measures, which is unsurprising given the high risk of infection in this field (e.g., close physical contact, indoor environments). Lastly, workers in the construction industry most often reported that Covid-19 measures were not implemented at all at their worksites.

Working from home

The support for working from home advice is high in the first 12 months of the pandemic as the support for this measure is more than 80% during this period (except summer 2020: RIVM). From spring 2021, however, support for working from home continues to fall, except for autumn 2021, to 57%. Like the other measures, the decreases and increases in support to the work from home advice are linked to the number of infections and hospital admissions.

The percentage of people working (partly) from home remained high during the pandemic, even though this percentage decreased from 47% in summer 2020 to 43% by the end of 2021 (Oude Hengel et al., 2022).

The main reason for working on-site was that workers were unable to work from home due to the nature of their work. However, early 2021, a small percentage of on-site workers did so because it was expected by their company (6%) or due to personal preferences (8%), even though it was not necessary for their work (Oude Hengel et al., 2021). The number of hours per week that remote workers worked from home slightly decreased from 29 hours in 2020 to 26 hours per week by the end of 2021.

Compliance with Measures at the worksite

In addition to measures taken by the employer, a large variation exist among workers on site regarding their ability to adhere to general measures such as keeping social distance and able to carry out hygiene measures.

During the pandemic, over 90% of the people working on site were able to comply with hygiene measures such as hand washing, and more than 80% adhered to general Covid-19 measures (Table 4.5). Social distancing from colleagues and/or customers varied over time, which can be explained by the differences in restrictions (e.g. sector closures) at different time points. Generally, the percentage of people wearing personal protective equipment and face masks decreased in 2021 which can be attributed to the relaxation of regulations regarding these measures in this period.

Differences in compliance with the measures were found across sectors, which can (partly) be explained by the type of work and whether close physical contact was required. Social distancing from colleagues was most difficult in healthcare and education, and social distancing from customers was most challenging in healthcare, education and in food- and accommodation services. As a result, personal protective equipment was most often used in these sectors. Medical masks were primarily used in healthcare, while non-medical masks were mostly used in educational and food & accommodation services. Workers in the construction industry and the transport sector adhere less to the general health measures compared to workers in other sectors.

Table 3.5 Covid-19 measures compliance at the worksite according to employees.

	Mid 2020	End 2020	Early 2021	End 2021
Compliance to General Covid-19 measures	86.4%	84.0%	90.5%	84.0%
Able to carry out hygiene measures (e.g., regular washing hand) at the workplace	92.7%	93.4%	92.9%	92.3%
Keeping distance from customers, students or patients (often/always)	46.1%	50.8%	50.9%	44.3%
Keeping distance from co-workers (often/always)	58.4%	67.0%	68.1%	61.7%
Use personal protective equipment (PPE) if available	22.5%	66.9%	70.5%	55.7%
Use of non-medical mouth masks	--	50.1%	54.9%	38.0%

Source: NEA-COVID-19 (TNO)

One of the measures taken by the Dutch government was to stay at home when experiencing mild symptoms. In early 2021, 72% of workers reported that they sometimes or always stayed at home with mild symptoms. However, 13% of workers did not stay at home at all, and the remaining 16% of the workers stayed sometimes at home with mild symptoms.

By the end of 2021, the number of people staying at home when having mild symptoms decreased to 63%, indicating that more workers went to work with symptoms towards the end of the pandemic. Workers in the transport sector (60%) stayed less often at home with mild symptoms compared to workers in other sectors early 2021, while construction workers (52%) stayed less at home with mild symptoms at the end of 2021.

3.5 Measures at the worksite and positive Covid-19 tests

By linking the information of the NWCS-COVID-19 with test results from the Municipal Health Services over the period June 2020 – August 2021, the link between measures taken by the employer and a positive Covid-19 test was investigated (Oude Hengel et al., 2023).

3.5.1 General measures by the company

Results showed that a higher percentage of workers had at least one positive Covid-19 test when companies had implemented none of the Covid-19 measures (7.5%) compared to when at least one measure was implemented by the company (5.2%; Oude Hengel et al., 2023). Additionally, the percentage of workers with a positive Covid-19 test was lower when the measures “working from home possible” (4.7%) and “maximum number of people present at the same time” (5.3%) were applied in the company (Table 4.6). However, it should be noticed that these workers more often had white-collar jobs with in general less exposure to Sars-Cov-2 (e.g. office work).

Table 3.6 The percentage of workers with Covid-19 by measures taken by the company.

	Measure taken	Measure not taken
General covid-19 measures (e.g. washing hands, social distance)	5.4%	4.7%
Working from home	4.7%∇	6.3%Δ
(Partly) dismissal	5.9%	5.3%
Maximum number of people in the company at the same time	5.3%∇	6.2%Δ
Adjustment of working hours	4.5%	5.5%
Revoke of leave or holidays	4.1%	5.4%
Seperation of groups of employees (e.g., working in shifts)	4.8%	5.5%

Source: TNO (Oude Hengel et al., 2023b) Δ en ∇: p<0,05, a significant difference with Cohen’s d is smaller than 0,20.

3.5.2 Specific measures at the worksite

The percentage of workers with at least one positive Covid-19 test was higher when workers were unable to maintain distance from customers (e.g., passengers, patients, students; 5.9%) compared to when they were able to keep distance (4.0%; Table 4.7). Additionally, the percentage of workers with at least one positive Covid-19 test was higher when they wore personal protective equipment (7,3%) than when they did not (4%). This can be logically explained because workers with PPE were more often exposed to Sars-Cov-2 at work as they frequently worked in close proximity to other people.

Therefore, this group of workers should be considered high-risk, and the percentage of Covid-19 cases would likely have been even higher without these measures.

Table 3.7. The percentage of workers with Covid-19 by specific workplace measures.

	Measure taken	Measure not taken
Able to carry out hygiene measures (e.g., regular washing hand) at the workplace	4.9%	5.4%
Keeping distance from customers, students or patents (often/always)	5.0%	5.0%
Keeping distance from co-workers (often/always)	4.0%∇	5.9%Δ
Use personal protective equipment (PPE) if available	7.3%Δ	3.9%∇
Use of non-medical mouthmasks	6.3%	6.5%

Source: TNO (Oude Hengel et al., 2023) Δ en ∇: p<0,05, a significant difference with Cohen's d is smaller than 0,20.

International comparison COVID-19 Regulations

As indicated in the introduction, this report is part of an international comparison. A more thorough comparison of different countries' responses to COVID-19 will be conducted as part of the PEROSH project, where the reports from various countries will be synergized. In the boxes below, we highlight key insights from two interviews held with representatives from the UK and Sweden.[2] In these interviews we explored the main differences between their regulations during the COVID-19 pandemic and the impact these had on working people and the situation in the Netherlands.

[2] We interviewed Professor Andrew Curran CBE - Director of Science and Chief Scientific Adviser from the UK and Anders Fredriksson consultant at Vilna AB from Sweden.

Box 1.

Differences in COVID-19 Regulations between the UK and the Netherlands

The UK's COVID-19 response was primarily driven by the need to control the R-number and hospital bed availability. Protecting the healthcare system in England, the NHS (National Health Service), was the main priority throughout the pandemic.

The Health and Safety Executive (HSE) played a significant role in managing workplace safety. They conducted extensive risk assessments and created manuals to guide workplaces. With half a million inspections carried out, over 90% of workplaces were found to have good measures in place. A common issue identified in the other 10% of workplaces was the improper use of ventilation systems. Inspections were both random and based on reports from the RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) network, which allowed people to report dangerous working conditions.

Ensuring the availability and safety of PPE was another critical task. The HSE reviewed about a billion PPE materials, many of which were found to be unfit for use.

To make informed decisions, the government was advised by multiple parties, such as the network of Chief Scientific Advisers (CSA) and the Scientific Advisory Group for Emergencies (SAGE). Public skepticism about lockdowns grew over time, especially after multiple lockdowns. However, overall public compliance with safety measures was high.

Compared to the Netherlands, the UK did more extensive inspections and risk assessments of workplaces. This led to a high level of compliance with the safety measures. The amount of inspections that were carried out in the Netherlands were significantly lower and mostly carried out after receiving reports (around 6.000 in 2020) of safety concerns in organizations regarding the virus.

Additionally, the UK placed less emphasis on mental health during the pandemic. The top priority was to protect the NHS and hospital bed availability, while mental health was not as high on the agenda in the decision-making process. In the Netherlands mental health became increasingly important as the pandemic continued, and the socio-economic impacts were considered more over time when implementing and easing measures.

Box 2.

Differences in COVID-19 Regulations between Sweden and the Netherlands

Sweden adopted a relatively mild approach to managing the COVID-19 pandemic, relying primarily on recommendations rather than regulatory measures. The government advised the public to practice social distancing, work from home, and from January 2021 to wear masks on public transport during peak hours. Instead of enforcing strict regulations, the measures were presented as general recommendations to the public or tailored guidance for specific industries. Schools remained open, except for some secondary schools that partially switched to online education, and universities that switched predominantly to online education. Also stores and hospitality establishments remained open. Additionally hospital and care homes were not open for visitors. Public gatherings were initially limited to 500 people and later reduced to 50. Anyone who organized an event that violated the ban could be sentenced to fines or imprisonment for up to six months, but this did not occur in known cases. The responsibility for ensuring a safe working environment was placed on employers and managers, particularly in sectors like healthcare.

Sweden has a relatively decentralized decision-making model, this decentralized approach was also used during the pandemic. Unlike many other countries, the state did not heavily interfere with labor unions, leaving many safety matters in the working environment to the unions and employers. The Swedish labor market model, characterized by strong social partnerships and a clear division of responsibilities between the state and social partners (i.e., trade unions and employers), significantly influenced how work environment issues were handled. During the pandemic, trade unions and employer organizations played a crucial role in protecting the work environment, providing support and guidance on managing the changed working conditions, and lobbying the government for regulatory clarifications.

In contrast, the Netherlands implemented stricter measures, including lockdowns and mandatory closures of various institutions. The Dutch government enforced social distancing and mask-wearing with legal mandates and penalties for non-compliance. Schools and universities were closed, and public gatherings were heavily restricted.

Sweden's decentralized approach allowed regions to make their own decisions regarding healthcare and public transport, leading to varied impacts across the country. The Swedish Public Health Agency and the National Board of Health and Welfare were central to decision-making. In the Netherlands, decision-making was more centralized, with the government taking a leading role in implementing and enforcing measures. Social effects were incorporated in the decision-making from the start of the pandemic. Sweden aimed to balance public health with maintaining societal functions and minimizing economic disruption. They were partly successful in doing this, especially compared to other countries, however, the measures (e.g. working from home) had a significant impact on many aspects of work-life. Compared to other Nordic countries there were high initial COVID-19 death rates in Sweden, particularly among the elderly, although when compared to other European countries the death rates were average. The healthcare capacity was not overwhelmed in Sweden but put under strong pressures at times. The Netherlands, experienced significant economic impacts due to stricter measures but also managed to keep healthcare capacity from being overwhelmed.

Overall, Sweden's reliance on voluntary compliance and regional decision-making contrasted with the Netherlands' more centralized and restrictive measures, reflecting different priorities and public health strategies during the pandemic.

4 Impact of measures on working conditions and health

Investigating the effects of individual Covid-19 measures is challenging due to the multitude of factors influencing employee health during the pandemic. Isolating the impact of a single measure is not feasible. To gain insights into the overall impact of these measures, we describe the working conditions and health of employees across different phases of the pandemic. Additionally, we present the results of a comprehensive literature review to further elucidate the impact. The results presented below have been previously described in Dutch reports. These reports are referenced in the text.

4.1 Working conditions and health of Dutch workers during the pandemic

4.1.1 On-site workers

Physical workload

The impact of Covid-19 measures on the physical workload was assessed among on-site workers. Approximately 17% of the on-site-workers reported an increase in physical workload due to measures taken during the pandemic (Table 4.1). The experienced physical workload during the pandemic was much higher among on-site workers working exclusively on-site (20%) compared to those who also worked remotely (6%) Notably, nearly one-third of healthcare workers (31%) indicated that the pandemic had made their work more physically demanding.

Psychosocial risks

The proportion of on-site workers experiencing high-strain jobs (characterized by high job demands and low autonomy) decreased at the onset of the pandemic compared to pre-pandemic levels. However, by the end of the pandemic, this proportion had returned to approximately the same level as before the pandemic. Also, the percentage of on-site workers experiencing high emotional demands at the end of 2021 was approximately the same as the pre-pandemic level. Social support from management as well as from colleagues remains high for on-site workers. During the pandemic, on-site workers experienced significantly less unacceptable behavior from both external parties and colleagues compared to the pre-pandemic period.

Table 4.1 Psychosocial risks of on-site workers.

	Wave 1		Wave 2		Wave 3		Wave 4	
	2019[a]	Mid 2020	2019[a]	End 2020	2019[a]	Early 2021	2019[a]	End 2021
High strain job (high demands, low autonomy)	19.6%Δ	17.3%∇	19.6%Δ	18.3%	19.2%Δ	16.9%∇	19.3%	19.4%
High emotional demands	13.4%Δ	10.6%∇	13.6%Δ	11.7%∇	13.2%Δ	9.8%∇	12.5%	11.9%
Social Support supervisors	85.0%∇	86.5%Δ	85.2%	86.4%	86.2%	87.5%	86.0%	87.2%
Social support colleagues	97.0%	96.9%	97.3%	97.1%	97.4%∇	98.0%Δ	97.6%	97.1%
External unacceptable behaviour	35.6%	--	38.0%▲	28.1%▼	36.8%▲	26.2%▼	35.4%Δ	27.1%∇
Internal unacceptable behaviour	22.5%	--	22.0%Δ	14.5%∇	21.7%Δ	14.7%∇	21.7%Δ	14.2%∇

Source: TNO (Oude Hengel et al., 2022) ▲ and ▼: p<0.05, significantly high (low) percentages and/or means (two-sided) within one wave, and Cohen's d is at least 0.20, Δ and ∇, p<0.05, significantly high (low) percentages and/or means within one wave and Cohen's d is less than 0.20. [a] The percentages of the NEA 2019 may differ because only participants who completed the respective measurement were selected. – Unacceptable behaviour was not measured in the first wave.

Health

The percentage of on-site workers with good self-perceived health was higher during the first period of pandemic compared to the pre-pandemic period but returned to almost pre-pandemic levels at the end of 2021. The percentage of on-site workers who were emotionally exhausted decreased during the pandemic but increased by the end of the pandemic to a level higher than the pre-pandemic period. The percentage of on-site workers with Repetitive Strain Injury (RSI) complaints decreased during the pandemic and remained lower at the end of 2021 compared to pre-pandemic levels.

Table 4.2 Health of on-site workers.

	Wave 1		Wave 2		Wave 3		Wave 4	
	2019[a]	Mid 2020	2019[a]	End 2020	2019[a]	Early 2021	2019[a]	End 2021
Self-perceived Health (good/very good)	78.9%∇	83.2%Δ	78.8%∇	82.9%Δ	79.1%∇	85.0%Δ	79.1%∇	80.9%Δ
Emotional exhaustion	17.2%	16.8%	17.0%Δ	15.6%∇	16.6%Δ	15.1%∇	17.1%∇	18.7%Δ
RSI (Complaints of the neck, shoulder, arm/elbows, and/or wrists/hands)	42.6%Δ	36.5%∇	42.5%Δ	36.4%∇	42.8%Δ	36.1%∇	42.2%Δ	36.3%∇

Source: TNO (Oude Hengel et al., 2022) Δ and ∇, p<0.05, significantly high (low) percentages and/or means within one wave and Cohen's d is less than 0.20. [a] The percentages of the NEA 2019 may differ because only participants who completed the respective measurement were selected. --not measured.

4.1.2 Remote workers

Physical risks

Remote workers spent more working time behind their screen during the pandemic, almost 8 hours day. The number of hours of screen work was higher compared to 2019, mainly because meetings were organized digitally, and workers took fewer rest breaks. Consequently, the percentage of home workers with regular repetitive movements increased as well as sedentary behavior during working time. Workers spend approximately 7 hours per working day sitting behind their desk.

Table 4.3 Physical risks of remote workers.

	Wave 1		Wave 2		Wave 3		Wave 4	
	2019[a]	Mid 2020	2019[a]	End 2020	2019[a]	Mid 2020	2019[a]	End 2020
Number of hours of screen work	6.12▼	7.84▲	6.24▼	7.86▲	6.17▼	7.85▲	6.19▼	7.85▲
Repetitive movements (regularly)	19.3%▼	36.2%▲	19.6%▼	36.7%▲	19.1%▼	37.8%▲	19.7%▼	32.2%▲
Sitting during work (hours per day)	6.52▼	7.10▲	6.68	--	6.60▼	7.23▲	6.63▼	7.09▲

Source: TNO (Oude Hengel et al., 2022▲ and ▼: $p<0.05$, significantly high (low) percentages and/or means (two-sided) within one wave, and Cohen's d is at least 0.20. [a] The percentages of the NEA 2019 may differ because only participants who completed the respective measurement were selected. --not measured.

Workspaces

During the pandemic, the percentage of remote workers with a proper workspace—comprising a good desk, an ergonomic chair, a separate monitor, and a mouse—increased. By the end of 2021, a slight majority of remote workers (53%) had access to a proper workspace.

Table 4.4 Configuration of remote workers' workspaces.

Configuration of workspaces	Mid 2020	End 2020	Early 2021	End 2021
All resources (desk, chair, computer screen, mouse)	33.2%	39.3%	46.9%	52.5%
Proper desk				
· No	32.7%	30.7%	25.7%	23.6%
· yes, already present	49.4%	44.2%	43.4%	37.5%
· Yes, self arranged	16.1%	21.9%	24.2%	29.2%
· Yes, provided by employer	1.8%	3.2%	6.6%	9.8%
Proper chair				
· No	53.6%	46.4%	39.0%	34.6%
· yes, already present	29.5%	25.2%	24.5%	23.3%
· Yes, self arranged	8.8%	14.2%	16.3%	17.8%
· Yes, provided by employer	8.2%	14.2%	20.2%	24.2%
External computer screen				
· No	37.4%	32.5%	25.8%	22.9%
· yes, already present	32.4%	26.5%	26.6%	25.1%
· Yes, self arranged	12.1%	16.5%	16.1%	19.6%
· Yes, provided by employer	18.1%	24.6%	31.4%	32.4%
External mouse				
· No	14.0%	12.5%	11.1%	9.0%
· yes, already present	52.3%	45.4%	42.6%	38.1%
· Yes, self arranged	13.4%	16.9%	16.2%	18.6%
· Yes, provided by employer	20.3%	25.2%	30.0%	34.3%

Source: TNO (Oude Hengel et al., 2022).

Psychosocial risks

The percentage of remote workers with high-strain jobs (high demands and low autonomy) did not change during the pandemic, compared to pre-pandemic levels. Job strain did not change because both autonomy and job demands showed a similar reduction at all waves. The percentage of remote workers experiencing high emotional demands decreased during the first period of the pandemic but returned to pre-pandemic levels at the end of 2021. Social support from both supervisors and colleagues remained consistently high throughout the pandemic. The percentage of remote workers experiencing unacceptable behavior, from both external sources and colleagues, was significantly lower during the pandemic compared to the pre-pandemic period.

Table 4.5 Psychosocial risks of remote workers.

	Mid 2020		End 2020		Early 2021		End 2021	
	2019[a]	Wave 1	2019[a]	Wave 2	2019[a]	Wave 1	2019[a]	Wave 2
High strain job (high demands, low autonomy)	10.3%	10.4%	9.4%	10.3%	9.9%	9.5%	8.9%	8.9%
High emotional demands	10.1%Δ	7.9%∇	9.9%Δ	7.7%∇	10.6%Δ	8.1%∇	9.4%	9.1%
Social Support supervisors	88.6%∇	90.1%Δ	89.5%	90.0%	89.8%	90.4%	89.5%	90.3%
Social support colleagues	98.1%	98.0%	98.0%	98.2%	97.7%	98.1%	98.5%	98.0%
External unacceptable behaviour	20.8%	--	20.8%▲	9.3%▼	21.7%▲	12.3%▼	21.5%▲	10.9%▼
Internal unacceptable behaviour	20.3%	--	19.9%▲	8.6%▼	20.0%▲	10.2%▼	20.8%▲	9.9%▼

Source: TNO (Oude Hengel et al., 2022▲ and ▼: p<0.05, significantly high (low) percentages and/or means (two-sided) within one wave, and Cohen's d is at least 0.20, Δ and ∇, p<0.05, significantly high (low) percentages and/or means within one wave and Cohen's d is less than 0.20. [a] The percentages of the NEA 2019 may differ because only participants who completed the respective measurement were selected. --not measured.

Health

More than 80% of the remote workers reported good self-health, slightly higher than in 2019, in the first year of the pandemic (wave 1-3) The percentage of remote workers experiencing emotional exhaustion did not change during the pandemic. The percentage of workers with Repetitive Strain Injury slightly decreased during the pandemic. Nearly 15% of remote workers experienced significant loneliness during the pandemic, and this had slightly decreased at the end of 2021.

Table 4.6 Health of remote workers.

	Wave 1		Wave 2		Wave 3		Wave 4	
	2019[a]	Mid 2020	2019[a]	End 2020	2019[a]	Mid 2020	2019[a]	End 2020
Self-perceived health (good/very good)	81.0%∇	83.8%Δ	81.8%∇	85.6%Δ	81.3%∇	84.7%Δ	81.3%	81.6%
Emotional exhaustion	17.4%	17.4%	16.3%	17.0%	16.5%	17.7%	17.3%	16.9%
RSI (complaints of the neck, shoulder, arm/elbows, and/or wrists/hands)	42.2%Δ	35.3%∇	42.3%Δ	38.4%∇	43.0%Δ	39.3%∇	42.3%Δ	37.5%∇
Loneliness (strong)	--	--	--	14.3%	--	14.7%	--	12.5%

Source: TNO (Oude Hengel et al., 2022). Δ and ∇, p<0.05, significantly high (low) percentages and/or means within one wave and Cohen's d is less than 0.20. [a] The percentages of the NEA 2019 may differ because only participants who completed the respective measurement were selected. --not measured.

4.2 Literature review

The tables described in the previous section provide insight into health outcomes of workers in various stages of the pandemic. To gain further insight into the relationship between measures, the working conditions of workers and health outcomes, we conducted an in-depth literature review.

4.2.1 Description of the studies

After applying the selection criteria for the reviews (see paragraph 3.2), we included 32 international peer-reviewed reviews. The vast majority of the reviews focused on the effects of working from home measure during the pandemic (n=25). In addition, six reviews focus partly or entirely on the impact of lockdowns or work-site closure, two on social distancing, one on school closures and one on wearing personal protective equipment. The reviews included a wide variety of work- and health-related outcomes, ranging from musculoskeletal problems, physical inactivity, anxiety and depression, skin problems, to concerns about career prospects and work-life balance. For some outcome measures, differences between men and women were described in the reviews. Below, the main findings of the reviews are outlined under the following three overarching themes: working conditions, physical health and mental health.

Many studies included in the reviews are cross-sectional studies, studies where a measurement took place at one point in time. Therefore, no conclusions can be drawn about the effects of measures on health outcomes. The studies only show possible relationships between measures and outcomes.

4.2.2 Working conditions

The association between Covid-19 measures and working conditions was described in 15 reviews. We have included reviews on flexibility and autonomy, on work-life balance and on sedentary behavior and physical activity.

Working from home and working conditions

Working from home increased flexibility and autonomy (Fadel, 2023; Davila Moran, 2023; De Vincenzi, 2022). An increase in autonomy is also positively related to work-life balance (Shirmohammadi, 2022a; Davila Moran, 2023). Not all employees, however, experience a better work-life balance due to remote work (De Vincenzi, 2022). Research suggests that remote work can also lead to the blurring of boundaries between work and personal life. For example, employees may be more easily distracted by family members at home during the pandemic. Working without distractions is cited as a prerequisite for the positive effects of remote work and is therefore strongly influenced by the home environment (Shirmohammadi, 2022b; Hall, 2023; Liu, 2021).

Remote work had a greater impact on the working conditions of women, especially working mothers (McPhail et al., 2024; Mazzucchelli et al., 2022; Inguaggiato et al. 2024; Vitoria, 2022). Women were more often confronted with a reduction in paid working hours, an increase in unpaid household work, and caregiving responsibilities (Fadda et al., 2022; Mazzucchelli et al., 2022; Vitoria et al., 2022).

The disproportionate distribution of caregiving and household tasks led to negative consequences for both their professional and personal lives.

Research on the relationship between working from home and sedentary behavior also presents mixed results (Hall et al., 2024; Wutschert et al., 2022; Wells et al., 2023). Reviews from the early pandemic period, however, consistently show a clear result: remote working is related to an increase in sedentary behavior and a decrease in physical activity (Di Fusco et al., 2021; Wilms et al., 2022). However, these reviews cover only a brief timeframe, during which additional restrictive measures were also in place.

4.2.3 Physical health

The associations between Covid-19 measures and physical health were described in 12 reviews. We have included reviews on musculoskeletal complaints and 'physical distress' as outcome measure. We also included one study that partly focused on skin problems, headaches, and difficulty breathing in relation to wearing personal protective equipment among others.

Working from home and musculoskeletal complaints

The reviews show mixed results on the associations between working from home and musculoskeletal complaints. For example, the umbrella review (a review of reviews) by Hall et al. (2024) indicates that both positive and negative relationships were found between working from home and the amount of pain and musculoskeletal complaints among workers, although more negative than positive relationships were observed. The most recent review focusing on the relationship between working from home and musculoskeletal complaints (Nha Hong, 2024) also shows that, in general, remote workers report musculoskeletal complaints more frequently. They also mentioned that the prevalence of neck complaints (23.5-74.3%) and back complaints (27.9-82.2%) varied greatly between studies. These findings are consistent with two earlier reviews from 2023 (Gualano, 2023; Fadel, 2023). The home workplace, particularly the ergonomic quality of the home workplace, has a significant impact on the degree of musculoskeletal complaints (Lyzwinski et al., 2024). Nha Hong et al. (2024) found that the prevalence of musculoskeletal problems was higher in women than in men. This may be related to the combination of caregiving and household tasks with remote work

Protective equipment and physical health

In a systematic review and meta-analysis, Radha et al. (2022) identified several negative effects associated with the use of protective equipment, such as face masks and safety goggles. Three-quarters of the included studies reported skin lesions, with a pooled prevalence of 57%. More than half of the studies also reported sweating (56%), with a pooled prevalence of 75%. Additionally, vision problems (33% of the studies; pooled prevalence: 61%), difficulty breathing (31% of the studies; pooled prevalence: 44%), and headaches (37% of the studies; pooled prevalence: 51%) were frequently observed. Other physical health issues included thirst/dry mouth (pooled prevalence: 54%) and fatigue (pooled prevalence: 67%), although these were mentioned in only 19% of the studies. The severity of these physical problems was correlated with the duration of personal protective equipment use. Notably, when the use of personal protective equipment exceeded six hours, the incidence of these problems increased significantly.

4.2.4 Mental Health

Most reviews in the field of mental health focus on the effects of the measure working from home on depression, anxiety, and stress (e.g., Hall, 2023; Ahmed, 2024).

Additionally, reviews on emotional fatigue, burnout, sleep quality, and feelings of isolation are included.

It is important to note that the terminology regarding outcome measures varies, while the underlying questionnaire often measures the same constructs (Hall, 2023). For instance, terms such as ‘mental wellbeing’, ‘psychological wellbeing’, ‘health’, and ‘psychological distress’ are used, but these concepts are all measured with the same questionnaire

Working from home and mental health

Reviews indicate that working from home has both positive and negative effects on mental health, with these effects being largely context-dependent (Hall et al., 2023; Wells et al., 2023). Factors such as age, job type, and home circumstances play a significant role (Hall, 2023) A busy and/or limited home environment, such as a workspace in the bedroom or living room without proper equipment, is associated with poorer mental health (Hall et al., 2023). The duration and intensity of remote work are also important: employees who work from home for extended periods, more days per week, and more hours per day experience higher levels of anxiety, depression, and stress than those who work from home less frequently and for shorter durations. When remote work is a voluntary choice, the effects on mental health are more positive than when it is mandatory (Wells et al., 2023).

In their review, Costin et al. (2023) report that employees working from home during the Covid-19 period experienced increased work pressure. This work pressure, along with a decrease in social interactions, led to an increase in stress and burnout symptoms among employees. These symptoms could be alleviated through instrumental leadership that focused on expectation management and socially supportive information exchanges (Costin, 2023). In the systematic review by Shirmohammadi et al. (2022a), work intensity is also identified as a significant stressor during working from home. Work intensity is described as experiences of increased hours and excessive workload. Single employees in particular, may be vulnerable to experiencing work intensity (Shirmohammadi, 2022a).

Research indicates that the combination of remote work and caregiving or childcare tasks is associated with a deterioration in overall mental health and well-being (Lyzwinsky et al., 2024). Due to the unequal distribution of tasks, exacerbated by the pandemic, women felt more exhausted, nervous, and insecure than men (Fadda et al., 2024), and mothers were more susceptible to burnout than fathers (Mazzucchelli et al., 2024). Women who work from home are at a higher risk of anxiety and depression compared to men as well (Hall et al., 2023).

In order to be able to work from home, the use of Information and Communication Technology (ICT) often is essential. Two systematic reviews (Bahamondes-Rosado et al., 2023; Gualano et al., 2023) indicate that the use of technology can induce stress. The use of ICT can lead to an excessive amount of work-related information (techno-overload). Additionally, the use of technology can create a feeling of being always reachable, regardless of time or location (techno-invasion). Several reviews report that the extent of this stress is strongly influenced by age, gender, the role of the employees, and their workplace (Gualano, 2023; Bahamondes-Rosado, 2023; Chan, 2023; Davila Moran, 2023). For example, older employees were less comfortable with the use of new ICT (Chan et al., 2023). Gualano et al. (2024) found that women experience stress from the use of technology more often than men. Additionally, the workplace and ICT facilities play a significant role (Gualano et al., 2023).

Reviews focusing on the effects of remote work on anxiety and depression present mixed results. A meta-analysis indicates no significant effect of remote work on anxiety and depression (Ahmed et al., 2024).

5 Conclusion and lessons learned

In the first paragraph below, we briefly answer the research questions formulated for this study. The lessons learned, which are more reflective in nature, are described in the second paragraph.

5.1 Conclusions

Research question 1: Covid- 19 measures affecting the working population.

In the Netherlands, multiple measures were implemented during the pandemic, which were tightened and relaxed as the situation and knowledge about Covid-19 evolved. The advice to work from home resulted in a change in the working environment for approximately half the working population overnight, while the other workers continued working onsite mainly due to the nature of their working activities. Other measures that impacted on the working conditions of workers included temporary closure of sectors, the requirement to wear face masks, hygiene measures and gathering limitations. Some measures were specifically aimed at workers or at particular sectors, such as those targeting flow through locations.

Decisions regarding measures were made by the Covid-19 Ministerial Committee (MCC-19), that contained all members of the cabinet. This committee was primarily advised by the Outbreak Management Team (OMT), which consisted mainly of medical experts. At the end of the pandemic, on September 1st, 2022, a second advisory committee was established, the Societal Impact Team (MIT) that focused on the social, societal and economic impact of the Covid-19 measures. Expertise in the field of occupational safety and health was not systematically included in the advisory bodies.

Compared to the United Kingdom, the implementation of measures in companies in the Netherlands was hardly monitored. The role of social partners in developing measures was smaller in the Netherlands than in Sweden.

Research question 2: Support for and compliance with measures.

Support for most measures fluctuated throughout the pandemic, generally aligning with the number of infections, hospitalizations and ICU admissions.

The implementation of measures varied across sectors. Remote working was particularly prevalent in sectors such as financial and business services, ICT and public administration, due to the nature of the work. Dismissals, adjustments of working hours, and mandatory days off were most common in the transport sector, while withdrawal of leave was highest among healthcare workers. Workers in the construction industry most often reported that Covid-19 measures were not implemented at their worksites. A previous study showed that a higher percentage of workers had at least one positive Covid-19 test when companies had implemented none of the Covid-19 measures compared to companies where at least one measure was implemented.

The ability to adhere to measures also varied across sectors according to workers, largely due to the type of work and the necessity of close physical contact. Social distancing from colleagues, patients and students was most challenging in healthcare and education, while maintaining distance from customers was difficult in food- and accommodation services. Consequently, personal protective equipment was most commonly used in these sectors.

Research question 3: Impact of measures on working conditions and health of workers.

Working conditions.

Physical and psychosocial working conditions changed over the pandemic but returned almost all to pre-pandemic levels at the end of the pandemic.

For workers working *on site*, for example, high job strain and emotional job demands decreased only in the first period of the pandemic. Social support from colleagues and supervisors remained high during the pandemic. Remarkable, unacceptable behavior from external parties and colleagues decreased at the onset of the pandemic and remained lower compared to pre-pandemic levels. Notably, nearly one-third of healthcare workers indicated that the pandemic had made their work more physically demanding.

Screen time, repetitive movements and sedentary behaviour notably increased among *remote* workers during the entire pandemic. Emotional job demands for remote workers decreased during the pandemic but returned to pre-pandemic levels at the end. High job strain and social support from colleagues and supervisors remained unchanged for remote workers. Additionally, remote workers consistently experienced high levels of support from colleagues and supervisors.

Health.

At the onset of the pandemic, both on-site and remote workers experienced an improvement in perceived general health. Over time, on-site workers' health reverted to pre-pandemic levels, whereas remote workers continued to report slightly better health. Emotional exhaustion initially decreased in the first period of the pandemic but later returned to pre-pandemic levels for on-site workers, remaining unchanged for remote workers. Both groups saw a reduction in repetitive strain injuries.

This report also synthesizes findings from an international literature review on the impact of pandemic measures on workers' work- and health-related outcomes. The results were generally mixed and varied by context, highlighting a significant gap in high-quality longitudinal research.

5.2 Lessons learned

The COVID-19 pandemic caught the entire world, including the Netherlands, by surprise. Immediate and impactful measures had to be taken, despite the limited knowledge about the virus, its transmission, and its consequences. "We are navigating with limited visibility," said former Prime Minister Rutte in a press conference.

With the knowledge we have now, a different strategy might have been followed. However, it is important to realize that this knowledge was not available at the beginning of the

pandemic. By reflecting on our experiences, we can learn lessons that will prepare us for any future pandemics.

The government implemented a number of measures to mitigate the negative economic effects that businesses resulting from the Covid-19 restrictions. These measures have not been included in this study. However, it is important to recognize that this context underpins all the findings described in this report.

The previous paragraph already described that a set of measures are taken within and outside the worksite at the same time. This also means that we were not able to study the effects of specific measures, e.g. wearing face masks or working from home, on working conditions and health. This study summarized the evidence of the effect of the entire pandemic on working conditions and health for workers. Based on this knowledge, several lessons learned can be identified.

Lesson 1: By collection more data at the occupational level and linking it to data on infections, the role of work in the spread of the virus becomes more apparent, and vulnerable groups of workers can be identified earlier.

The collected data in the Netherlands, provides a general overview of the impact of Covid-19 measures on working conditions and health and wellbeing of workers. Data collected during the pandemic on the support and compliance of workers with the measures as well as on the impact of the measures on the working conditions and health of workers was limited, fragmented and not shared. The collected data does not allow for conclusions about the role of work environment and its characteristics in the spread of the virus, nor about the extent to which compliance with measures reduced the chances of transmission. This is a significant limitation, especially since half of the workers continued working on site due to the nature of their jobs.

For the future it is advisable to better systematically collect data at the occupational level for example starting a cohort with multiple measurements timed according to governmental measures. Additionally, establishing an infrastructure where data can be shared and linked is recommended.

A robust data infrastructure, where data from various domains, including work, is stored, shared and analyzed in relation to each other, can enhance our understanding of the interplay of factors and will contribute to a better understanding of the spread of the virus in the society. This will help improve the selection of relevant and tailored measures. To ensure that insights can be developed based on data from all domains, this data infrastructure must be accessible to a broad group of experts, potentially spread across different organizations.

With more systematic data collection at the occupational level and direct analyses of these data, it might be possible to detect vulnerable groups earlier and implement targeted measures for these groups. With a more systematic approach, it is also possible to conduct thorough research on the impact of measures, during different peaks of the pandemic. In the United Kingdom, for example the labor inspectorate conducted in-dept research at worksites where an outbreak occurred. Based on the results, tailored infection prevention strategies were developed.

Lesson 2: Involving occupational experts in the advisory teams can ensure better consideration of work in general and vulnerable groups of workers.

Neither the Outbreak Management Team nor the Societal Impact Team included experts in occupational safety and health (such as occupational epidemiologists or occupational health physicians). The SARS-CoV-2 virus posed a risk on the health of workers and although we cannot investigate the effects of individual Covid-19 measures on the health of workers, we can conclude that measures generally had an impact on the work of almost all workers. In some work environments, it was difficult to effectively enforce general government measures, such as social distancing.

Alternative measures necessary to protect employees in these environments were sometimes not implemented immediately but only after some time. By incorporating knowledge about work and working conditions earlier in the decision-making process, the impact of measures on work and workers can be taken into account and more specific measures can be formulated sooner. Therefore, it is recommended to involve expertise on occupational safety and health in both advisory teams.

Lesson 3: Structured knowledge exchange among experts can contribute to a better support of employers

Protecting workers from health risks at work, such as the health risk of the SAR-CoV-2 virus is one of the obligations for employers, as established in the Occupational Health and Safety act. In the Netherlands, there was less oversight regarding the extent and manner in which employers protected their employees from this risk, compared to other European countries, such as the United Kingdom. The Netherlands Labour Authority (Labour Inspectorate) primarily responded to reports of unsafe situations, which were mostly handled over the phone. Due to lack of intensive monitoring of the implementation of preventive measures at the individual workplace level, detailed information is lacking at the job title level, despote significant differences in both the impact of these measures and the risk of SARS-CoV-2 infection across occupations.

Since there is no single 'worksite' variations in protective measures and adherence across workplaces are understandable and appropriate. However, maintaining adherence to safety measures in all workplaces remains essential. Gathering more data on risks for specific groups, as previously noted, would be valuable in assisting employers with effective implementation of these measures. The Labour Authority as well as sector organisations could play a role in this.

A more structured exchange of knowledge among occupational health experts can further strengthen their ability to support employers effectively. Enhanced collaboration between general health and occupational health experts can improve understanding of workplace infection prevention. A more structured collaboration between experts and sector organizations, and employers would facilitate the translation of knowledge into concrete recommendations for prevention of infections, as well as other health risks in workplaces, whether on site or remote.

Lesson 4: Workers, managers and employers were able to adapt quickly to working from home, but knowledge on the long term effects are needed.

The recommendation to work from home likely had a significant impact on many employees in the Netherlands. Overnight, half of the Dutch workforce transitioned to remote work. The robust digital infrastructure in the Netherlands facilitated this swift change.

Both employees and employers in the Netherlands demonstrated the ability to quickly adapt to the new situation. Managing workers who all work from home is challenging for managers. Managing contact with all employees is crucial and requires targeted action from supervisors, which can be time-consuming. Withing the available possibilities (due to restrictive measures) supervisors had to conduct ways to sustain social interaction within their department. During the pandemic the support that workers received from their supervisors as well as from their co-workers remained very high.

Even after the government's recommendation to work from home was lifted at the end of the pandemic, many workers continued to (partly) work from home. Hybrid working, that is partly working from home and partly working in the office, is therefore a consequence of the Covid-19 measures. Hybrid working also requires adjustments. For instance, it is important to carefully consider what face-to-face contact opportunities are necessary for the functioning of a group or department, taking into account the differing needs of various employee groups (e.g., young employees, new hires). After a transition phase, hybrid working now seems to be well established in the Netherlands. However, it remains important to monitor the long-term effects of hybrid working, such as its impact on social cohesion within organizations, differences between employee groups and productivity and creativity.

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Appendices

Appendix 1

Selection criteria and search strategy of the literature review.

Selection Criterion 1: Studies must focus on the effect of the coronavirus pandemic.
(((((TITLE-ABS-KEY (covid) OR TITLE-ABS-KEY ("Covid-19") OR TITLE-ABS-KEY ("Sars-Cov-2"))))
Selection Criterion 2: Studies must focus on describing or testing the effect of coronavirus measures on employees' work and work environment.
AND ((TITLE-ABS-KEY (employment) OR TITLE-ABS-KEY (job) OR TITLE-ABS-KEY (labor) OR TITLE-ABS-KEY (labour) OR TITLE-ABS-KEY (occupation*) OR TITLE-ABS-KEY (employee*) OR TITLE-ABS-KEY (personnel) OR TITLE-ABS-KEY (worker*) OR TITLE-ABS-KEY ("working condition*") OR TITLE-ABS-KEY ("work factor*"))))
Selection Criterion 3: Studies must explicitly describe effects on the health of workers.
AND (((TITLE-ABS-KEY ("physical work demand*") OR TITLE-ABS-KEY ("physical job demand*") OR TITLE-ABS-KEY ("lifting") OR TITLE-ABS-KEY ("awkward posture*") OR TITLE-ABS-KEY ("repetitive movement*") OR TITLE-ABS-KEY ("autonomy") OR TITLE-ABS-KEY ("social support") OR TITLE-ABS-KEY ("work pressure") OR TITLE-ABS-KEY ("psychological job demand") OR TITLE-ABS-KEY ("sexual harassment") OR TITLE-ABS-KEY ("job strain") OR TITLE-ABS-KEY ("effort-reward") OR TITLE-ABS-KEY (overtime) OR TITLE-ABS-KEY (overwork) OR TITLE-ABS-KEY ("work-life"))) OR ((TITLE-ABS-KEY (teleworking) OR TITLE-ABS-KEY (telecommuting) OR TITLE-ABS-KEY ("remote work") OR TITLE-ABS-KEY ("social safety") OR TITLE-ABS-KEY ("well-being") OR TITLE-ABS-KEY ("physical health") OR TITLE-ABS-KEY ("musculoskeletal disorder") OR TITLE-ABS-KEY ("musculoskeletal symptom*") OR TITLE-ABS-KEY ("physical disorder") OR TITLE-ABS-KEY ("burn-out") OR TITLE-ABS-KEY ("psychological health") OR TITLE-ABS-KEY ("mental health") OR TITLE-ABS-KEY ("mental fatigue") OR TITLE-ABS-KEY ("psychological fatigue") OR TITLE-ABS-KEY (anxiety))) OR ((TITLE-ABS-KEY (depression) OR TITLE-ABS-KEY (ptsd) OR TITLE-ABS-KEY ("general health") OR TITLE-ABS-KEY ("self-perceived health") OR TITLE-ABS-KEY (loneliness) OR TITLE-ABS-KEY (happiness) OR TITLE-ABS-KEY ("feel lonely") OR TITLE-ABS-KEY (sickness) OR TITLE-ABS-KEY (absenteeism) OR TITLE-ABS-KEY ("sick leave")))))
Selection criterion 4 : Studies must not involve patient studies.
AND NOT (TITLE-ABS-KEY (patient*))
Selection criterion 5: Studies must be published during or after the corona pandemic.
AND PUBYEAR > 2019 AND PUBYEAR < 2025)
Selection criterion 6: Studies must be reviews
AND (TITLE-ABS-KEY (review))
Selection criterion 7: Studies must be written in English or Dutch.
AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Dutch"))

Appendix 2

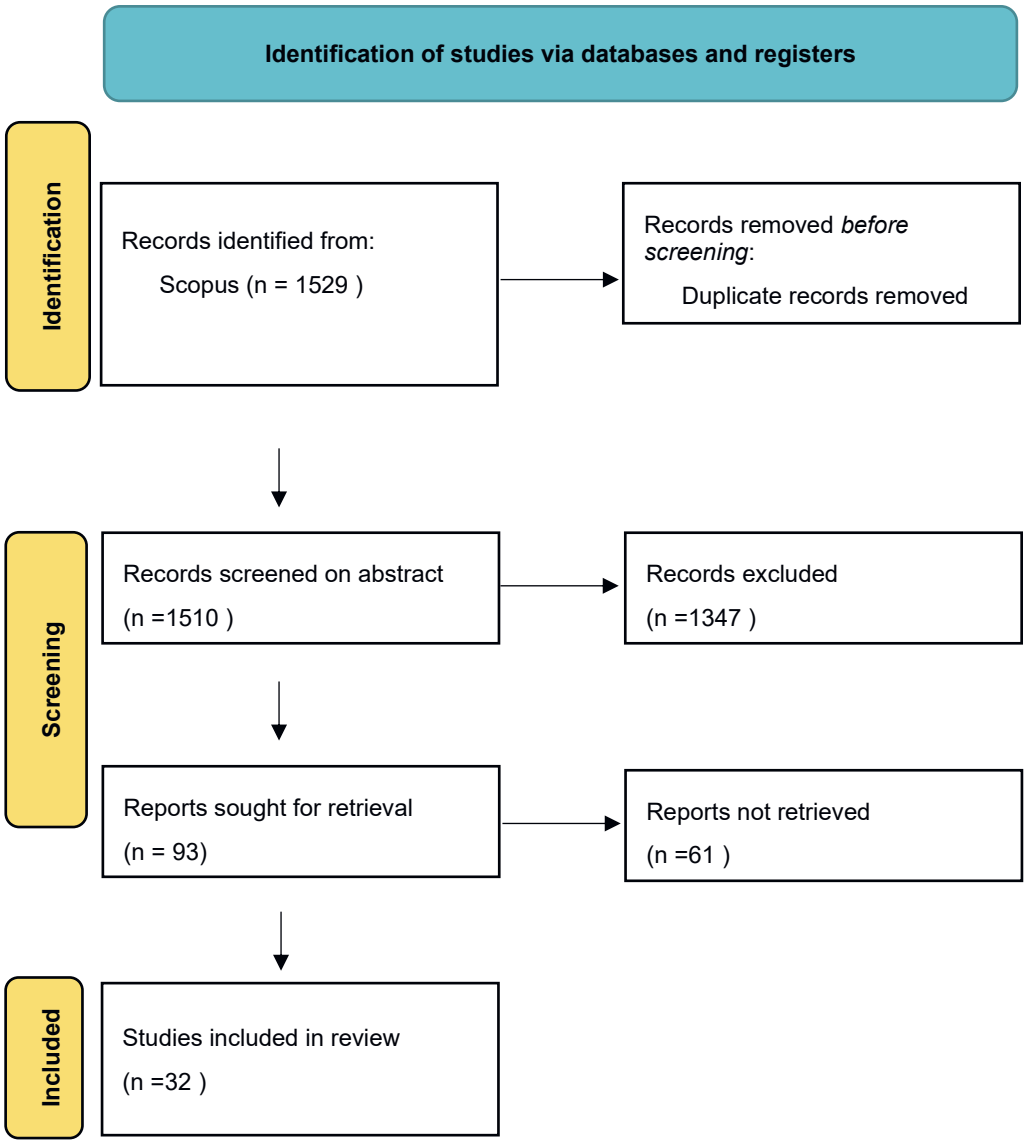

Figure: Literature Search Procedure. Adapted from Page et al. (2021).

Appendix 3

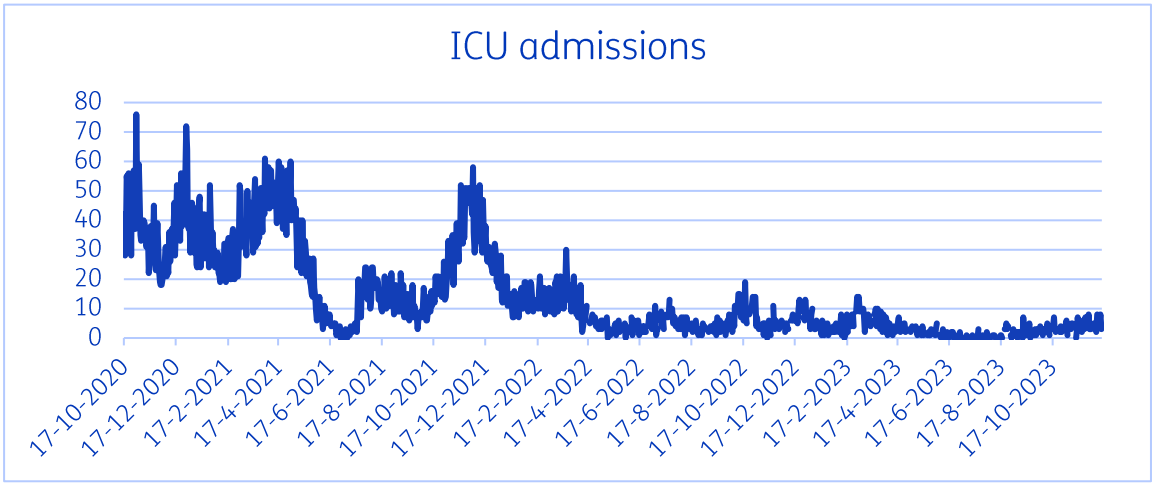

Figure: This graph shows the ICU admissions on the day that Covid-19 patients were admitted on working days. Source: RIVM.

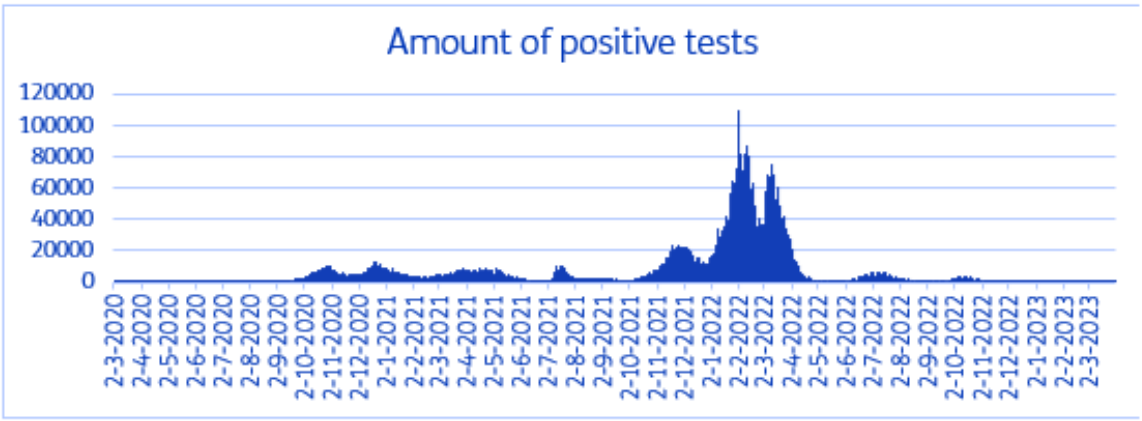

Figure: This graph shows how many people in total received a positive test result that were reported to the RIVM. Source: RIVM.

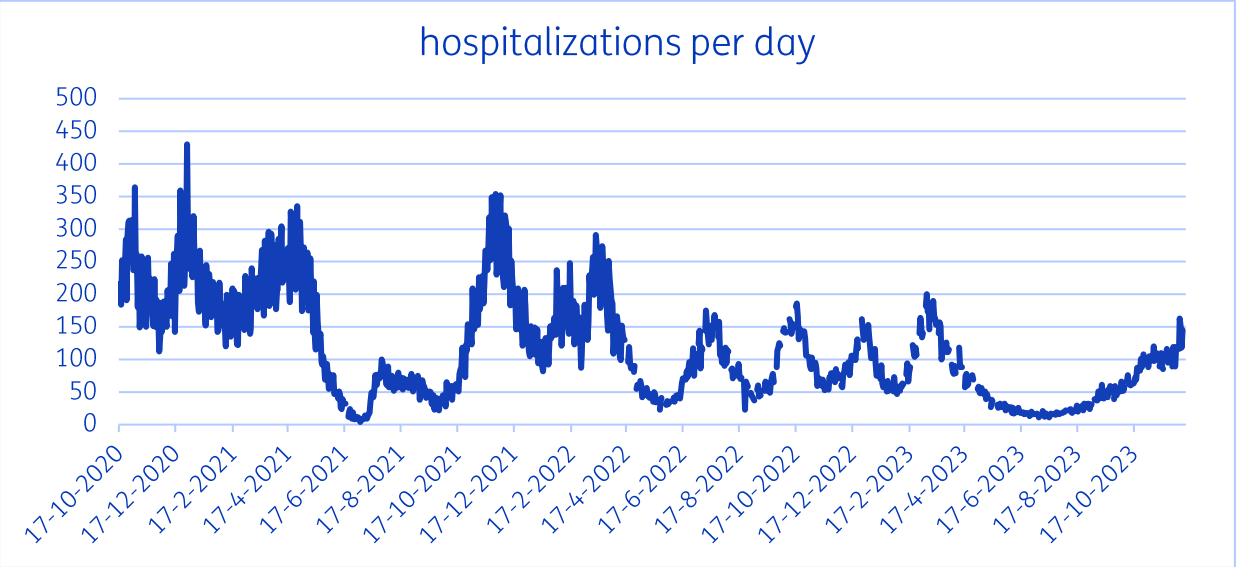

Figure: This graph shows the hospital admissions on the day that Covid-19 patients were admitted on working days. Source: RIVM.

Appendix 4

Specific measures for flow-through locations.

Date	Specific measures
Mar 12, 2020	Public venues like museums and theaters closed to prevent virus spread.
Mar 23, 2020	Social distancing mandated in stores, with solo shopping encouraged; municipalities were authorized to enforce this to limit contacts.
June 1, 2020	Museums and monuments allowed to reopen with restrictions, including time slots and visitor caps, to ensure a safe reopening while maintaining a 1.5-meter distance.
July 1, 2020	Visitor limits lifted, but 1.5-meter distancing remained mandatory, allowing for a step towards "normal" while keeping the virus under control.
Oct 14, 2020	Time slot reservations required at flowthrough locations to reduce infections.
Febr 8, 2021	'Click & collect' allowed, enabling customers to pick up orders at prearranged times, limiting in-store contact.
Mar 3, 2021	In-person shopping by appointment permitted, with a maximum of two customers per floor, allowing for limited safe in-person shopping.
Mar 16, 2021	Expanded shopping by appointment, allowing more customers as part of further easing.
Apr 28, 2021	Additional easing, allowing increased store visits.
May 19, 2021	Libraries, theme parks, and open-air museums reopened as a step towards normalization.
June 5, 2021	Cap of 50 people with fixed seating or 1 person per 10 m^2 in flowthrough locations to manage crowds without lifting the 1.5-meter rule.
Nov 13, 2021	Mandatory closing time from 8 PM to 6 AM for non-essential services to curb infection rates.
Nov 28, 2021	Evening lockdown with 5 PM closing time for flowthrough locations, a max of 1 person per 5 m^2, mandatory masks, and a goal to reduce contacts by 20% to contain the infection surge.
Dec 19, 2021	Full lockdown requiring all stores to close, except for 'click & collect' for non-essential stores, to slow the anticipated Omicron wave.
Jan 15, 2022	Initial easing; stores could reopen until 5 PM with mask requirements, a 1.5-meter distance, and a limit of 1 customer per 5 m^2 to cautiously restart the economy.
Jan 26, 2022	Flowthrough locations allowed to open from 5 AM to 10 PM, with 1.5-meter distancing remaining as a step forward due to high vaccination rates despite rising infections.
Feb 25, 2022	Return to normal pre-Covid closing times, marking a move towards full reopening due to reduced infection risks.

Specific measures for culture, recreation and sports.

Date	Specific measures
Mar 13, 2020	Ban on all events with more than 100 participants to prevent infections and reduce contact points.
Mar 23, 2020	Ban on events with no minimum threshold to further limit contact moments.
June 24, 2020	Events allowed again, observing basic rules to keep the virus under control while moving towards normalcy.
Oct 14, 2020	Events prohibited except for food markets, trade shows, congresses, cinemas, theaters, sports matches, demonstrations, and meetings as per the Public Manifestations Act.
Dec 15, 2020	General ban on all events.
Mar 20, 2021	First Fieldlab events (outdoor festivals using the beta version of the CoronaCheck app) to assess event safety.
Mar 27, 2021	Upscaled Fieldlab event, football match with 5,000 spectators as a further trial.
Apr 14, 2021	Fieldlab cafes open as part of practical testing in the hospitality sector.
Jun 5, 2021	Events with admission testing have no attendee limit; without testing, a max of 50 seated people or 1 person per 10 m^2. Amusement parks and festivals remain closed, while the arts and cultural sector may reopen.
Jun 30, 2021	Events allowed again, expanding openings with safety measures.
Jul 9, 2021	Multi-day events over 24 hours allowed from August 14. For cultural events with admission checks, distancing is no longer required, with up to 2/3 of venue capacity.
Aug 2, 2021	One-day, non-seated events allowed under strict conditions.
Sep 25, 2021	Outdoor festivals, sports events, and seated indoor events allowed at full capacity; non-seated indoor events limited to 75% capacity. Closing time set from midnight to 6 AM, with proof of entry required.
Nov 6, 2021	Proof of entry required for hospitality, flowthrough venues like museums, fairs, and cultural associations like choirs.
Nov 13, 2021	Closing time from 6 PM to 6 AM, except for seated cultural performances (theaters, cinemas). Seating events limited to 1,250 people.
Dec 19, 2021	Events banned, with museums, theaters, cinemas, amusement parks, and zoos closed.
Jan 26, 2022	Events allowed with mandatory proof of entry, mask-wearing, seating, and 1.5-meter distancing. Theaters, museums, cinemas, amusement parks, zoos, and casinos can open from 5 AM to 10 PM.

Specific measures for education.

Date	Specific measures
Mar 13, 2020	Higher education no longer has on-site classes to prevent infection and reduce contact moments.
Mar 16, 2020 to Apr 6, 2020	Schools in primary education, secondary education (vo), and vocational education (mbo) also close (decided on March 15, 2020).
May 11, 2020	Partial reopening of primary education to make life easier for working parents (decided on April 21, 2020).
Jun 2, 2020	Easing of measures in secondary education with restrictions (1.5 meters distance between individuals).
Jun 8, 2020	Primary education fully reopens (press conference on June 3, 2020).
Aug 31, 2020	All schools in primary and secondary education fully reopen.
Oct 14, 2020	In secondary education (VO), vocational education (mbo), and higher education (HO), everyone wears a face mask outside of class.
Dec 15, 2020	Distance learning for primary education (po), secondary education (vo), vocational education (mbo), higher professional education (hbo), university education (wo), and all other educational, training, and educational activities.
Dec 16, 2020	Secondary education exam candidates for 2021 are allowed to continue attending school.
Jan 17, 2021	Primary education remains closed until February 8.
Feb 8, 2021	Primary education reopens.
Mar 1, 2021	Secondary schools reopen for at least one day per week, and vocational education (mbo) for a maximum of one day.
Apr 26, 2021	Students are allowed to attend higher education one day per week, provided self-tests are used (funded by the government) to detect the virus more quickly.
May 31, 2021	1.5 meters distance is no longer required in secondary education, provided self-tests are conducted twice a week.
Aug 30, 2021	At the start of the new academic year, the 1.5-meter rule is lifted in vocational education (mbo), higher professional education (hbo), and universities under strict conditions. Maximum group size of 75 per room. Measures still in effect
Sep 25, 2021	Maximum group size of 75 is lifted for higher education (announced on September 14, 2021).
Nov 13, 2021	Mandatory maximum group size of 75 people in vocational education (mbo), higher professional education (hbo), and universities (announced on November 12, 2021).
Nov 28, 2021	Education remains open. Additional measures: walking routes in schools, face masks, self-testing twice a week for teachers and students, asking parents and children who can come to school alone as much as possible
Dec 1, 2021	Stricter measures in primary education: 1.5 meters distance between adults, face mask requirement for staff, self-testing twice a week, children with mild symptoms stay home, all household members quarantine if infected, staff work from home as much as possible to detect infections more quickly and prevent further spread of the virus.

Date	Specific measures
Dec 20, 2021	Primary schools, special (primary) education schools, and after-school care close (announced on December 14, 2021).
Jan 10, 2022	Reopening of schools in primary and secondary education and after-school care (announced on January 3, 2022).
Jan 10, 2022	Quarantine policy in schools: If 3 students are infected, the entire class must stay home.
Jan 26, 2022	Only children with symptoms or who have tested positive stay home (announced on January 25, 2022).
Feb 18, 2022	Classrooms and lecture halls in higher education may be fully occupied again.

Specific measures for childcare.

Date	Specific measures
Mar 16, 2020	Daycares close, emergency care available for children of essential workers to reduce infections.
May 11, 2020	Daycare reopens, with emergency care still available for healthcare workers to support working parents.
Jun 8, 2020	Daycares fully reopen, with emergency care still for healthcare sector parents.
Dec 15, 2020	Daycares close again, emergency care available for children of essential workers and vulnerable children.
Feb 8, 2021	Daycares and primary schools reopen, but after-school care remains closed.
Apr 19, 2021	After-school care reopens.
Dec 1, 2021	Stricter measures, including 1.5-meter distancing between adults, mask mandates, and quarantine for household members, to prevent virus spread.
Dec 14, 2021	Emergency care available for vulnerable children and children of essential workers, advised only if necessary.
May 11, 2022	Daycare fully reopened.

Specific measures for food and beverage industry.

Date	Specific measures
Mar 15, 2020	All restaurants, bars, sports clubs, saunas, sex clubs, and coffee shops close. Takeaway/delivery remains allowed.
Mar 16, 2020	Coffee shops are allowed to remain open for takeaway service.
Jun 1, 2020	Cafés and restaurants reopen under conditions, coffee shops remain closed.
Aug 6, 2020	Earlier relaxations for hospitality venues are reversed, registration is now mandatory.
Sep 18, 2020	Music must be turned off at midnight, no new guests after 1 a.m., gatherings limited to 50 people.
Sep 29, 2020	Groups limited to 4 people, hospitality closes at 9 p.m., takeaway allowed until 2 a.m., no alcohol sales after 10 p.m.
Oct 14, 2020	All restaurants and bars close, takeaway remains allowed.
Feb 8, 2021	Click & collect becomes available for hospitality establishments.
Apr 28, 2021	Terraces reopen under conditions, max 50 people, registration and reservation required.
May 19, 2021	Terraces can stay open longer.
Jun 5, 2021	Restaurants and bars fully reopen.
Jun 26, 2021	Indoor hospitality operates with 1.5 meters distance, outdoor areas can relax the rule with screens. Health checks, registration, and testing for entry are required.
Jul 9, 2021	1.5 meters distancing and closing time from midnight to 6 a.m. are reintroduced.
Sep 25, 2021	Seating requirement removed, hospitality closes between midnight and 6 a.m., COVID pass required.
Nov 6, 2021	COVID pass becomes mandatory in hospitality, closing time from 8 p.m. to 6 a.m.
Nov 28, 2021	Evening lockdown, hospitality closes from 5 p.m. to 5 a.m.
Dec 19, 2021	Hospitality fully closes, takeaway remains possible.
Jan 26, 2022	Hospitality reopens between 5 a.m. and 10 p.m., COVID pass, seating, masks, and 1.5 meters distancing required.
Feb 18, 2022	Nightlife venues reopen until 1 a.m., no mandatory seating or masks for under 500 visitors.
Feb 25, 2022	No COVID pass or seating required for gatherings under 500 visitors, regular opening hours return.

Specific measures for contact professions.

Date	Specific measures
Mar 23, 2020	Advisory for personal care professions (e.g., hairdressers, nail technicians) to close to protect vulnerable individuals; prohibition on contact professions that could not maintain 1.5 meters distance.
May 11, 2020	Most contact professions allowed to resume operations.
Sep 29, 2020	Introduction of registration requirements for contact professions.
Dec 15, 2020	Prohibition on non-medical contact professions (e.g., hairdressers, tattoo artists, beauticians) reinstated.
Mar 3, 2021	Most contact professions (excluding sex work) allowed to resume, including hairdressers and masseurs.
Dec 19, 2021	All non-medical contact professions ordered to close again.
Jan 15, 2022	Contact professions permitted to receive clients until 5 PM with a mask mandate.
Mar 2022	Contact professions allowed to operate without restrictions.

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