

Work-related musculoskeletal disorders – facts and figures

European Risk Observatory

Methodological report

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Table of contents

List of figures and tables	4
1 Introduction	5
1.1 The need to obtain an overview of facts and figures on MSDs	5
1.2 A methodological review of available data on MSDs	6
1.3 Approach of the review and structure of the report	6
2 A multidimensional model of MSDs	7
2.1 The current model	7
2.2 Recommendations for a revised model	7
3 European survey data on MSDs	9
3.1 EWCS	9
3.2 EHIS	16
3.3 ESENER	21
3.4 LFS ad hoc modules on accidents at work and work-related health problems	26
3.5 Other European surveys	29
3.6 National survey data on MSDs	41
4 European administrative data on MSDs	47
4.1 ESAW	48
4.2 WHO health indicators	52
4.3 EODS	54
4.4 ECHI	54
4.5 National administrative data on MSDs	56
5 Analysis of available data for the building blocks of the model	58
5.1 Prevalence of MSDs	58
5.2 Physical, organisational and psychosocial risk factors	59
5.3 Sociodemographic factors	60
5.4 Social, political and economic environment and occupation	61
5.5 Accidents at work and occupational diseases	61
5.6 Preventive measures	62
5.7 Impact of MSDs	63
5.8 Examining relations between building blocks	64
5.9 Joint analysis of different data sources	64
5.10 New and emerging MSD-related risks: sedentary work	66
6 Findings	67
6.1 Sufficiency of comparable comprehensive data on MSDs	67
6.2 Main indicators for the prevalence and impact of MSDs	67
6.3 Missing MSD indicators	68
6.4 The advantages of joint analysis	68
6.5 Data gaps and comparability	68

Annex 1: Identification of relevant data sources70

List of figures and tables

Figure 1: Revised theoretical framework of work-related MSDs 8

Table 1: EWCS metadata.....9

Table 2: EHIS metadata 17

Table 3: ESENER metadata.....21

Table 4: LFS ad hoc modules related to MSDs metadata26

Table 5: EQLS metadata30

Table 6: FLASH Eurobarometer 398 metadata.....31

Table 7: SHARE metadata 34

Table 8: ESS metadata37

Table 9: EU-SILC metadata 38

Table 10: National surveys on MSDs41

Table 11: ESAW metadata 48

Table 12: WHO HFA/MDB metadata52

Table 13: ECHI metadata54

Table 14: National administrative data sources on MSDs56

Table 15: Characteristics of data sources used for this study (source Panteia 2019).....72

1 Introduction

1.1 The need to obtain an overview of facts and figures on MSDs

In 2015, roughly three out of every five workers across the 28 Member States of the EU (EU-28) reported complaints related to musculoskeletal disorders (MSDs). This illustrates that MSDs remain the most common work-related health problem in the EU. MSDs affect workers in all sectors and occupations and, besides the effects on workers themselves, they lead to high costs to enterprises and society as a whole ⁽¹⁾.

It is in this context that the European Agency for Safety and Health at Work (EU-OSHA) decided to set up the 'OSH overview on MSDs' activity. The specific objectives of this activity were to:

- encourage more and better-targeted policy instruments at EU and national levels by providing a better picture of the prevalence and costs of MSDs in Europe;
- contribute to improving the prevention of MSDs, as well as the management of chronic MSDs, in European workplaces by raising awareness and by identifying and disseminating good practice among national authorities, employers and sector-level organisations in particular;
- stimulate and support measures at national level among policy-makers and occupational safety and health (OSH) intermediaries designed to improve preventive action in the workplace through the identification and sharing of successful initiatives;
- promote greater success in the sustainable reintegration of workers with MSDs by identifying successful schemes and workplace measures;
- identify research priorities and improve understanding of the underlying causes of MSDs through a targeted analysis of research and data.

In this context, a study entitled 'MSDs facts and figures overview: prevalence, costs and demographics of MSDs in Europe' was carried out. The aims of this study were to:

- provide quantitative information on the prevalence and costs of MSDs;
- improve understanding of the underlying causes of MSDs through a targeted analysis of data;
- contribute to the earlier identification of emerging trends and risks at work with the aim of enabling more timely and effective interventions.

The results of this project are presented in the report ['Work-related musculoskeletal disorders: Prevalence, costs and demographics in the EU'](#) ⁽²⁾. For ease of reference, this study will be referred to as the overview report. The results are based on descriptive and more advanced statistical analysis of various surveys carried out at the European level, and administrative data relating to MSDs collected at EU level. Where relevant these results are complemented and enriched with data from national sources from Austria, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Spain and Sweden. For each of these Member States a national report ⁽³⁾ was produced. In addition, a synthesis report of these 10 national reports was produced ⁽⁴⁾.

Other studies were carried out in the framework of this 'OSH overview on MSDs' activity, including:

- 'Review of research, policy and practice on prevention of work-related musculoskeletal disorders (MSDs)';

⁽¹⁾ EU-OSHA (European Agency for Safety and Health at Work), *Work-related musculoskeletal disorders: Prevalence, costs and demographics in the EU*, 2019. Available at: <https://osha.europa.eu/en/publications/msds-facts-and-figures-overview-prevalence-costs-and-demographics-msds-europe/view>

⁽²⁾ Report available at: <https://osha.europa.eu/en/publications/msds-facts-and-figures-overview-prevalence-costs-and-demographics-msds-europe/view>

⁽³⁾ National reports are available at: https://osha.europa.eu/en/publications/l_en/type_4859?text&sort_by=field_publication_date9

⁽⁴⁾ Synthesis report of the 10 Member States reports available at: <https://osha.europa.eu/en/publications/work-related-musculoskeletal-disorders-facts-and-figures-synthesis-report-10-eu-member/view>

- 'Working with chronic MSDs';
- 'Workforce diversity and MSDs';
- 'MSDs associated with prolonged static postures (sitting/standing) and lower limb disorders'.

The reports related to these studies are available at <https://osha.europa.eu/en/research-work-related-msds>

1.2 A methodological review of available data on MSDs

One of the tasks of the project briefly introduced above was to conduct a methodological review. The objectives of the methodological review were to:

- contribute to the identification of new MSD-related sources of information (for the OSH sector), data gaps and needs in terms of data/knowledge to be addressed;
- provide data to support the preparation of the forthcoming Europe-wide campaign on the prevention of work-related MSDs (Healthy Workplaces Campaign 2020-22).

Based on these objectives, the methodological review set out to answer the following research questions:

- Are there sufficient and up-to-date comprehensive data on MSDs that are comparable across all Member States? If this is not the case, what are the main shortcomings and how could the situation be overcome?
- What are the main indicators or questions (or kinds of questions) used for measuring the prevalence and impact of MSDs in general and for more specific disorders such as upper limb, lower limb, etc.? Can a typology be established (throughout surveys/administrative datasets/countries)? If this is the case, what is the added value/are the limitations of these different types of indicators/questions (compared with each other)?
- What are the missing questions/indicators (if any) that should or could be developed to better measure or make (more) visible MSDs in general or a more specific MSD issue/problem/trend (for instance, lower limb disorders or sitting as a MSD risk)? Would it be possible to recommend the generalisation of one specific indicator/question used in one specific country/survey to other countries/surveys?
- What can we learn about MSDs from joint analysis of datasets such as the European Survey of Enterprises on New and Emerging Risks (ESENER), EU Labour Force Survey (LFS) and European Working Conditions Survey (EWCS) that it is not possible to learn by analysing the individual datasets in isolation?
- What can be learned from the data analyses carried out in terms of data gaps, comparability, etc.?

This methodological report is based on an analysis of the quality, comparability, coverage and reliability of the existing data on MSDs and the identification of shortcomings or gaps in terms of knowledge and information as experienced during the execution of the project, taking into account the hands-on experience of the other project tasks. The findings from this analysis are too detailed and technical to be included in the general report mentioned above, but can be of use to specific experts to further improve data on MSDs and to repeat and improve the current study in due course; hence, they have been described in this separate report.

1.3 Approach of the review and structure of the report

The review is based on the experience of processing and analysing the data during the other activities undertaken in the different stages of this project. During each step in the project, team members wrote down relevant issues and findings concerning the methodology. The collected input has been further structured and analysed in accordance with the logical set-up of the different project stages.

The identification of relevant data sources started with a multidimensional model on causes, indicators and consequences of MSDs. Chapter 2 of this methodological report therefore presents the multidimensional model of MSDs that served as a framework for the overview report. During the

finalisation of the overview report, several suggestions emerged on how this framework could be improved. These suggestions are included in this chapter.

Chapters 3 and 4 of this methodological report focus on the different datasets that have been analysed for this study, with Chapter 3 describing survey data and Chapter 4 describing administrative data. Each of these chapters discusses European data sources that have been used to prepare tables and graphs for the overview report, as well as other European data sources that have not been used because they turned out to be less relevant. For each of the data sources used for the overview report, the following aspects are discussed:

- main characteristics;
- quality (in terms of size, representativeness, reliability and comparability);
- findings from the descriptive and exploratory analyses carried out for the overview report (lessons learned).

For the data sources that have not been used for the overview report, the reason for not using them is explained.

The overview report is based not only on information from Europe-wide surveys, but also on country-specific information collected for 10 Member States. One of the objectives of these country reports was to provide available national data regarding MSDs that may enrich/complement the identified Europe-wide surveys. Chapters 3 and 4 end with an overview of the national surveys and administrative data sources that have been identified for these 10 countries.

In Chapter 5, the available data (as presented in Chapters 3 and 4) are compared with the multidimensional model (as presented in Chapter 2) to identify any shortcomings or gaps in terms of knowledge and information regarding MSDs. In sections 5.1-5.7, the availability of relevant indicators is discussed for each building block of the model. Section 5.8 discusses the possibility of analysing relations between different building blocks of the model (based on the available data). The possibility of joint analysis of different data sources is discussed in section 5.9, and section 5.10 focuses on the availability of data on new and emerging MSD-related risks.

The main findings are summarised in Chapter 6. This chapter is structured in accordance with the research questions.

2 A multidimensional model of MSDs

2.1 The current model

MSDs can be caused by many different (combinations of) factors. These include not only physical factors (whereby mechanical load applied to the musculoskeletal tissues can cause MSDs), but also organisational and psychosocial factors. The extent to which these risk factors occur and affect the musculoskeletal health of workers is related to various contextual dimensions, including the social, political and economic environment, the organisation of the workplace, and also sociodemographic and individual factors. A discussion of this model can be found in Chapter 2 of the overview report.

2.2 Recommendations for a revised model

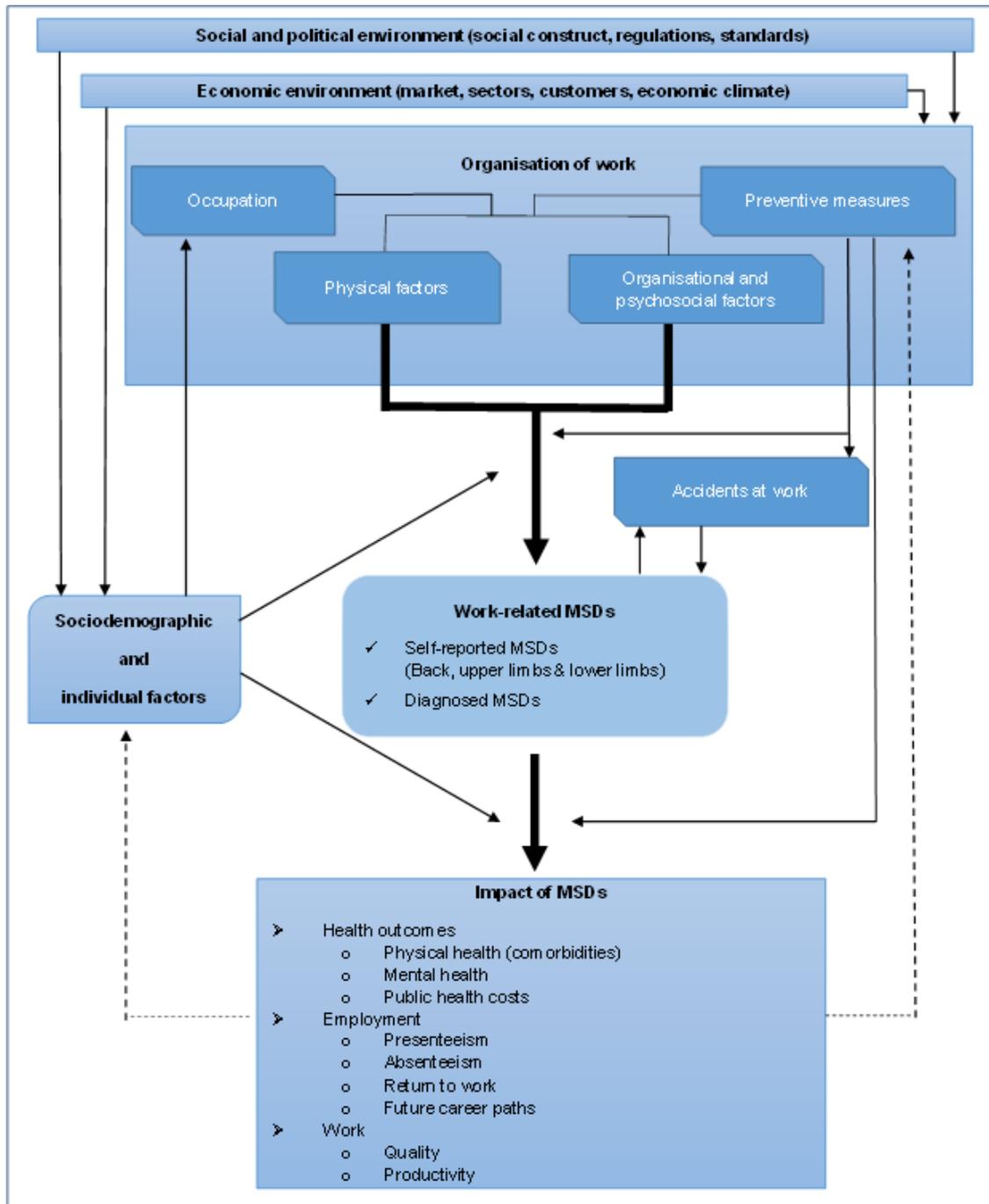
During the finalisation of the overview report, two suggestions emerged on how this framework could be improved. The first suggestion was that the framework should be more specific about the three types of self-reported MSDs that can be distinguished in surveys (MSDs in the back, in the upper limbs and in the lower limbs).

The second suggestion was to include accidents at work as an additional building block in the framework. The relationship between accidents and MSDs is complex, as causality may run both ways: work-related accidents can result in (acute) MSDs, but pre-existing MSDs may also cause work-related accidents. This applies not only to work-related accidents but also to other types of accidents. From a policy perspective it is, however, relevant to distinguish between work-related accidents and other types of accidents: policies aiming to reduce the number of work-related accidents have to target

a different population (enterprises) from policies aiming to reduce the number of non-work-related accidents (individuals).

These suggestions have been incorporated in a revised theoretical framework presented in Figure 1, which can be used in future studies.

Figure 1: Revised theoretical framework of work-related MSDs



Note: theoretical framework developed by Panteia, vhp human performance and IKEI, 2019.

3 European survey data on MSDs

This chapter discusses the European surveys that were examined for the overview report. Sections 3.1-3.4 discuss four Europe-wide surveys that were used for the final overview report: the EWCS, the European Health Interview Survey (EHIS), ESENER and the 2013 LFS ad hoc module (on accidents at work and work-related health problems). For each of these data sources, the main characteristics of the data source (data collection process, available indicators for MSDs and for other relevant topics) and the quality of the dataset (including reliability and comparability between countries and across time) are discussed.

Some of these data sources were used for exploratory analyses. This is especially the case for the sixth wave of the EWCS and, to a lesser extent, the second wave of the EHIS and ESENER. The main findings from these analyses (regarding the possibility of using these data sources for these types of analyses) are also discussed. For the EWCS, a specific recommendation on the use of logistic regressions is made. Recommendations regarding the content of the questionnaires for these surveys are included in Chapter 5, where for each building block of the multidimensional model the coverage of relevant topics across all identified data sources is discussed.

Section 3.5 discusses other European data sources that were also considered for this study, but that were not used for the final overview report. For each of these data sources the main characteristics, the quality of the dataset and the reason for not using it for the overview report are discussed.

The final section of this chapter presents an overview of the national surveys that have been identified in the 10 national studies conducted as part of this project.

3.1 EWCS

3.1.1 Main characteristics

In 1991, Eurofound conducted its first EWCS. Since then, five more waves have been conducted, the last one in 2015. Table 1 summarises the main characteristics of this survey and the variables that may be relevant in the context of MSDs.

Table 1: EWCS metadata

Name of the data source	EWCS — Eurofound
Website	https://www.eurofound.europa.eu/surveys/european-working-conditions-surveys
Period/years covered by the data source	Six waves are available: 1991, and then every 5 years from 1995 to 2015.
Data collection methodology	The EWCS is set up as a repeated cross-sectional study. Within each country, multi-stage stratified random sampling is used to select individuals. These are interviewed using face-to-face interviews. Data are collected at the national level, after which Eurostat collects, checks and combines the national datasets into a single dataset. The datasets for the different waves are integrated into a single longitudinal dataset.

Name of the data source	EWCS — Eurofound
The people interviewed	In each wave a random sample of workers (employees and self-employed) has been interviewed.
Sample size	The number of participating countries increases over time, and so does the number of completed interviews: from 12,800 in 1991 to more than 40,000 in each of the last three waves (2005, 2010 and 2015).
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ age; ▪ gender; ▪ level of education (only for 2015; information not (yet) comparable across countries); ▪ country of birth.
MSD indicators	<p>The surveys include questions that can be used to construct indicators on the prevalence of self-reported MSDs:</p> <ul style="list-style-type: none"> ▪ For the first four waves, questions regarding the presence of work-related MSDs are included. ▪ For waves five and six, questions regarding the presence of MSDs in general are included, for the following three types of MSDs: <ul style="list-style-type: none"> ○ muscular pains in the shoulders, neck and/or upper limbs; ○ muscular pains in the lower limbs (hips, legs, knees, feet, etc.); ○ backache.
Health indicators (comorbidities)	<p>The following question concerning (physical) health is included:</p> <ul style="list-style-type: none"> ▪ Over the last 12 months, did you suffer from any of the following health problems? <ul style="list-style-type: none"> ○ Hearing problems ○ Skin problems ○ Headaches, eyestrain ○ Injury(ies) ○ Anxiety ○ Overall fatigue ○ Difficulties falling asleep ○ Wake up repeatedly during sleep ○ Waking up with a feeling of exhaustion and fatigue ○ Until 2010: stomach ache ○ Until 2010: respiratory difficulties ○ Until 2010: insomnia or general sleep difficulties ○ Until 2005: problems with your vision ○ Until 2005: stress ○ Until 2005: allergies
Physical risk factors	The following questions concerning physical risk factors are included:

Name of the data source	EWCS — Eurofound
	<ul style="list-style-type: none"> ▪ Posture-related issues: does your job involve (on a six-point scale from 'all of the time' to 'almost never'): <ul style="list-style-type: none"> ○ Tiring or painful positions ○ Lifting or moving people ○ Carrying or moving heavy loads ○ Sitting ○ Repetitive hand or arm movements ○ Working with computers: PCs, network, mainframe ○ Only in 2010: standing ○ Only in 2005: standing or walking ○ Only in 2005 and 2010: using internet/email for professional purposes ▪ Job hazards: does your job involve <ul style="list-style-type: none"> ○ Vibrations from hand tools, machinery, etc. ○ Noise so loud that you would have to raise your voice to talk to people ○ High temperatures which make you perspire even when not working ○ Low temperatures whether indoors or outdoors ○ Breathing in smoke, fumes (such as welding or exhaust fumes), powder or dust (such as wood dust or mineral dust), etc. ○ Breathing in vapours such as solvents and thinners ○ Handling or being in skin contact with chemical products or substances ○ Tobacco smoke from other people ○ Handling or being in direct contact with materials which can be infectious, such as waste, bodily fluids, laboratory materials, etc. ○ Until 2005: radiation (X-rays, radioactive radiation, welding light, laser beams) ▪ Does your job involve short repetitive tasks of less than <ul style="list-style-type: none"> ○ 1 minute ○ 10 minutes ▪ Do you think your health or safety is at risk because of your work? ▪ Does your work affect your health, or not?
<p>Organisational and psychosocial risk factors</p>	<p>The following questions concerning organisational and psychosocial risk factors are included:</p> <ul style="list-style-type: none"> ▪ How many hours do you usually work per week in your main paid job? ▪ Besides your main paid job, do you have any other paid job(s)? ▪ Normally, how many times a month do you work <ul style="list-style-type: none"> ○ At night, for at least 2 hours between 10.00 p.m. and 05.00 a.m.? ○ On Sundays ○ On Saturdays ○ More than 10 hours a day ▪ Do you work in shifts? ▪ Do changes to your working time arrangements occur regularly? ▪ Does your job involve <ul style="list-style-type: none"> ○ Working at very high speed ○ Working to tight deadlines

Name of the data source	EWCS — Eurofound
	<ul style="list-style-type: none"> ▪ Generally, does your main paid job involve <ul style="list-style-type: none"> ○ Meeting precise quality standards ○ Assessing yourself the quality of your own work ○ Solving unforeseen problems on your own ○ Monotonous tasks ○ Complex tasks ○ Learning new things ▪ Generally, does your pace of work depend on <ul style="list-style-type: none"> ○ Work done by colleagues ○ Direct demands from people such as customers, passengers, pupils, patients, etc. ○ Numerical production targets or performance targets ○ Automatic speed of a machine or movement of a product ○ The direct control of your boss ▪ Are you able to choose or change <ul style="list-style-type: none"> ○ Your order of tasks ○ Your methods of work ○ Your speed or rate of work ▪ For each of the following statements, please select the response which best describes your work situation (always/most of the time/sometimes/rarely/never) <ul style="list-style-type: none"> ○ Your colleagues help and support you ○ Your manager helps and supports you ○ You are consulted before objectives are set for your work ○ You are involved in improving the work organisation or work processes of your department or organisation ○ You can take a break when you wish ○ You have enough time to get the job done ○ Your job gives you the feeling of work well done ○ You have the feeling of doing useful work ○ You know what is expected of you at work ○ You are treated fairly at your workplace ○ You experience stress in your work ○ You can influence decisions that are important for your work ○ Your job requires that you hide your feelings ▪ To what extent do you agree or disagree with the following statements: Your immediate boss <ul style="list-style-type: none"> ○ Respects you as a person ○ Gives you praise and recognition when you do a good job ○ Is helpful in getting the job done ▪ During the last three years has there been a restructuring or reorganisation at the workplace that has substantially affected your work? ▪ Please indicate for each of the five statements which is the closest to how you have been feeling over the last two weeks. <ul style="list-style-type: none"> ○ I have felt cheerful and in good spirits ○ I have felt calm and relaxed ○ I have felt active and vigorous ○ I woke up feeling fresh and rested ○ My daily life has been filled with things that interest me

Name of the data source	EWCS — Eurofound
Preventive measures	<ul style="list-style-type: none"> ▪ The following statements are about how you feel about your job. For each statement, please tell me how often you feel this way (always/often/sometimes/rarely/never) <ul style="list-style-type: none"> ○ At my work I feel full of energy ○ I am enthusiastic about my job ○ Time flies when I am working ○ I feel exhausted at the end of the working day ○ I doubt the importance of my work ○ In my opinion, I am good at my job ▪ Over the last 12 months, during the course of your work have you been subjected to any of the following? <ul style="list-style-type: none"> ○ Verbal abuse ○ Unwanted sexual attention ○ Threats ○ Humiliating behaviours ▪ And over the last 12 months, during the course of your work have you been subjected to any of the following? <ul style="list-style-type: none"> ○ Physical violence ○ Sexual harassment ○ Bullying/harassment <p>The following questions concerning preventive measures are included:</p> <ul style="list-style-type: none"> ▪ Does your job ever require that you wear personal protective equipment? ▪ Do you always use it when it is required? ▪ Regarding the health and safety risks related to performance of your job, how well informed would you say you are? (very well/well/not very well/not at all well informed) ▪ Does your company or organisation have a health and safety delegate or committee? ▪ Over the past 12 months at work, have you been subjected personally to discrimination linked to disability? (this can be used to determine the share of works with a disability that feel they have been discriminated because of their disability)
Public health costs	No questions included.
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following questions concerning absenteeism are included:</p> <ul style="list-style-type: none"> ▪ Over the past 12 months how many days in total were you absent from work for reasons of health problems? ▪ How many of these days of absence resulted from accidents at work? ▪ How many of these days of absence resulted from health problems caused or made worse by your work (excluding accidents). <p>The following questions concerning return to work (after absenteeism) are included:</p> <ul style="list-style-type: none"> ▪ In case of illness or a health problem which has lasted, or is expected to last, for 6 months or more: <ul style="list-style-type: none"> ○ Has your workplace or work activity been changed to accommodate your illness or health problem?

Name of the data source	EWCS — Eurofound
	<ul style="list-style-type: none"> ○ Would further adaptation in your workplace or work activity be needed to accommodate your illness or health problem? <p>The following questions concerning the future career path are included:</p> <ul style="list-style-type: none"> ▪ Do you think you will be able to do your current job or a similar one: <ul style="list-style-type: none"> ○ Until you are 60 years old? (if less than 56 years old) ○ In five years' time? (if 56 years or older)
Work outcomes (quality and productivity)	No questions included

3.1.2 Quality, reliability and comparability

The data collection methodology is of a sound nature, ensuring a high-quality data collection process. Combined with the large sample size and the population weights that are made available to researchers, this implies that the EWCS can be used to present reliable estimates for the population of workers in EU Member States (5).

The comparability across countries is high: for each wave all participating countries use the same questionnaire and the translation of the master questionnaire into all languages is thoroughly checked.

The comparability across time depends on whether the questions have remained the same over time. Because of changes over time in the questionnaires, not all questions have been included every year, and not all questions have been formulated the same way each year. In particular, the questions on health outcomes have changed considerably, making it impossible to compare the first four waves (1999-2005) with the last two waves. Until 2005 the questions were concerned with work-related health problems. After 2005, the questions were formulated in a more general way (resulting in considerably higher prevalence rates). For example, this is how the question about backache has been formulated over the last three waves:

- 2005: Does your work affect your health, or not? If so, How does it affect your health? Backache (yes or no).
- 2010: Over the last 12 months, did you suffer from any of the following health problems? Backache (yes or no).
- 2015: Over the last 12 months, did you have any of the following health problems? Backache (yes or no).

▪ Possibility of analysing trends

The number of participating countries has increased over time. Statistics for the EU-28 can be obtained from the last three waves (during the fourth and fifth wave, Croatia participated as a candidate country).

The classification schemes of sectors and occupations have changed since the first EWCS was conducted. The current schemes (NACE rev. 2 for sector, ISCO 08 for occupation) are available only for the last two waves. To examine trends over the past 3 years, the previous schemes (NACE rev. 1 for sector, ISCO 88 for occupation) are also available.

⁽⁵⁾ If statistics on specific subpopulations are presented, the reliability may become less, as the numbers of observations for subpopulations are smaller than the number for the population as a whole.

3.1.3 Findings and recommendations

The EWCS is one of the surveys with the most detailed information on self-reported MSDs, health indicators, and physical, organisational and psychosocial risk factors. For this reason it has been used a lot for the overview report and several exploratory analyses have been conducted, including cluster analyses and logistic regressions ⁽⁶⁾.

▪ Cluster analyses: not very informative

If specific combinations of physical, organisational and psychosocial risk factors occur relatively often, it would be relevant to know which employees are exposed to these combinations of risk factors, and to which extent these risk factors reinforce each other by increasing the risk of developing MSDs. Likewise, if specific combinations of health problems occur relatively often, it would be relevant to know if and how these different health problems reinforce each other and how this reinforcing effect could be broken.

For these reasons, two cluster analyses were performed on the EWCS data: a cluster analysis in search of different combinations of (physical and/or organisational and psychosocial) risk factors among workers, and a cluster analysis in search of different combinations of MSDs and comorbidities.

The outcomes of a cluster analysis depend, among other things, on how the cluster analysis has been performed. For the cluster analyses conducted for the overview report, the following remarks are relevant:

- Two-step cluster algorithms have been applied. This was necessary because in some cases the clusters were based on a combination of scale variables, ordinal variables and dichotomous variables.
- The quality of a two-step cluster algorithm depends on the way the data are sorted in the dataset. In the original dataset the observations are sorted by country. To increase the quality, the observations of the EWCS dataset were ordered randomly. Additional results show that the exact cluster solution changes if the observations are ordered differently. This makes it difficult for other researchers to replicate the cluster analyses (because the random ordering of the data is difficult to replicate).
- The two-step cluster algorithm assumes that the variables are independent. Furthermore, each continuous variable is assumed to have a normal (Gaussian) distribution, and each categorical variable is assumed to have a multinomial distribution. It seems fair to assume that these assumptions are not met in the case of the MSD study. Although this may not be a serious problem in the case of exploratory research, it does raise doubts as to the validity of the procedure.
- A common characteristic of a cluster analysis is that the outcomes depend on the variables used for the analysis. A cluster analysis based on a different selection of variables or on a different dataset would be likely to result in a different cluster solution.

Neither of the two cluster analyses based on the EWCS data provided good results. This follows from the scores of the 'silhouette measure of cohesion and separation'. In the case of the two-step cluster algorithm, this measure can be used as an indicator for the goodness of fit of the chosen solution. This indicator ranges from -1 to +1. Positive values indicate that the average distance between cases in a cluster is smaller than the average distance to cases in other clusters, and are thus desirable. According to Finch et al. (2015 (7)), there is no common understanding on how to interpret the values for this measure. Rather than using criteria based on theoretical arguments, criteria on when a silhouette is considered to be good enough are based on the experience of researchers in their own particular field. A generally accepted criterion is that, if the silhouette measure is < 0.2, then the quality of the average silhouette measure across the whole sample is considered poor; a measure between

⁽⁶⁾ More information on these analyses can be found in annexes 2 and 3 of the overview report. Available at: <https://osha.europa.eu/en/publications/msds-facts-and-figures-overview-prevalence-costs-and-demographics-msds-europe/view>

⁽⁷⁾ Finch, C. F., Stephan, K., Wong-Shee, A., Hill, K., Haines, T. P., Clemson, L. and Day, L., 'Identifying clusters of falls-related hospital admissions to inform population targets for prioritising falls prevention programmes', Injury Prevention, 2015, 21(4), pp. 254-259.

0.2 and 0.5 indicates a fair solution and a measure > 0.5 is a good solution. None of the cluster analyses based on the EWCS data resulted in a cluster solution with a silhouette measure of more than 0.5 (a good solution).

The most important conclusion from these analyses may be formulated as follows: if a cluster analysis is applied to the population of all workers, these workers will be grouped based on the number of health problems rather than the nature of their health problems. For a better understanding of combinations of different health problems, future studies might focus on workers reporting several health problems and/or use data sources other than the sixth wave of the EWCS or the second wave of the EHIS.

▪ **Country differences in self-reported MSD prevalence not yet explained**

One of the conclusions from the overview study is that the prevalence rate of MSDs varies considerably between countries. This is not a specific characteristic of the sixth wave of the EWCS dataset: it has also been found for previous waves from the EWCS, and the EHIS shows that the prevalence rates of chronic MSDs also vary considerably between countries. Nevertheless, these large country differences may raise doubts regarding the reliability of the estimated self-reported MSD prevalence rates: perhaps these country differences are due to national differences in the way the data have been collected (the way the sample is selected, the way the interviews are carried out, the translation of the MSD-related questions from the master questionnaire)? These doubts would be less if the country differences could be explained by different country characteristics.

Additional logistic regressions have therefore been estimated to examine to what extent country differences in the prevalence of MSDs can be explained by country differences in sectors, occupations, sociodemographic characteristics of the workforce, prevalence of risk factors and attention of establishments to preventive measures (based on aggregated results from ESENER). As an indicator of the number of country differences, the standard deviation of the estimated dummy variables for all countries in the logistic regression model can be used. Including the explanatory variables mentioned does not reduce the standard deviation of the estimated dummy variables. This leads to the conclusion that these explanatory variables cannot explain the country differences in MSD prevalence rates.

It is recommended that the search for possible determinants of these country differences is continued. One suggestion is to estimate logistic regressions in a multilevel setting, to account for the fact that some explanatory variables are defined at more aggregate levels than other explanatory variables. Other suggestions are to use other data sources (with other information for individual respondents) and to enrich the available data with additional explanatory variables at higher aggregation levels (e.g. gender, educational level, sector, occupation and/or region).

3.2 EHIS

3.2.1 Main characteristics

Between 2006 and 2009, the first EHIS was conducted. A second wave followed between 2013 and 2015. Table 2 summarises the main characteristics of this survey and the variables that may be relevant in the context of MSDs.

Table 2: EHIS metadata

Name of the data source	EHIS — Eurostat
Website	https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey See also: https://ec.europa.eu/eurostat/cache/metadata/en/hlth_det_esms.htm
Period/years covered by the data source	Two waves are available: EHIS 1 between 2006 and 2009 (different years for different Member States) and EHIS 2 between 2013 and 2015. EHIS 3 was carried out in 2019.
Data collection methodology	<p>Various types of sampling frames have been used, including a population census (five countries), population registers (15 countries), dwelling registers (three countries) and other statistical sources (seven countries). Given these sampling frames, all countries made use of probability sampling. More than half of the participating countries applied multi-stage sampling (with different sampling techniques applied within each sampling stage). The remaining 14 countries applied single-stage sampling.</p> <p>The way the data have been collected varies between countries: 12 countries used face-to-face interviews only, two countries used telephone interviews only, two countries used postal questionnaires only and 14 countries used a combination of these modes (and web questionnaires).</p>
The people interviewed	The sampling resulted in a selection of households to be contacted. The number of interviews conducted within a household varied from one respondent to all household members. This resulted in a random sample of people aged 15 years or over living in private households and residing in the territory of each country.
Sample size	<p>The first wave was conducted in 19 European countries. Data were disseminated for 18 countries (AT, BE, BG, CZ, CY, DE, EE, EL, ES, FR, HU, LV, MT, PL, RO, SI, SK and TR). In total, more than 174,000 people were interviewed.</p> <p>The second wave was conducted in all EU Member States and Iceland and Norway. Other countries, for example Lichtenstein, Serbia, Switzerland and Turkey, used at least part of the EHIS wave 2 methodology in national surveys. Data have been gradually disseminated from the third quarter of 2016 onwards. In total, more than 176,000 people were interviewed.</p>
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ gender; ▪ age group; ▪ country; ▪ region (Nomenclature of Territorial Units for Statistics — NUTS: level 1); ▪ degree of urbanisation; ▪ sector (NACE rev.2); ▪ occupation (ISCO 88 for EHIS 1, ISCO 08 for EHIS 2); ▪ self-declared labour status:

Name of the data source	EHIS — Eurostat
	<ul style="list-style-type: none"> ○ carries out a job or profession, including unpaid work for a family business or holding, an apprenticeship or paid traineeship, etc.; ○ unemployed; ○ pupil, student, further training, unpaid work experience; ○ in retirement or early retirement or has given up business; ○ permanently disabled; ○ in compulsory military or community service; ○ fulfilling domestic tasks; ○ other inactive person; ○ missing (don't know, refusal); ▪ highest level of education completed (International Standard Classification of Education — ISCED —1997 for EHIS 1 and ISCED 2011 for EHIS 2).
MSD indicators	<p>The surveys include questions that can be used to construct indicators on the prevalence of self-reported chronic MSDs:</p> <ul style="list-style-type: none"> ▪ Here is a list of chronic diseases or conditions. During the past 12 months, have you had any of the following diseases or conditions? <ul style="list-style-type: none"> ○ A low back disorder or other chronic back defect ○ Neck disorder or other chronic neck defect
Health indicators (comorbidities)	<p>The following questions concerning (physical) health are included:</p> <ul style="list-style-type: none"> ▪ Here is a list of chronic diseases or conditions. During the past 12 months, have you had any of the following diseases or conditions? <ul style="list-style-type: none"> ○ Asthma ○ Chronic bronchitis, chronic obstructive pulmonary disease or emphysema ○ Myocardial infarction (heart attack) ○ Coronary heart disease or angina pectoris ○ High blood pressure ○ A stroke ○ Arthrosis ○ A low back disorder or other chronic back defect ○ Neck disorder or other chronic neck defect ○ Diabetes ○ An allergy, such as rhinitis, eye inflammation, dermatitis, food allergy or other (allergic asthma excluded) ○ Cirrhosis of the liver ○ Urinary incontinence, problems in controlling the bladder ○ Kidney problems ○ Depression ○ General health: very good/good/fair/bad/very bad
Physical risk factors	<p>The following questions concerning physical risk factors are included:</p> <ul style="list-style-type: none"> ▪ Long-standing health problems: yes/o ▪ General activity limitations: yes/no ▪ Occurrence of an accident in the past 12 months: work/at home/during leisure ▪ Intensity of bodily pain during the past 4 weeks: none/very mild/mild/moderate/severe/very severe ▪ How much did pain interfere with your normal work (both outside the home and homework): not at all/a little bit/moderately/quite a bit/extremely

Name of the data source	EHIS — Eurostat
	<ul style="list-style-type: none"> ▪ Physical effort of working tasks (both paid and unpaid work activities included) <ul style="list-style-type: none"> ○ Mostly sitting or standing ○ Mostly walking or tasks of moderate physical effort ○ Mostly heavy labour or physically demanding work ○ Body mass index (weight and length) ○ Sport activities: ○ Number of days in a typical week walking to get to and from places at least 10 minutes continuously ○ Time spent on walking to get to and from places on a typical day ○ Number of days in a typical week bicycling to get to and from places at least 10 minutes continuously ○ Time spent on bicycling to get to and from places on a typical day ○ Number of days in a typical week doing sports, fitness or recreational (leisure) physical activities that cause at least a small increase in breathing or heart rate for at least 10 minutes continuously ○ Time spent on doing sports, fitness or recreational (leisure) physical activities in a typical week ○ Number of days in a typical week doing muscle-strengthening activities ○ Food habits ○ Frequency of eating fruit, excluding juice ○ Number of portions of fruit a day, excluding juice ○ Frequency of eating vegetables or salad, excluding juice and potatoes ○ Number of portions of vegetables or salad, excluding juice and potatoes a day ▪ Smoking: yes, daily/yes, occasionally/not at all ▪ Frequency of exposure to tobacco smoke indoors: never or almost never/less than 1 hour per day/1 hour or more a day ▪ Frequency of consumption of an alcoholic drink of any kind (beer, wine, cider, spirits, cocktails, premixes, liqueurs, homemade alcohol...) in the past 12 months.
Organisational and psychosocial risk factors	<p>The following questions concerning organisational and psychosocial risk factors are included:</p> <ul style="list-style-type: none"> ▪ Mental health: How often bothered by any of the following problems: <ul style="list-style-type: none"> ○ Little interest or pleasure in doing things ○ Feeling down, depressed or hopeless ○ Trouble falling or staying asleep, or sleeping too much ○ Feeling tired or having little energy ○ Poor appetite or overeating ○ Feeling bad about yourself or that you are a failure or have let yourself or your family down ○ Trouble concentrating on things, such as reading the newspaper or watching television ○ Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual
Public health costs	No questions included
Preventive measures	No questions included

Name of the data source	EHIS — Eurostat
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following questions concerning absenteeism are included:</p> <ul style="list-style-type: none"> ▪ Absent from work due to personal health problems in the past 12 months: Yes/no ▪ Number of days of absence from work due to personal health problems in the past 12 months
Work outcomes (quality and productivity)	No questions included

3.2.2 Quality, reliability and comparability

For each individual country, the data collection methodology is of a sound nature, ensuring a high-quality data collection process. The EHIS covers all adult individuals in a country (not just workers). The number of observations is, however, so large that (for most countries) the number of observations on workers is large enough to allow for reliable estimates for the population of workers in EU Member States.

For the first wave, it is not without risks to compare the results across countries, because the participating countries were allowed to adapt the master questionnaire and to use different modes of data collection.

For the second wave, the results are much more comparable between countries and an overall good-quality level of the resulting data and indicators has been achieved. Following implementing of the Regulation on EHIS by the Commission, the same set of variables was collected for all countries for this wave. In 10 countries, the national questionnaires included additional questions to those specified in the Commission regulation.

▪ Possibility of analysing trends

Because of the differences in the national questionnaires used by the countries participating in the first wave, it is difficult to analyse trends. The following indicators are found to be (moderately) comparable over time:

- self-reported chronic morbidity;
- tobacco consumption;
- alcohol consumption;
- functional and activity limitations;
- body mass index;
- injuries from accidents;
- consumption of fruits and vegetables;
- self-perceived health and well-being.

3.2.3 Findings and recommendations

▪ Cluster analysis: not very relevant

The second wave of the EHIS was mainly used to produce several descriptive graphs in the overview report. In addition, a cluster analysis was performed to identify combinations of different chronic health problems that occur together.

Similar to the cluster analysis performed on the EWCS data, a two-step cluster algorithm was used to identify clusters. The critical remarks about using cluster analysis on the EWCS (see section 3.1.3) also apply to the EHIS.

Perhaps more important is the finding that this approach may be less relevant in the context of chronic health issues. The prevalence of the health problems involved is not very high (the highest prevalence rates are found for allergies — 15 % — and chronic back problems — 16 %; all other health problems

are mentioned by 10 % of workers or less). To be precise, 54 % of all workers report no health problems and another 25 % report only one health problem. This means that for almost 80 % of the workforce it is irrelevant to search for common combinations of chronic health issues occurring. For the remaining group, more than half only mention two different chronic health problems.

▪ **EHIS: new source of information for the OSH sector**

One of the objectives of this methodological review is to contribute to the identification of new sources of information (for the OSH sector). The EHIS can be seen as such a new source of information. Although the first wave was conducted more than 10 years ago, this survey has largely been ignored by the OSH sector because it does not focus on workers (and/or the workplace). Nevertheless, although workers are only part of the population targeted by the EHIS, the large scale of this survey ensures that the subpopulation of workers still includes many respondents to the EHIS (the second wave of the EHIS includes more than 12,000 respondents who carry out a job or profession, including unpaid work for a family business or holding, an apprenticeship or paid traineeship).

The EHIS is the only identified survey that includes questions on chronic MSDs. Comparing the prevalence of chronic MSDs to the prevalence of MSDs in general provides relevant information about the differences in the severity of MSD complaints among individuals. The EHIS data can also be used to examine to what extent the prevalence of chronic MSDs is related to various risk factors (as included in the survey) and to what extent chronic MSDs are related to levels of absenteeism.

▪ **Definition of (chronic) MSDs should cover more body regions**

To increase the comparability between the EHIS and other surveys on MSDs, it is recommended that, in future waves, (chronic) MSDs are defined more broadly, that is, not restricted to chronic defects in the back or neck (as is the case in the second wave) but also including chronic defects in the upper limbs and lower limbs.

3.3 ESENER

3.3.1 Main characteristics

Since 2009, EU-OSHA has conducted three waves of ESENER. Table 3 summarises the main characteristics of this survey and the variables that may be relevant in the context of MSDs.

Table 3: ESENER metadata

Name of the data source	ESENER — EU-OSHA
Website	https://osha.europa.eu/en/surveys-and-statistics-osh/esener
Period/years covered by the data source	Starting in 2009, ESENER is conducted once every 5 years. Currently, three waves are available: 2009, 2014 and 2019.
Data collection methodology	<p>For the first wave, the universe of the survey includes all establishments in the countries covered with 10 or more employees, across all sectors of economic activity except agriculture, forestry and fishing (and households and extraterritorial organisations).</p> <p>From the second wave, the universe has been enlarged in two ways:</p> <ul style="list-style-type: none"> ▪ Establishments with 5-10 employees are now also included. ▪ Establishments from the agriculture, forestry and fishing sector are now also included. <p>National samples have been drawn from address registers covering this universe. Existing national address registers are not comparable cross-nationally; therefore, considerable efforts have been made to build samples that provide the necessary</p>

Name of the data source	ESENER — EU-OSHA
	<p>quality and ensure cross-national comparability. From these samples the country samples have been drawn. The country samples have been stratified by size class and sector. In the case of multi-establishment companies, the objective is to interview more than one establishment of that company.</p> <p>Once the samples are drawn, interviews are conducted using computer-assisted telephone interviewing (CATI) or computer-assisted web interviewing (in case CATI is refused/not feasible).</p>
The people interviewed	<p>In the first wave, the objective was to interview two people in each establishment: The highest-ranking manager responsible for health and safety at work.</p> <p>In all organisations where a formal health and safety representative (HSR) of the employees existed at the local level of the chosen establishment, additionally one interview with such a HSR was conducted wherever possible (HSR interview). The questionnaire for this interview differs from the manager questionnaire. Such an interview was obtained for 25 % of all participating establishments.</p> <p>From the second wave, a single person was interviewed in each establishment. This was the individual ‘who knows best’ about safety and health in that specific establishment.</p>
Sample size	<ul style="list-style-type: none"> ▪ In the first wave (2009) more than 28,600 establishments participated, with more than 28,600 completed interviews with managers and more than 7,200 completed interviews with OSH representatives. In total 31 countries participated: the EU-28 plus Norway, Switzerland and Turkey. ▪ The second wave (2014) involved 49,320 interviews and covered 36 countries including all the EU-28 Member States plus Albania, North Macedonia, Iceland, Montenegro, Norway, Serbia, Switzerland and Turkey. ▪ The third wave (2019) involved 45,420 establishments — across all activity sectors and employing at least five people — in the 33 countries covered: the EU-28, as well as Iceland, North Macedonia, Norway, Serbia and Switzerland. The questionnaire was kept largely the same as that in ESENER-2 (2014), allowing for comparisons over time.
Establishment characteristics	<p>The following characteristics of participating establishment are available:</p> <ul style="list-style-type: none"> ▪ sector; ▪ establishment size; ▪ establishment age; ▪ country.
MSD indicators	<p>No questions on the prevalence of MSDs are included.</p>
Health indicators (comorbidities)	<p>No questions on the health of workers are included.</p>
Physical risk factors	<p>The following question concerning physical risk factors is included:</p> <ul style="list-style-type: none"> ▪ Depending on the type of work there are different types of risks and hazards. Please tell me for each of the following risk factors whether it is present or not in your establishment, regardless of whether it is

Name of the data source	ESENER — EU-OSHA
	<p>currently under control and regardless of the number of employees it affects.</p> <ul style="list-style-type: none"> ○ Tiring or painful positions ○ Prolonged sitting ○ Lifting or moving people or heavy loads ○ Repetitive hand or arm movements ○ Heat, cold or draught ○ Risk of accidents with machines or hand tools ○ Increased risk of slips, trips and falls
Organisational and psychosocial risk factors	<p>The following question concerning organisational and psychosocial risk factors is included:</p> <ul style="list-style-type: none"> ▪ Besides these risks, there may also be health risks resulting from the way work is organised, from social relations at work or from the economic situation. Please tell me for each of the following risks whether or not it is present in the establishment? <ul style="list-style-type: none"> ○ Time pressure ○ Poor communication or cooperation within the organisation ○ Employees' lack of influence over their work pace or work processes ○ Job insecurity ○ Long or irregular working hours
Public health costs	No questions included
Preventive measures	<p>The following questions on preventive measures are included:</p> <ul style="list-style-type: none"> ▪ What health and safety services do you use, be it in-house or contracted externally: <ul style="list-style-type: none"> ○ Occupational health doctor ○ Psychologist ○ Expert dealing with the ergonomic design and set-up of workplaces ○ Generalist on health and safety ○ Expert for accident prevention ▪ Does your establishment arrange regular medical examinations to monitor the health of employees (yes/no)? ▪ Does your establishment take any of the following measures for health promotion among employees? <ul style="list-style-type: none"> ○ Raising awareness about healthy nutrition ○ Raising awareness on the prevention of addiction, e.g. to smoking, alcohol or drugs ○ Promotion of sports activities out of working hours ○ Promotion of back exercises, stretching or other physical exercise at work ▪ Are sickness absences routinely analysed with a view to improving the working conditions? (yes/no) ▪ Do team leaders and line managers in your establishment receive any training on how to manage health and safety in their teams? ▪ Does your establishment regularly carry out workplace risk assessments? <ul style="list-style-type: none"> ○ If so, which of the following aspects are routinely evaluated in these workplace risk assessments (safety of machines, equipment and installations/work postures, physical working demands and repetitive movements/exposure to noise, vibrations, heat or cold/supervisor-employee relationships/organisational aspects such as work schedules, breaks or work shifts)

Name of the data source	ESENER — EU-OSHA
	<ul style="list-style-type: none"> ○ If not, why not (hazards and risks are already known anyway/there are no major problems/the procedure is too burdensome/the necessary expertise is lacking) ▪ In your establishment, how important are the following reasons for addressing health and safety? (major reason/minor reason/not a reason at all) <ul style="list-style-type: none"> ○ Fulfilment of legal obligation ○ Meeting expectations from employees or their representatives ○ Maintaining or increasing productivity ○ Maintaining the organisation's reputation ○ Avoiding fines and sanctions from the labour inspectorate. ▪ Turning to musculoskeletal problems such as pain in the back, neck, arms, hands or legs, are any of the following preventive measures in place in your establishment? <ul style="list-style-type: none"> ○ Equipment to help with the lifting or moving of loads or other physically heavy work ○ Rotation of tasks to reduce repetitive movements or physical strain ○ Encouraging regular breaks for people in uncomfortable working or static postures including prolonged sitting ○ Provision of ergonomic equipment, such as specific chairs or desks ▪ On which of the following topics does your establishment provide the employees with training? <ul style="list-style-type: none"> ○ Proper use and adjustment of their working equipment and furniture ○ How to prevent psychosocial risks such as stress or bullying ○ How to lift and move heavy loads or people ▪ For which of the risks — if any — is your establishment lacking information or adequate preventive tools (to deal with them effectively)? <ul style="list-style-type: none"> ○ Tiring or painful positions, including sitting for long periods ○ Lifting or moving people or heavy loads ○ Loud noise ○ Repetitive hand or arm movements ○ Heat, cold or draught ○ Risk of accidents with machines or hand tools ○ Increased risk of slips, trips and falls ○ Time pressure ○ Poor communication or cooperation within the organisation ○ Employees' lack of influence on their work pace or work processes ○ Job insecurity ○ Long or irregular working hours
<p>Employment outcomes (presenteeism, absenteeism, future career paths and return to work)</p>	<p>The following question concerning absenteeism is included:</p> <ul style="list-style-type: none"> ▪ How would you rate the level of absenteeism in your establishment compared with other establishments in the sector? <ul style="list-style-type: none"> ○ Very high ○ Quite high ○ About average ○ Quite low ○ Very low
<p>Work outcomes (quality and productivity)</p>	<p>No questions included</p>

3.3.2 Quality, reliability and comparability

The data collection methodology is of a sound nature, ensuring a high-quality data collection process. Combined with the large sample size and the population weights that are made available to researchers, this implies that ESENER can be used to present reliable estimates for EU Member States.

The ESENER datasets contain two types of weights:

- Establishment-based weights. These can be used to present estimates that are representative for the population of establishments.
- Employee-based weights. These can be used to present estimates that are representative for the population of workers (in the establishments covered by ESENER).

The comparability across countries is high: for each wave all participating countries use the same questionnaire, and the translation of the master questionnaire into all languages is thoroughly checked.

▪ Possibility of analysing trends

The topics covered in the three survey waves are largely the same but, because of reformulation of almost all questions, the results from ESENER-1 (2009) are not directly comparable with those from ESENER-2 (2014) and/or ESENER-3 (2019). In fact, in the development of the ESENER-3 master questionnaire, care was taken to keep a number of key questions from ESENER-2 without any changes in the wording, asking the questions in an identical way across both waves. Survey results based on these trend questions are therefore directly comparable between ESENER-2 and ESENER-3 and allow for an observation of developments over time, thus providing indications on whether national or international campaigns on specific issues (such as the improvement of workplace risk assessments or the raising of awareness of psychosocial risks at work) or changes in the legislation have had an impact.

The effort to ensure comparability over time was not restricted to the master questionnaire (and the national versions) but to the whole methodological approach of the survey, from the sampling design to the weighting.

3.3.3 Findings and recommendations

The ESENER-2 and -3 surveys were used to produce several descriptive graphs in the overview report. In addition, some data from ESENER-2 were aggregated and used to enrich data from the sixth wave of the EWCS (see section 5.9 for more details). Matching two datasets in this way is possible only if both datasets define certain subpopulations in exactly the same way. In the case of the second wave of ESENER and the sixth wave of the EWCS, both include the same indicators for country and sector, and the subpopulations have been defined by these two dimensions.

Both surveys also include establishment size (with the same size class boundaries). This means that data from ESENER can also be aggregated for different combinations of country × establishment size class, or sector × establishment size class. It is not possible to define subpopulations based on region (NUTS) or occupation, as this information is not available in the second wave of ESENER.

Recommendations regarding the questions included in ESENER are included in Chapter 5, where for each building block of the multidimensional model the coverage of relevant topics across all identified data sources is discussed.

3.4 LFS ad hoc modules on accidents at work and work-related health problems

3.4.1 Main characteristics

The LFSs have been conducted for many years. Each year the survey consists of a general part and an ad hoc module. Since 1999, three ad hoc modules have been conducted that include questions about MSDs and work-related health problems (including accidents at work). Table 4 summarises the main characteristics of this survey and the variables that may be relevant in the context of MSDs.

Table 4: LFS ad hoc modules (AHMs) related to MSDs metadata

Name of the data source	EU LFS AHMs — Eurostat
Website	https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey
Period/years covered by the data source	Three waves: 1999 (named 'Accidents at work and occupational diseases'), 2007 and 2013 (named 'Accidents at work and work-related health problems').
Data collection methodology	The LFS is a rotating random sample survey of people in private households. Survey data are collected by directly interviewing sampled individuals. The national statistical institutes are responsible for selecting the sample, preparing the questionnaires, conducting the direct interviews among households, and forwarding the results to Eurostat in accordance with the requirements of the regulation.
The people interviewed	<p>The target population consists of all residents aged 15 years or older who are working or have worked (this includes self-employed).</p> <ul style="list-style-type: none"> ▪ For accidents at work and work-related health problems: everybody aged 15 or more and who is working or has worked during the past 12 months. ▪ For exposure to risk factors for physical health and mental well-being: everybody aged 15 or more and who has a job or business (including family workers but excluding conscripts of compulsory military or community services).
Sample size	<p>The LFS AHM 2013 covers all EU-28 Member States (except the Netherlands), as well as Norway, Switzerland and Turkey. Germany did not send microdata but aggregated data according to the dissemination tables published by Eurostat.</p> <p>The LFS AHM 2007 covers all EU-28 Member States, Iceland and Norway (Switzerland and Turkey did not participate).</p> <p>The LFS AHM 1999 covers 12 countries: all EU-15 Member States from 1999 except for Belgium, France and Austria.</p>
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ gender; ▪ age; ▪ sector; ▪ occupation; ▪ educational attainment level;

Name of the data source	EU LFS AHMs — Eurostat
MSD indicators	<p>The surveys include questions that can be used to construct indicators on the prevalence of self-reported MSDs:</p> <ul style="list-style-type: none"> ▪ In case of at least one health problem: type of the most serious health problem caused or made worse by work: <ul style="list-style-type: none"> ○ Bone, joint or muscle problem which mainly affects neck, shoulders, arms or hands ○ Bone, joint or muscle problem which mainly affects hips, knees, legs or feet ○ Bone, joint or muscle problem which mainly affects back
Health indicators (comorbidities)	<p>The following questions concerning (physical) health are included:</p> <ul style="list-style-type: none"> ▪ Physical or mental health problems suffered in the past 12 months that was/were caused or made worse by work (apart from previously recorded accidents at work) <ul style="list-style-type: none"> ○ None ○ One ○ Two or more ▪ In the case of at least one health problem: type of the most serious health problem caused or made worse by work <ul style="list-style-type: none"> ○ Breathing or lung problem ○ Skin problem ○ Hearing problem ○ Stress, depression or anxiety ○ Headache and/or eyestrain ○ Heart disease or attack, or other problems in the circulatory system ○ Infectious disease (virus, bacteria or other type of infection) ○ Stomach, liver, kidney or digestive problem (only in 2013) ○ Other types of health problem
Physical risk factors	<p>The following question concerning physical risk factors is included:</p> <ul style="list-style-type: none"> ▪ Exposure at work to one of the following risk factors that can affect physical health. Identify the factor considered most risky for the physical health: <ul style="list-style-type: none"> ○ None of the list below ○ Yes, mainly to difficult work postures or work movements ○ Yes, mainly to handling of heavy loads ○ Yes, mainly to noise or strong vibration ○ Yes, mainly to chemicals, dust, fumes, smoke or gases ○ Yes, mainly to activities involving strong visual concentration ○ Yes, mainly to risk of accidents
Organisational and psychosocial risk factors	<p>The following question concerning organisational and psychosocial risk factors is included:</p> <ul style="list-style-type: none"> ▪ Exposure at work to one of the following risk factors that can affect mental well-being. Identify the factor considered most risky for the mental well-being <ul style="list-style-type: none"> ○ None of the list below ○ Yes, mainly to severe time pressure or overload of work ○ Yes, mainly to violence or threat of violence

Name of the data source	EU LFS AHMs — Eurostat
	<ul style="list-style-type: none"> ○ Yes, mainly to harassment or bullying
Public health outcomes	No questions included
Preventive measures	No questions included
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following questions concerning ability to work are included:</p> <ul style="list-style-type: none"> ▪ Whether the most serious health problem caused or made worse by work limits the ability to carry out day to day activities either at work or outside work. <ul style="list-style-type: none"> ○ No ○ Yes, to some extent ○ Yes, considerably ▪ Number of calendar days in the 12 months before the reference week the person was unfit to work because of the most serious health problem caused or made worse by work. <ul style="list-style-type: none"> ○ Still off work because has not yet recovered from the health problem, but expects to resume work later ○ Expects never to work again because of this health problem ○ Less than one day or no time off ○ At least one day but less than four days ○ At least four days but less than two weeks ○ At least two weeks but less than one month ○ At least one month but less than three months ○ At least three months but less than six months ○ At least six months but less than nine months ○ Between nine and twelve months
	<p>The following questions concerning absenteeism are included:</p> <ul style="list-style-type: none"> ▪ Accidents at work resulting in injuries occurred in the 12 months before the reference week: <ul style="list-style-type: none"> ○ None ○ One ○ Two or more ▪ In case of an accident: period off work because of the accident: <ul style="list-style-type: none"> ○ Still off work because has not yet recovered from the accident, but expects to resume work later ○ Expects never to work again because of this accident ○ Less than one day or no time off ○ At least one day but less than four days ○ At least four days but less than two weeks ○ At least two weeks but less than one month ○ At least one month but less than three months ○ At least three months but less than six months ○ At least six months but less than nine months ○ Between nine and twelve months
Work outcomes (quality and productivity)	No questions included

3.4.2 Quality, reliability and comparability

The overall quality of the EU LFS statistics is considered to be high. LFSs are considered as reliable sources applying high standards with regard to methodology. Given the large sample size and the population weights that are made available to researchers, the LFS can be used to present reliable estimates for the population of workers in EU Member States ⁽⁸⁾.

Comparability across countries is also high: for each wave all participating countries use the same questionnaire and considerable attention has been paid to the translation process of the questionnaires.

▪ Possibility of analysing trends

The results from the last two ad hoc modules (2007 and 2013) can be compared: both waves cover the EU-28 and most questions are the same (although the formulation of some questions and answer categories have slightly changed).

Comparisons with the results from the first ad hoc module (1999) are very difficult: the first ad hoc module includes only 12 EU-28 countries and the questionnaire from this module differs from the questionnaires from the second and third ad hoc modules in many ways. In particular, the questionnaire from the first ad hoc module does not distinguish between different types of MSDs (no distinction is made between upper limb, lower limb and back problems).

The classification schemes of sectors and occupations have changed over time. The ad hoc module from 2013 includes different classification schemes from the ad hoc module from 2007, which complicates a comparison between these two years by sector or by occupation (the ad hoc module 2013 classifies workers according to NACE rev. 2 and ISCO-08, whereas the ad hoc module 2007 classifies workers according to NACE rev. 1.1 and ISCO-88).

3.4.3 Findings and recommendations

The overview report includes several graphs based on data from the LFS ad hoc modules. All of these graphs are based on aggregated data that are published by Eurostat; the underlying LFS microdata have not been analysed in the framework of this project.

Eurostat publishes several tables with information on self-reported work-related MSDs. These tables show the share of workers reporting work-related MSDs relative to the total number of workers reporting work-related health problems. Eurostat does not publish tables regarding the prevalence rate of work-related MSDs (by MSD type and/or overall). Researchers who want to present such prevalence rates therefore have to analyse the LFS microdata themselves.

Currently, the LFS ad hoc module is the only European survey that includes questions concerning work-related MSDs. It is therefore an important source of information for studies on MSDs. The next LFS ad hoc module on accidents at work and work-related health problems is planned to take place in 2020 ⁽⁹⁾. It is recommended that future studies use the results of this module (together with its predecessor from 2013) to obtain a more recent picture of the prevalence of work-related MSDs for different groups of workers (e.g. by country, sector, occupation, gender, education) and the developments over time, and how MSDs are related to different building blocks of the model presented in Chapter 2.

3.5 Other European surveys

This section discusses several European data sources that were considered for this study, but that were not used for the final overview report.

⁽⁸⁾ If statistics on specific subpopulations are presented, the reliability may become less, as the numbers of observations for subpopulations are smaller than the number for the population as a whole.

⁽⁹⁾ More information about EU LFS ad hoc modules is available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_labour_force_survey_-_ad_hoc_modules

3.5.1 European Quality of Life Survey (EQLS)

Table 5: EQLS metadata

Name of the data source	EQLS — Eurofound
Website	https://www.eurofound.europa.eu/surveys/european-quality-of-life-surveys
Period/years covered by the data source	Four waves are available: 2003, 2007-08, 2011-12 and 2016
Data collection methodology	<p>For each country, the sample was selected using multi-stage stratified random sampling. Depending on the availability of high-quality registers, sampling was carried out using individual-level, household-level and address-level registers or through enumeration using a random-walk approach. Country-level samples were stratified by region and degree of urbanisation. In each stratum, primary sampling units (PSUs) were randomly selected proportional to population size. Subsequently, a random sample of individuals or households was drawn in each PSU. Finally, unless individual-level registers were used, in each household the respondent was randomly selected.</p> <p>Selected respondents were interviewed face to face, using a questionnaire, at their home in the national language(s) of the country. The average duration of the interview was 40 minutes in the EU-28 and 35 minutes in the candidate countries.</p>
The people interviewed	The sample targeted all adults (i.e. country residents aged 18 years or older).
Sample size	<p>The objective is to obtain at least 1,000 interviews for each country, and more for larger countries. In view of the prospective European enlargements and interest from the European Free Trade Association (EFTA) countries, the geographical coverage as well as the sample of the survey differ over time:</p> <ul style="list-style-type: none"> ▪ The first wave in 2003 covered 28 countries and 26,257 respondents. ▪ The second wave in 2007-08 covered 31 countries and 35,634 respondents. ▪ The third wave in 2011-12 covered 34 countries and 43,636 respondents. ▪ The fourth wave in 2016 covered 33 countries and 36,908 respondents.
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ age; ▪ gender; ▪ country.
MSD indicators	The surveys include no questions that can be used to construct indicators on the prevalence of self-reported MSDs
Health indicators (comorbidities)	<p>The following question concerning health is included:</p> <ul style="list-style-type: none"> ▪ Health status <ul style="list-style-type: none"> ○ In general, how is your health' (measured on a five-point scale) ○ Chronic physical or mental health problem, illness or disability (yes or no) ○ If yes: Limitation in daily activities by physical or mental health problem, illness or disability (yes, severely; yes, to some extent; no)
Physical risk factors	<ul style="list-style-type: none"> ▪ The following question concerning physical risk factors is included: <ul style="list-style-type: none"> ○ How much do you agree or disagree with the following statement? (strongly agree, agree, neither agree nor disagree, disagree or strongly disagree) ○ I work in dangerous or unhealthy conditions

Name of the data source	EQLS — Eurofound
Organisational and psychosocial risk factors	<p>The following question concerning organisational and psychosocial risk factors is included:</p> <ul style="list-style-type: none"> ▪ How much do you agree or disagree with the following statements? (strongly agree, agree, neither agree nor disagree, disagree or strongly disagree) <ul style="list-style-type: none"> ○ My work is too demanding and stressful ○ I constantly work to tight deadlines
Public health costs	No questions included
Preventive measures	No questions included
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	No questions included
Work outcomes (quality and productivity)	No questions included

▪ **Comparability, quality and reliability of the data**

For each individual country, the data collection methodology is of a sound nature, ensuring a high-quality data collection process. The EQLS covers all adult individuals in a country (not just workers). The number of observations is, however, so large that (for most countries) the number of observations on workers is large enough to allow for reliable estimates for the population of workers in EU Member States.

The comparability across countries is high: for each wave all participating countries use the same questionnaire, and the translation of the master questionnaire into all languages is thoroughly checked.

Not all questions are available in all waves, which limits the possibilities to identify trends. In particular, the questions about the workplace-related risk factors are available only for the first two waves. For the third and fourth waves, the information concerning the sector in which workers are active is restricted to just two sectors (it is only known if respondents are working in the public or private sector).

The main reason why this data source was not used for the overview study is that it does not contain information on the prevalence of self-reported MSDs. In addition, the amount of information provided on physical, organisational and psychosocial risk factors is very limited.

3.5.2 FLASH Eurobarometer 398

Table 6: FLASH Eurobarometer 398 metadata

Name of the data source	Flash Eurobarometer 398: Working Conditions — European Commission
Website	<p>1) https://data.europa.eu/euodp/data/dataset/S2044_398</p> <p>2) http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_398_pres_en.pdf</p>
Period/years covered by the data source	The fieldwork for this flash survey was conducted in the first week of April 2014.

Name of the data source	Flash Eurobarometer 398: Working Conditions — European Commission
Data collection methodology	The survey was conducted by telephone (fixed-line and mobile phone)
The people interviewed	<p>Interviews were conducted with individuals aged over 15 years and the following populations were targeted:</p> <ul style="list-style-type: none"> a) employees, manual workers, students working, retired working, seeking a job working (not self-employed); b) self-employed, self-employed students, self-employed retired, self-employed seeking a job; c) seeking a job with experience of work; d) students with experience of work; e) retired with experience of work.
Sample size	The survey was conducted among all EU-28 Member States. In total, 26,571 interviews were conducted.
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> • gender; • age; • employment status.
MSD indicators	<p>The survey includes questions that can be used to construct indicators on the prevalence of self-reported MSDs:</p> <ul style="list-style-type: none"> ▪ In the last twelve months, have you experienced any of the following health problems caused or worsened by your work? <ul style="list-style-type: none"> ○ Bone, joint or muscle problems
Health indicators (comorbidities)	<p>The following question concerning health is included:</p> <ul style="list-style-type: none"> ▪ In the last twelve months, have you experienced any of the following health problems caused or worsened by your work? <ul style="list-style-type: none"> ○ Stress, depression or anxiety ○ Another health problem caused by work ○ Accident or injuries ○ Allergies ○ Breathing or lung problems ○ Infectious diseases
Physical risk factors	<p>The following questions concerning physical risk factors is included:</p> <ul style="list-style-type: none"> ▪ In your opinion what are the main health and safety risks that you face in your workplace. <ul style="list-style-type: none"> ○ Exposure to stress ○ Repetitive movements or tiring or painful positions ○ Lifting, carrying or moving loads on a daily basis ○ Risks of accidents or serious injuries ○ Exposure to noise or vibrations ○ Exposure to violence or harassment ○ Exposure to potentially dangerous chemicals ○ Exposure to infectious materials or substances ○ Other
Organisational and psychosocial risk factors	<p>The following questions concerning organisational and psychosocial risk factors are included:</p> <ul style="list-style-type: none"> ▪ Working conditions satisfaction (working hours, interest tasks, workload, autonomy, work-life balance, breaks, holidays, flexibility, etc.) <p>Over the past 12 months, have you ...</p> <ul style="list-style-type: none"> ○ Discussed work-related problems with your colleagues?

Name of the data source	Flash Eurobarometer 398: Working Conditions — European Commission
	<ul style="list-style-type: none"> ○ Been informed about the situation of your company or organisation regarding its financial situation and its future, including possible restructuring? ○ Discussed work-related problems with your manager? ○ Been consulted about changes in the organisation of work and/or working conditions? ○ Discussed work-related problems with employee representatives? <ul style="list-style-type: none"> ● How satisfied are you with health and safety in your current job?
Public health costs	No questions included.
Preventive measures	<p>The following questions concerning preventive measures are included:</p> <ul style="list-style-type: none"> ▪ Have the following measures been put in place at your workplace? (yes, no or don't know) <ul style="list-style-type: none"> ○ Information and/or training provided for staff about health and safety at work ○ Measures to prevent health problems or accidents at work (for example control harmful emissions or safety at machines) ○ Measures for people who are returning to work from long term sickness absence ○ Measures for employing people with chronic diseases or disabilities ○ Measures to adapt the workplace for older people ○ Measures to address new and emerging risks (for example caused by nanotechnologies or biotechnologies) ▪ Over the past 12 months, have you been consulted on health and safety issues at work by your employer or a health and safety representative? (yes or no)
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following question concerning absenteeism is included:</p> <ul style="list-style-type: none"> ▪ During the last twelve months, how many days were you on sick leave due to health problems caused or made worse by your work or due to an accident at work? <ul style="list-style-type: none"> ○ None ○ 1 to 3 days ○ 4 to 15 days ○ 16 days to 2 months ○ 2 to 6 months ○ More than 6 months to 1 year ○ You are currently on sick leave and you are not expected to work again <p>The following question concerning return to work after absenteeism is included:</p> <ul style="list-style-type: none"> ▪ Have the following measures been put in place at your workplace? (yes, no or don't know) <ul style="list-style-type: none"> ○ Measures for people who are returning to work from long term sickness absence ○ Measures for employing people with chronic diseases or disabilities
Work outcomes (quality and productivity)	No questions included

For each individual country, the data collection methodology is of a sound nature, ensuring a high-quality data collection process. Comparability across countries is high; comparability across different waves does not apply for this survey.

Similar to the LFS ad hoc module, the Flash Eurobarometer 398 can be used to determine the prevalence rate of self-reported work-related MSDs. The main reasons why this data source was not used are that it does not distinguish between different types of MSDs and it does not contain many indicators regarding organisational and psychosocial risk factors.

3.5.3 Survey of Health, Ageing and Retirement in Europe (SHARE)

Table 7: SHARE metadata

Name of the data source	SHARE — European Research Infrastructure Consortium (ERIC)
Website	http://www.share-project.org/
Period/years covered by the data source	Seven waves (2004, 2006, 2008, 2010, 2013, 2015, 2017)
Data collection methodology	The SHARE data collection is based on computer-assisted personal interviewing (CAPI). The interviewers conduct face-to-face interviews using a laptop computer on which the CAPI instrument is installed. Personal interviews are necessary for SHARE because they make the execution of physical tests and the collection of biomarkers possible. Exceptions are the drop-off and vignettes questionnaires, which are conducted using paper and pencil, as well as the end-of-life interviews, which can also be conducted by computer-assisted telephone interview (CATI).
The people interviewed	<p>The SHARE target population consists of all people aged 50 years and over at the time of sampling who have their regular domicile in the respective SHARE country. A person is excluded if she or he is incarcerated, hospitalised or out of the country during the entire survey period, is unable to speak the country's language(s) or has moved to an unknown address.</p> <p>In wave 1 all household members born in 1954 or earlier were eligible for an interview. Starting in the second wave, for new countries or refreshment samples, only one selected respondent per household had to be born in 1956 or earlier in wave 2, 1960 or earlier in wave 4, 1962 or earlier in wave 5 and 1964 or earlier in wave 6. In addition, in all waves, current partners living in the same household were interviewed regardless of their age.</p>
Sample size	SHARE covers 27 European countries and Israel. In total (across all six waves) more than 297,000 interviews have been conducted, an average of more than 49,500 interviews per wave.
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ gender; ▪ age; ▪ educational level.
MSD indicators	<p>The surveys include questions that can be used to construct indicators on the prevalence of self-reported MSDs:</p> <ul style="list-style-type: none"> ▪ Which conditions, if any, accounted for the period of ill health or disability that you had as an adult? (back pain, arthritis, including osteoarthritis and rheumatism, osteoporosis) ▪ Doctor told you you had conditions (rheumatoid arthritis, osteoarthritis or other rheumatism)

Name of the data source	SHARE — European Research Infrastructure Consortium (ERIC)
Health indicators (comorbidities)	<p>The following questions concerning health are included:</p> <ul style="list-style-type: none"> ▪ As an adult, how many periods of ill health or disability have you had that lasted for more than a year? (one, two, three, more than three years or all/most of my life) ▪ When did the period of ill health or disability start? (year) ▪ Long-term illness (yes or no) ▪ Limited activities (severely limited, limited but not severely, not limited) ▪ Please tell me whether you have any difficulty doing each of the everyday activities on this card. Exclude any difficulties that you expect to last less than three months. <ul style="list-style-type: none"> ○ Walking 100 metres ○ Sitting for about two hours ○ Getting up from a chair after sitting for long periods ○ Climbing several flights of stairs without resting ○ Climbing one flight of stairs without resting ○ Stooping, kneeling or crouching ○ Reaching or extending your arms above shoulder level ○ Pulling or pushing large objects like a living room chair ○ Lifting or carrying weights over 10 pounds/5 kilos, like a heavy bag of groceries ○ Picking up a small coin from a table ▪ Please tell me if you have any difficulty with these activities because of a physical, mental, emotional or memory problem. Again exclude any difficulties you expect to last less than three months. <ul style="list-style-type: none"> ○ Dressing, including putting on shoes and socks ○ Walking across a room ○ Bathing or showering ○ Eating, such as cutting up your food ○ Getting in or out of bed ○ Using the toilet, including getting up or down ○ Using a map to figure out how to get around in a strange place ○ Preparing a hot meal ○ Shopping for groceries ○ Making telephone calls ○ Taking medications ○ Doing work around the house or garden ○ Managing money, such as paying bills and keeping track of expenses ○ Leaving the house independently and accessing transportation services ○ Doing personal laundry • In the last month, have you been sad or depressed?
Physical risk factors	No questions concerning physical risk factors are included.
Organisational and psychosocial risk factors	No questions concerning organisational and psychosocial risk factors are included.
Public health costs	<p>The following questions concerning costs of healthcare are included:</p> <ul style="list-style-type: none"> • How much did you pay yourself in the last 12 months, that is since , for ambulatory therapies?

Name of the data source	SHARE — European Research Infrastructure Consortium (ERIC)
	<ul style="list-style-type: none"> • During the last twelve months, did you receive in your own home any professional or paid services listed on this card due to a physical, mental, emotional or memory problem? <p>The following questions concerning the impact of illness are included:</p> <ul style="list-style-type: none"> • Experiences at work because of illness period <ul style="list-style-type: none"> ○ Denied promotions ○ Assignment to a task with fewer responsibilities ○ Working on tasks below your qualifications ○ Harassment by your boss or colleagues, pay cuts) • What long-term effects, if any, has injury, ill health or disability had on your life? Consequences of illness period <ul style="list-style-type: none"> ○ Limited my opportunities for paid work ○ Had a negative effect on my family life ○ Had a positive effect on my family life ○ Made my social life more difficult ○ Limited my leisure activities ○ Made me determined to get the best out of life ○ Opened up new opportunities
Preventive measures	<p>The following question on preventive measures is included in the survey:</p> <p>- The state takes adequate measures to protect me from health hazards at the workplace. Would you say your current work health risk is reduced (strongly agree, agree, disagree, strongly disagree)?</p>
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	No questions included.
Work outcomes (quality and productivity)	No questions included.

SHARE was not used for the overview report for the following reasons:

- The survey is restricted to people aged 50 years or more.
- The survey does not include a good indicator for the presence of MSDs occurring during the past year. There is a question on conditions that accounted for a period of ill health or disability, but this question refers to a very long time period and the answer categories for this question are difficult to relate to MSDs.
- The survey does not include questions about physical, organisational and psychosocial risk factors.

3.5.4 European Social Survey (ESS)

Table 8: ESS metadata

Name of the data source	ESS — European Research Infrastructure Consortium (ERIC)
Website	https://www.europeansocialsurvey.org/
Period/years covered by the data source	The ESS has been conducted across Europe every 2 years since its establishment in 2001: 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016 and 2018.
Data collection methodology	<p>Different sampling methods are used in different countries. The basic principles are to ensure the best possible coverage of the target population, to use probability sampling and to provide a prescribed level of statistical precision.</p> <p>A key principle of sampling on the ESS is (among other things) that all countries must aim for a minimum 'effective achieved sample size' of 1,500, or 800 in countries with an ESS population of less than 2 million, after discounting for design effects.</p> <p>Data collection is carried out by face-to-face interviews in every country.</p>
The people interviewed	Individuals aged 15 years and over (no upper age limit) resident within private households in each country, regardless of their nationality, citizenship or language. Individuals are selected using strict random probability methods at every stage.
Sample size	The numbers of countries and participants differ over time: from 42,359 and 22 countries in 2002 to 44,387 and 23 countries in 2018. In total, 37 countries have taken part in at least one round of the ESS since its inception.
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ age; ▪ gender; ▪ level of education (ISCED 1-6); ▪ degree of urbanisation; ▪ work status.
MSD indicators	The surveys include no questions that can be used to construct indicators on the prevalence of self-reported MSDs.
Health indicators (comorbidities)	<p>The following questions concerning health are included:</p> <ul style="list-style-type: none"> ▪ Hampered in daily activities by illness/disability/infirmary/mental problem — yes a lot/yes to some extent/no ▪ How is your health in general? — very good/good/fair/bad/very bad
Physical risk factors	No questions concerning physical risk factors are included.
Organisational and psychosocial risk factors	No questions concerning organisational and psychosocial risk factors are included.
Preventive measures	No questions included.
Employment outcomes (presenteeism, absenteeism, future)	No questions included.

Name of the data source	ESS — European Research Infrastructure Consortium (ERIC)
career paths and return to work)	
Work outcomes (quality and productivity)	No questions included.

The ESS does not include questions concerning MSDs, and questions on physical, organisational and psychosocial risk factors are also not included. Because of this lack of data, the ESS was not used as a data source for the overview report.

3.5.5 European Union Statistics on Income and Living Conditions (EU-SILC)

Table 9: EU-SILC metadata

Name of the data source	EU-SILC — Eurostat
Website	1) https://ec.europa.eu/eurostat/web/income-and-living-conditions/overview 2) https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions
Period/years covered by the data source	Annually since 2003. At the start of the project, 2016 was the most recent year for which microdata were available. The EU-SILC provides information on primary and secondary variables. Primary variables are collected every year; secondary variables are collected every 5 years or less frequently using the so-called ad hoc modules. They include information either at the household or at the personal level about specific topics. The following modules are relevant in the context of the current study: <ul style="list-style-type: none"> ▪ well-being (2013); ▪ health (2017 — microdata not yet available at the start of this study).
Data collection methodology	Five different ways to collect data are allowed: paper-assisted personal interview (PAPI), computer-assisted personal interview (CAPI), computer-assisted telephone interview (CATI), computer-assisted web interview (CAWI) and self-administrated questionnaire. Most countries use mainly PAPI and CAPI; CATI, CAWI and self-administered modes are used by fewer countries.
The people interviewed	The reference population in EU-SILC includes all private households and their current members residing in the territory of the countries at the time of data collection. All household members are surveyed, but only those aged 16 years and older are interviewed. People living in collective households and in institutions are generally excluded from the target population. Some small parts of the national territory amounting to no more than 2 % of the national population and the national territories may be excluded from EU-SILC.
Sample size	The minimum size of the sample of the overall population surveyed each year is: <ul style="list-style-type: none"> ▪ cross-sectional data operation: about 130,000 households and 270,000 people aged 16 years and older are interviewed in EU countries;

Name of the data source	EU-SILC — Eurostat
	<ul style="list-style-type: none"> ▪ longitudinal data operation: about 100,000 households and 200,000 people aged 16 years and older are interviewed in EU countries.
Sociodemographic characteristics	<p>The following sociodemographic characteristics of respondents are available:</p> <ul style="list-style-type: none"> ▪ gender; ▪ age; ▪ employment status; ▪ educational level.
MSD indicators	<p>The surveys include no questions that can be used to construct indicators on the prevalence of self-reported MSDs</p>
Health indicators (comorbidities)	<p>The following questions concerning health are included:</p> <ul style="list-style-type: none"> ▪ How is your health in general? (very good, good, fair, bad or very bad) ▪ Do you have any physical or mental health conditions or illnesses lasting or expected to last for 12 months or more? (yes or no) ▪ Do any of these conditions or illnesses affect you in any of the following areas? <ul style="list-style-type: none"> ○ Vision ○ Hearing ○ Mobility ○ Dexterity ○ Learning or understanding or concentrating ○ Memory ○ Mental health ○ Stamina or breathing or fatigue ○ Socially or behaviourally ▪ Can I just check, do you receive medication or treatment without which your conditions or illnesses (when taken together) would reduce your ability to carry out day-to-day activities? (yes, activities reduced a lot; yes, a little; not at all) ▪ Have you ever had any physical or mental health conditions or illnesses which lasted 12 months or more? (yes or no) ▪ Does your condition or illness/do any of your conditions or illnesses reduce your ability to carry out day-to-day activities? (yes a lot yes a little not at all) ▪ For how long has your ability to carry out day-to-day activities been reduced? (less than six months, between six months and 12 months, 12 months or more) ▪ Did this condition or illness (did these conditions or illnesses, when taken singly or together) reduce your ability to carry out day-to-day activities? If you were receiving medication or treatment, please consider what the situation would have been without medication or treatment. (yes a lot, yes a little not at all, don't know) ▪ Have you ever been diagnosed with any physical or mental health conditions or illnesses which could reduce your ability to carry out day-to-day activities in the future? (yes activities could be reduced a lot, yes a little, not at all)
	<p>No questions concerning physical risk factors are included in the list of primary variables.</p>
Physical risk factors	<p>The health module (included in 2017) includes the following question on physical risk factors: When you are working, which of the following best describes what you do? Would you say ...</p> <ul style="list-style-type: none"> ▪ Mostly sitting ▪ Mostly standing ▪ Mostly walking or tasks of moderate physical effort

Name of the data source	EU-SILC — Eurostat
	<ul style="list-style-type: none"> ▪ Mostly heavy labour or physically demanding work
Organisational and psychosocial risk factors	<p>The following questions concerning organisational and psychosocial risk factors are included:</p> <ul style="list-style-type: none"> ▪ Overall, how satisfied are you with your life nowadays? Where 0 is 'not at all satisfied' and 10 is 'completely satisfied'. ▪ Overall, to what extent do you feel that the things you do in your life are worthwhile? Where 0 is 'not at all worthwhile' and 10 is 'completely worthwhile'. ▪ Overall, how happy did you feel yesterday? Where 0 is 'not at all happy' and 10 is 'completely happy'. ▪ On a scale where 0 is 'not at all anxious' and 10 is 'completely anxious', overall, how anxious did you feel yesterday?
Public health costs	<p>The following questions concerning public health are included:</p> <ul style="list-style-type: none"> ▪ Was there any time in the last 12 months when, in your opinion, you personally needed a medical examination or treatment for a health problem but you did not receive it? (yes or no) ▪ What was the main reason for not receiving the examination or treatment (the most recent time)? <ul style="list-style-type: none"> ○ Could not afford to (too expensive) ○ Waiting list ○ Could not take time because of work, care for children or for others ○ Too far to travel/no means of transportation ○ Fear of doctor/hospitals/examination/treatment ○ Wanted to wait and see if problem got better on its own ○ Didn't know any good doctor or specialist, Other reasons)
Preventive measures	No questions included
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following question concerning limitations in daily activities is included:</p> <ul style="list-style-type: none"> ▪ Some people are restricted in the amount or type of work they can do, because they have an injury, illness or disability. Which of these statements comes closest to your own position at the moment? <ul style="list-style-type: none"> ○ I am unable to work at the moment ○ I am restricted in the amount or type of work I can (could) do ○ I am not restricted in the amount or type of work I can (could) do <p>The following questions concerning presenteeism and absenteeism are included:</p> <ul style="list-style-type: none"> ▪ How long have you been unable to work because of this injury/illness/disability? (28 weeks or less, over 28 weeks, up to 1 year, more than 1 year) ▪ If restricted in the amount or type of work: How many hours a week (could you/are you able to) work? (less than 16 hours a week, 16 but less than 24 hours a week, 24 but less than 30 hours a week, 30 hours a week or more) ▪ Have you been away from work for more than the last 3 working days? ▪ What is the reason for your absence? <ul style="list-style-type: none"> ○ Pattern of shifts ○ Maternity leave ○ Illness/accident ○ Paternity leave ○ Holiday ○ Compassionate leave

Name of the data source	EU-SILC — Eurostat
	<ul style="list-style-type: none"> ○ Strike ○ Parental leave ○ Laid off ○ Other — code and explain
	<ul style="list-style-type: none"> ▪ How many weeks in all have you been away during this spell of absence?
Work outcomes (quality and productivity)	No questions included

The primary variables of the EU-SILC surveys do not include questions concerning MSDs or physical risk factors, and there are very few questions on psychosocial risk factors. Because of this lack of data, the EU-SILC surveys have not been used for the overview report.

The 2017 ad hoc module on health includes a question about the extent to which the working conditions of workers include sitting, standing, walking or physically more demanding work. This question presents a good alternative to measuring the prevalence of (prolonged) sitting and standing (considered to be new and emerging risks). These data were not available for the current overview report, but future studies may examine the prevalence of the different answer categories (in general and by gender, age and educational level) and to what extent these working conditions are related to respondents' health situations and levels of presenteeism and absenteeism.

3.6 National survey data on MSDs

The 10 national studies conducted as part of this project identified 19 additional national surveys. These are presented in Table 10.

Table 10: National surveys on MSDs

Country	National survey
Austria	Statistik Austria, Work-related accidents and work-related diseases (Arbeitsunfälle und arbeitsbezogene Gesundheitsprobleme).(see http://www.statistik.at/web_de/services/publikationen/4/index.html?includePage=detailView&sectionName=Gesundheit&pubId=694)
Austria	Institut für empirische Sozialforschung (IFES), Austrian Occupational Health Monitor (Österreichischer Arbeitsgesundheitsmonitor) (see https://www.ifes.at/projekte/oesterreichischer-arbeitsgesundheitsmonitor)
Austria	Statistik Austria, Micro census ad hoc module 2011: Working population with sanitary disabilities (Statistik Austria: MZ-Ad-hoc Modul 2011: Erwerbstätigkeit von Menschen mit gesundheitlichen Beeinträchtigungen) (see http://www.statistik.at/web_de/services/publikationen/3/index.html?includePage=detailView&sectionName=Arbeitsmarkt&pubId=647)
Denmark	Danish Working Environment Authority, National Research Centre for the Working Environment: Working Environment and Health in Denmark (Det Nationale Forskningscenter for Arbejdsmiljø: arbejdsmiljø og helbred i Danmark) (see https://arbejdsmiljodata.nfa.dk/)
FinlandFin	Finnish Institute for Health and Welfare, Health behaviour and health among the Finnish population (Suomalaisen aikuisväestön terveystiläytyminen ja terveys) (see https://thl.fi/fi/tutkimus-ja-kehittaminen/tutkimukset-ja-hankkeet/finsote-

Country	National survey
	tutkimus/aiemmat-tutkimukset/suomalaisen-aikuisvaeston-terveyskayttaytyminen-ja-terveys-avtk-
France	DARES, Physical constraints, risk prevention and accidents at work (Contraintes physiques, prévention des risques et accidents du travail) (see https://dares.travail-emploi.gouv.fr/IMG/pdf/Synthese_Stat_no_10_-_Conditions_de_travail_Vol-1_.pdf)
France	DARES, The working conditions survey of employers: detailed results (L'enquête «Conditions de travail» auprès des employeurs: résultats détaillés) (see https://dares.travail-emploi.gouv.fr/IMG/pdf/synthese.stat_no23_-_enquete_ct_volet_employeurs.pdf)
France	DARES and Direction Générale du Travail, Medical Surveillance of Occupational Risk Exposures (Sumer) survey (Surveillance médicale des expositions aux risques professionnels (Sumer)) (see https://dares.travail-emploi.gouv.fr/dares-etudes-et-statistiques/enquetes/article/surveillance-medicale-des-expositions-aux-risques-professionnels-sumer-edition)
France	Santé publique France, Epidemiological surveillance programme for MSDs in Pays de la Loire (lumbago and upper limb MSDs) (Programme de surveillance épidémiologique des TMS dans les Pays de la Loire (lombalgies et TMS du membre supérieur)) (see https://www.santepubliquefrance.fr/maladies-et-traumatismes/maladies-liees-au-travail/troubles-musculo-squelettiques/notre-action)
Germany	Federal Institute for Occupational Safety and Health (BAuA), Changing working world — facts and figures (Arbeitswelt im Wandel, Zahlen — Daten — Fakten), 2018 (see https://www.baua.de/DE/Angebote/Publikationen/Praxis/A99.pdf?__blob=publicationFile&v=11)
Germany	Federal Institute for Occupational Safety and Health (BAuA), Basic evaluation of the BIBB/BAuA employee survey 2012 focusing on working conditions, work-related strains and physical discomfort (Grundauswertung der BIBB/BAuA-Erwerbstätigenbefragung 2012) (see https://www.baua.de/DE/Angebote/Publikationen/Berichte/Gd73.pdf?__blob=publicationFile)
Italy	National Institute for Insurance against Accidents at Work (INAIL), Survey on safety at work (INSuLa — INdagine sulla Sicurezza sul Lavoro) (see https://www.inail.it/cs/internet/comunicazione/pubblicazioni/catalogo-generale/insula_i_report_dell_indagine.html ;
The Netherlands	TNO, NEA — Netherlands Working Conditions Survey (Nationale Enquête Arbeidsomstandigheden), 2017 (see https://www.cbs.nl/nl-nl-publicatie/2018/16/nationale-enquete-arbeidsomstandigheden-2017)
The Netherlands	Lautenbach, H., van der Torre, W., de Vroome, E. M. M., Janssen, B. J. M., Wouters, B. and van den Bossche, S. N. J., ZEA — Netherlands Survey of the Self-employed (Zelfstandigen Enquête Arbeid: Methodologie en globale resultaten 2017, Centraal Bureau voor de Statistiek, The Hague, 2017 (see https://www.monitorarbeid.tno.nl/dynamics/modules/SFIL0100/view.php?fil_id=199)
The Netherlands	TNO, WEA — National Survey for Employers (Werkgevers Enquête Arbeidsomstandigheden), Leiden, 2008-2016 (see https://www.monitorarbeid.tno.nl/dynamics/modules/SFIL0100/view.php?fil_id=195)
The Netherlands	Blik op Werk, Work Ability index (WAI) (see https://www.blikopwerk.nl/werkgever/duurzame-inzetbaarheid/work-ability-index)
Sweden	Public Health Agency of Sweden, National Health Survey (Nationella folkhälsoenkäten) (see http://fohm-app.folkhalsomyndigheten.se/Folkhalsodata/pxweb/sv/B_HLV/?rxid=b74d8053-7b13-4cfa-8716-aa2a5c66f44c)

Country	National survey
Sweden	Swedish Work Environment Authority, The Work Environment 2017 (Arbetsmiljöverket: Arbetsmiljön 2017) (see https://www.av.se/globalassets/filer/statistik/arbetsmiljon-2017/arbetsmiljostatistik-arbetsmiljon-2017-rapport-2018-2.pdf).
Sweden	Swedish Work Environment Authority, Work-related Disorders (Arbetsorsakade besvär) (see https://www.av.se/arbetsmiljoarbete-och-inspektioner/arbetsmiljostatistik-officiell-arbetsorsakadestatistik/arbetsorsakade-besvar-2018/)

Generally speaking, the questions regarding the building blocks of the MSD framework that are included in these surveys are very similar to the questions used in the European surveys presented in this chapter. In some cases, the identified surveys are national versions of European surveys such as the EU LFS, with a few additional questions (e.g. the Swedish survey on work-related disorders or the Austrian survey 'Working population with sanitary disabilities', which is the Austrian version of the 2011 LFS ad hoc module on employment of disabled people) ⁽¹⁰⁾.

In some cases, these surveys use questions that are not used in any of the identified European surveys. These questions are discussed in the remainder of this section. This discussion is organised along the different building blocks of the (revised) theoretical framework presented in Chapter 2 ⁽¹¹⁾.

3.6.1 Prevalence of MSDs

▪ Questions distinguishing between five or more bodily areas rather than three

The questions concerning MSDs in the EWCS and LFS distinguish between three different bodily areas where MSDs may occur (back, upper limbs and lower limbs). Several national questionnaires distinguish between five or more bodily areas. In most cases, these can be aggregated to the three main bodily areas.

For example, the following question from the Danish survey, '**Working Environment and Health in Denmark**', distinguishes between five bodily areas:

- In the last three months, have you experienced pain in the:
 - hips;
 - knees;
 - arms and/or wrists;
 - neck and/or shoulders;
 - lumbar area;
 - (other regions are the stomach and chest, but these should not be interpreted as indicators for MSDs).

The **Work Ability Index (WAI) survey** ⁽¹²⁾ includes questions about pain or discomfort in the following bodily areas:

- higher/middle back region;
- lower back region;
- hip/upper leg region;
- lower leg/ankle/foot region;
- shoulder/neck region.

⁽¹⁰⁾ The national report for Spain mentions several national data sources. These are the national versions of ESENER and the EWCS and do not appear to contain any additional questions. As they do not include any information additional to the available European data, they are not discussed here.

⁽¹¹⁾ Three building blocks are not included in this discussion because the identified national surveys do not include relevant questions that are not already included in some of the European surveys. These building blocks are sociodemographic factors; social, political and economic environment; and accidents at work.

⁽¹²⁾ The WAI is conducted in several Member States (notably in the Netherlands, Finland, Germany and Austria).

This survey distinguishes between different areas of the back, but it does not include questions on the upper limbs.

The German survey conducted for the study '**Changing working world**' includes questions about pain complaints that distinguish seven bodily areas:

- hip pain;
- knee pain;
- arm pain;
- hand pain;
- neck and shoulder pain;
- lower back pain;
- leg and feet pain;
- swollen legs.

▪ **Questions on whether MSD complaints have been diagnosed or treated**

In the case of MSD-related health complaints, some surveys include questions on whether these complaints have been diagnosed by a physician or whether employees have been treated for these complaints.

For example, the Finnish survey, '**Health behaviour and health among the Finnish population**', includes not only a question about the presence of back diseases, but also a question on whether back diseases have been diagnosed by a physician:

- Have you been diagnosed by a physician over the last year (12 months) for the following diseases or have you been treated because of them:
 - rheumatoid arthritis;
 - some back diseases.

The German '**BIBB/BAuA employee survey 2012**' includes questions on whether employees have been treated for several complaints:

- I will read out your health complaints once again. For each of them, please tell me whether you have been treated by a physician or therapist for this condition in the last 12 months
 - Pain in the lower back
 - If yes: over the past 12 months, have you received treatment for it?

This question is repeated for several other health problems, including pain in the neck or shoulders, arms, hands, hips, knees, legs and feet, and swollen legs.

▪ **Question on the frequency of MSD complaints**

The **Austrian Occupational Health Monitor** includes a question regarding the frequency of (work-related) MSDs:

- How often have you had [back pain/pain in the legs/neck pain] in the last few weeks? (answered on a five-point scale from 'never' to 'very often')
- If the answer to this question is 'rarely' or more often, this is followed by the question, 'Do you attribute this to your work?'

3.6.2 Physical, organisational and psychological risk factors

▪ **Questions on (prolonged) sitting and standing**

There does not appear to be a standard way of asking workers about (prolonged) standing and sitting, either on their own or in relation to other physical risk factors. The Danish survey, '**Working Environment and Health in Denmark**', includes a question that deserves attention:

- During work, how much time do you spend (answered on a six-point scale from 'almost all the time' to 'never'):
 - on sedentary work?
 - walking or standing?
 - working with a twisted or bent back without support with hands and arms?
 - With your arms raised at or above shoulder height?
 - doing the same arm movement many times a minute (e.g. packing, assembly)?
 - squatting or lying on your knees when you work?
 - pushing or pulling?
 - carrying or lifting?"

- **Questions on carrying/lifting**

The same Danish survey includes follow-up questions regarding carrying or lifting:

- If carrying or lifting during work, what is the typical weight you are carrying/lifting?
 - Under 5 kg.
 - 5-15 kg.
 - 16-29 kg.
 - 30 kg or above.
- How often (answered on a five-point scale from 'always' to 'never'):
 - are the lifts exhausting?
 - do you use tools, when necessary, during lifting or moving?
 - do you move or lift things that two people should move?

Using follow-up questions may be a good idea for obtaining this additional information (rather than including all of these topics in the general question on working postures).

The German survey conducted for the study '**Changing working world**' also includes questions about weights in the case of carrying or lifting. This survey distinguishes between normal and heavy loads, where the threshold value for 'heavy' is gender-related (> 10 kg for women, > 20 kg for men).

In the United States, the National Institute for Occupational Safety and Health (NIOSH) uses a threshold of 50 lb (see, for example, Waters et al., 1994 ⁽¹³⁾), which is equivalent to 23 kg. Evidence shows that this threshold is related to low back complaints, and this threshold is often used by OSH specialists.

- **Questions on other physical risk factors**

The French '**Medical Surveillance of Occupational Risk Exposures**' includes questions on the following set of work-related postures that may increase MSD prevalence:

- Manual handling of loads.
 - Manual handling 10 hours or more per week.
- Postural and articular constraints.
- Standing or working upright in a fixed location.
 - Standing or working upright in a fixed location 20 hours or more per week.
- Walking to work.
- Walking 20 hours or more per week.
- Kneeling position.
 - Kneeling position 2 hours or more per week.

⁽¹³⁾ Waters, T. R., Putz-Anderson, V. and Garg, A., *Applications manual for the revised NIOSH lifting equation*, 1994, US Department of Health and Human Services, Cincinnati, OH. Available at: <https://www.cdc.gov/niosh/docs/94-110/default.html>

- Kneeling position 10 hours or more per week.
- Fixed position of the head and neck.
 - Fixed head or neck position 20 hours or more per week.
- Keeping the arms in the air.
 - Arms in the air 2 hours or more per week.
 - Arms in the air 10 hours or more per week.

Finally, two Dutch surveys of employees and the self-employed (the '**Netherlands Working Conditions Survey**' and '**Netherlands Survey of the Self-employed**') distinguish between two types of vibrations:

- vibrations of the hand/arm;
- vibrations of the body.

This distinction is made for two reasons:

- Both types of vibration affect different body parts and concern different types of MSDs (whole body: back region; hand/arm: upper limb).
- Both types of vibration result in different types of tissue damage (whole body: usually vertebrae-related damage; hand/arm: muscles, nerves and blood vessels in the hand/wrist region).

▪ **Question on the extent to which employees are bothered by physical working conditions**

The German '**BIBB/BAuA employee survey 2012**' includes questions about working conditions, with follow-up questions on whether employees experience these conditions as troublesome:

- I am about to read a number of working conditions to you. Please tell me for each point respectively, if a certain condition occurs at your occupation frequently, sometimes, rarely or never.
 - Working in an upright position?
 - Does that bother you?
 - Lifting and carrying goods which are heavier than (male: 20 kg; female: 10 kg)
 - Does that bother you?
 - Using your hands while executing working tasks which require dexterity, rapid movements or a good amount of power?
 - Does that bother you?
 - Working in a bent over position, in a cowering position, kneeling or working overarm?
 - Does that bother you?
 - Working in an upright position?
 - Does that bother you?
 - Working in an upright position?
 - Does that bother you?

These follow-up questions may provide an indication of the impact of these working conditions (as perceived by the respondents).

3.6.3 Preventive measures

▪ **Question on OSH training courses**

The Italian '**Survey on safety at work**' includes questions on the provision of OSH training courses, which also address the issue of the effectiveness or adequacy of these training courses:

- Did you attend any training course addressed to provide you indications and tools for your health and safety at work over the past 5 years? (answered on a five-point scale from 'totally' to 'not at all') ⁽¹⁴⁾.
- How adequate do you consider your employer's behaviour for your firm's health and safety? (answered on a five-point scale from 'totally' to 'not at all').

The Swedish survey, '**The Work Environment**', includes a question on how quickly employers react if problems with working conditions are mentioned:

- Are working conditions taken care of, as soon as they are raised? (always, most of the time, not usually, never, does not apply, do not know).

None of these questions explicitly deals with measures that aim to prevent MSDs, but they can serve as examples of how such questions could be formulated.

3.6.4 Impact of MSDs

▪ Question on employee behaviour

The Swedish survey '**The Work Environment**' includes a question on whether or not employees wanted to change their current employment because of health considerations:

- Have you during the last year, for health reasons, considered to (answered on a three-point scale: yes considered; yes and also done; no):
 - swaping working tasks;
 - changing working tasks;
 - changing employer;
 - reducing your working time.

It is recommended that some of the questions discussed in this section are used to improve the questions currently included in the main European surveys.

4 European administrative data on MSDs

This chapter discusses all European administrative data sources that were examined for the study entitled 'MSDs facts and figures overview: prevalence, costs and demographics of MSDs in Europe'. Sections 4.1 and 4.2 discuss two Europe-wide sources that were used for the final overview report: the European Statistics on Accidents at Work (ESAW) and the World Health Organization (WHO) health indicators. For each of these data sources, this chapter discusses the main characteristics of the data source (data collection process, available indicators for MSDs and for other relevant topics) and the quality of the dataset (including reliability and comparability between countries and across time).

Sections 4.3 and 4.4 discuss two European administrative data sources that were also considered for this study, but that were not used for the final overview report: the European Occupational Diseases Statistics (EODS) and European Core Health Indicators (ECHI).

The previous chapter includes several subsections reporting findings from exploratory analyses that were conducted for the overview report. No exploratory analyses were conducted on available administrative data.

The final section of this chapter presents an overview of the national administrative data sources that were identified in the 10 national studies conducted as part of this project.

⁽¹⁴⁾ The Flash Eurobarometer 398 also contains a question about training provided on health and safety at work, but this question is not as specific as the question from the Italian survey.

4.1 ESAW

4.1.1 Main characteristics

Table 11: ESAW metadata

Name of the data source		ESAW — Eurostat
Website	https://ec.europa.eu/eurostat/web/health	
Period/years covered by the data source	<p>Data are available from 1994 onwards for all EU-15 Member States and from 1995 onwards all EU-15 Member States and Norway. From 2008 onwards, data for all EU-27 Member States and EU aggregates are available. Croatian data are included since 2010.</p> <p>Data for Switzerland are available from 2004 onwards and Icelandic data from 2012 onwards.</p>	
Data collection methodology	<p>The national ESAW sources are the declarations of accidents at work, to the accident insurance company of the national social security system, private insurance companies for accidents at work or other relevant national authorities (labour inspection, etc.). As an exception, accident data for the Netherlands are based on survey data.</p> <p>The following measurement units are used in ESAW data:</p> <ul style="list-style-type: none"> ▪ numbers of accidents; ▪ percentages of accidents (in relation to different totals and breakdowns); ▪ incidence rates of accidents: number of accidents per 100,000 workers; ▪ standardised incidence rates: number of accidents per 100,000 workers adjusted for the relative sizes of economic sectors at EU level. <p>An accident at work is defined as 'a discrete occurrence in the course of work that leads to physical or mental harm'. The data include only fatal and non-fatal accidents involving more than 3 calendar days of absence from work. If an accident does not lead to the death of the victim it is called a 'non-fatal' (or 'serious') accident. A fatal accident at work is defined as an accident that leads to the death of a victim within 1 year of the accident.</p>	
The people interviewed	Not applicable	
Sample size	Not applicable	
Sociodemographic characteristics	<ul style="list-style-type: none"> ▪ Age of victim. ▪ Sex of victim. ▪ Type of injury. ▪ Economic activity of the employer (NACE). ▪ Occupation of victim (ISCO). 	
MSD indicators	No indicators on MSD prevalence are available.	
Physical health indicators (comorbidities)	<p>Detailed information on the type of injury (resulting from the accident) is available:</p> <ul style="list-style-type: none"> ▪ 000 Type of injury unknown or unspecified ▪ 010 Wounds and superficial injuries ▪ 011 Superficial injuries ▪ 012 Open wounds ▪ 019 Other types of wounds and superficial injuries ▪ 020 Bone fractures ▪ 021 Closed fractures 	

Name of the data source	ESAW — Eurostat
	<ul style="list-style-type: none"> ▪ 022 Open fractures ▪ 029 Other types of bone fractures ▪ 030 Dislocations, sprains and strains ▪ 031 Dislocations and subluxations ▪ 032 Sprains and strains ▪ 039 Other types of dislocations, sprains and strains ▪ 040 Traumatic amputations (loss of body parts) ▪ 050 Concussion and internal injuries ▪ 051 Concussion and intracranial injuries ▪ 052 Internal injuries ▪ 059 Other types of concussion and internal injuries ▪ 060 Burns, scalds and frostbites ▪ 061 Burns and scalds (thermal) ▪ 062 Chemical burns (corrosions) ▪ 063 Frostbites ▪ 069 Other types of burns, scalds and frostbites ▪ 070 Poisonings and infections ▪ 071 Acute poisonings ▪ 072 Acute infections ▪ 079 Other types of poisonings and infections ▪ 080 Drowning and asphyxiation ▪ 081 Asphyxiation ▪ 082 Drowning and non-fatal submersions ▪ 089 Other types of drowning and asphyxiation ▪ 090 Effects of sound, vibration and pressure ▪ 091 Acute hearing losses ▪ 092 Effects of pressure (barotrauma) ▪ 099 Other effects of sound, vibration and pressure ▪ 100 Effects of temperature extremes, light and radiation ▪ 101 Heat and sunstroke ▪ 102 Effects of radiation (non-thermal) ▪ 103 Effects of reduced temperature ▪ 109 Other effects of temperature extremes, light and radiation ▪ 110 Shock ▪ 111 Shocks after aggression and threats ▪ 112 Traumatic shocks ▪ 119 Other types of shocks ▪ 120 Multiple injuries ▪ 999 Other specified injuries not included under other headings

The following information on the specific physical activity that resulted in the accident is available:

Physical risk factors	<ul style="list-style-type: none"> ▪ 00 No information ▪ 10 Operating machine — not specified ▪ 11 Starting the machine, stopping the machine ▪ 12 Feeding the machine, unloading the machine ▪ 13 Monitoring the machine, operating or driving the machine, ▪ 19 Other group 10 type Specific Physical Activities not listed above ▪ 20 Working with hand-held tools — not specified ▪ 21 Working with hand-held tools — manual ▪ 22 Working with hand-held tools — motorised ▪ 29 Other group 20 type Specific Physical Activities not listed above
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Name of the data source

ESAW — Eurostat

- 30 Driving/being on board a means of transport or handling equipment — not specified
- 31 Driving a means of transport or handling equipment — mobile and motorised
- 32 Driving a means of transport or handling equipment — mobile and non-motorised
- 33 Being a passenger on board a means of transport
- 39 Other group 30 type Specific Physical Activities not listed above
- 40 Handling of objects — not specified
- 41 Manually taking hold of, grasping, seizing, holding, placing — on a horizontal level
- 42 Tying, binding, tearing off, undoing, squeezing, unscrewing, screwing, turning
- 43 Fastening, hanging up, raising, putting up — on a vertical level
- 44 Throwing, flinging away
- 45 Opening, closing (box, package, parcel)
- 46 Pouring, pouring into, filling up, watering, spraying, emptying, baling out
- 47 Opening (a drawer), pushing (a warehouse/office/cupboard door)
- 49 Other group 40 type Specific Physical Activities not listed above
- 50 Carrying by hand — not specified
- 51 Carrying vertically — lifting, raising, lowering an object
- 52 Carrying horizontally — pulling, pushing, rolling an object
- 53 Transporting a load — carried by a person
- 59 Other group 50 type Specific Physical Activities not listed above
- 60 Movement — not specified
- 61 Walking, running, going up, going down, etc.
- 62 Getting in or out
- 63 Jumping, hopping, etc.
- 64 Crawling, climbing, etc.
- 65 Getting up, sitting down
- 66 Swimming, diving
- 67 Movements on the spot
- 69 Other group 60 type Specific Physical Activities not listed above
- 70 Presence — not specified
- 99 Other Specific Physical Activities not listed in this classification

The following information on the contact mode of injury is available:

- 00 No information
- 10 Contact with electrical voltage, temperature, hazardous substances — not specified
- 11 Indirect contact with a welding arc, spark, lightning (passive)
- 12 Direct contact with electricity, receipt of electrical charge in the body
- 13 Contact with naked flame or a hot or burning object or environment
- 14 Contact with a cold or frozen object or environment
- 15 Contact with hazardous substances — through nose, mouth via inhalation
- 16 Contact with hazardous substances — on/through skin or eyes
- 17 Contact with hazardous substances — through the digestive system by swallowing or eating
- 19 Other group 10 type contacts — Modes of Injury not listed above
- 20 Drowned, buried, enveloped — not specified
- 21 Drowned in liquid
- 22 Buried under solid
- 23 Enveloped in, surrounded by gas or airborne particles
- 29 Other group 20 type contacts — Modes of Injury not listed above

Name of the data source	ESAW — Eurostat
	<ul style="list-style-type: none"> ▪ 30 Horizontal or vertical impact with or against a stationary object (the victim is in motion) — not specified ▪ 31 Vertical motion, crash on or against (resulting from a fall) ▪ 32 Horizontal motion, crash on or against ▪ 39 Other group 30 type contacts — Modes of Injury not listed above ▪ 40 Struck by object in motion, collision with — not specified ▪ 41 Struck — by flying object ▪ 42 Struck — by falling object ▪ 43 Struck — by swinging object ▪ 44 Struck — by rotating, moving, transported object, including vehicles ▪ 45 Collision with an object, including vehicles — collision with a person (the victim is moving) ▪ 49 Other group 40 type contacts — Modes of Injury not listed above ▪ 50 Contact with sharp, pointed, rough, coarse material agent — not specified ▪ 51 Contact with sharp material agent (knife, blade, etc.) ▪ 52 Contact with pointed material agent (nail, sharp tool, etc.) ▪ 53 Contact with hard or rough material agent ▪ 59 Other group 50 type contacts — Modes of Injury not listed above ▪ 60 Trapped, crushed, etc. — not specified ▪ 61 Trapped, crushed — in ▪ 62 Trapped, crushed — under ▪ 63 Trapped, crushed — between ▪ 64 Limb, hand or finger torn or cut off ▪ 69 Other group 60 type contacts — Modes of Injury not listed above ▪ 70 Physical or mental stress — not specified ▪ 71 Physical stress — on the musculoskeletal system ▪ 72 Physical stress — due to radiation, noise, light or pressure ▪ 73 Mental stress or shock ▪ 79 Other group 70 type contacts — Modes of Injury not listed above ▪ 80 Bite, kick, etc. (animal or human) — not specified ▪ 81 Bite ▪ 82 Sting from insect or fish ▪ 83 Blow, kick, head butt, strangulation ▪ 89 Other group 80 type contacts — Modes of Injury not listed above ▪ 99 Other contacts — Modes of Injury not listed in this classification
Organisational and psychosocial risk factors	No information on this topic is available.
Public health costs	No information on this topic is available.
Preventive measures	No information on this topic is available.
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	<p>The following information on absenteeism is available:</p> <p>All cases are accidents that lead to a minimum of 3 days of absence from work.</p> <p>Days lost:</p> <ul style="list-style-type: none"> ▪ A01 4-6 days lost ▪ A02 7-13 days lost ▪ A03 14-20 days lost ▪ A04 At least 21 days but less than 1 month lost ▪ A05 At least 1 month but less than 3 months lost

Name of the data source	ESAW — Eurostat
	<ul style="list-style-type: none"> ▪ A06 At least 3 months but less than 6 months lost ▪ 997 Permanent incapacity (to work) or 183 or more days lost (6 months' absence or more) ▪ 998 Fatal accident
Work outcomes (quality and productivity)	No information on this topic is available.

4.1.2 Quality, reliability and comparability

Because ESAW is based on administrative data, it is assumed that it provides accurate estimates of the number of accidents in EU-28 Member States (except for the Netherlands, which uses a survey to obtain data on accidents).

The comparability of the data between countries is different for different types of accidents:

- Data on fatal accidents have a high level of comparability between all countries.
- Data on non-fatal accidents are considered to be of limited comparability across certain groups of countries. This is because of expected under-reporting in some countries and different insurance systems between countries ⁽¹⁵⁾.

Data on the Eurostat website is divided between datasets with a reference year up to 2007 (included) and datasets with a reference year from 2008 onwards.

The datasets up to reference year 2007 are restricted to EU-15 Member States, Norway and Switzerland and use the NACE rev. 1 classification for economic activities.

The datasets from 2008 onwards include all countries of the previous datasets plus the other EU-28 Member States (Croatia from 2010 only) and Iceland (from 2012 onwards). These datasets use the NACE rev. 2 classification of economic activities.

Analysis of trends is therefore possible for two separate subperiods (1994-2007 and 2008-current).

4.2 WHO health indicators

4.2.1 Main characteristics

Table 12: WHO European Health for All (HFA) database/ European Mortality Database (MDB) metadata

Name of the data source	HFA and MDB — WHO Europe
Website	1) https://gateway.euro.who.int/en/hfa-explorer/ 2) http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html
Period/years covered by the data source	Various, depending on the sources.
Data collection methodology	Different, depending on the data sources.

⁽¹⁵⁾ The national ESAW data sources are the notifications of accidents at work, either to national insurance systems for accidents at work (BE, BG, DE, EL, ES, FR, IT, LU, AT, PT, SI, FI and CH) or to relevant national authorities such as labour inspectorates in the framework of a universal social security system (CZ, DK, EE, IE, CY, LV, LT, HU, MT, NL, PL, RO, SK, SE, UK and NO). Incidence rates and standardised incidence rates (number of accidents per 100,000 workers) often vary strongly between these two main types of notification system.

Name of the data source		HFA and MDB — WHO Europe
The people interviewed		Not applicable.
Sample size		Not applicable.
Sociodemographic characteristics		<ul style="list-style-type: none"> ▪ Country. ▪ Gender. ▪ Year.
MSD indicators		No indicators on MSD prevalence are available.
Physical health indicators (comorbidities)		<p>The following indicators are available:</p> <ul style="list-style-type: none"> ▪ people injured as a result of work-related accidents per 100,000 (1970-2016) (HFA); ▪ new cases of occupational diseases per 100,000 (1970-2016) (HFA); ▪ hospital discharges and musculoskeletal system and connective tissue diseases per 100,000 (1970-2016) (HFA); ▪ diseases of the musculoskeletal system and connective tissue per 100,000 (2000 – 2010 – 2015 - 16) (HFA); ▪ age-standardised death rate for diseases of the musculoskeletal system and connective tissue per 100,000 (2000 – 2010 – 2015 - 16) (MDB).
Physical risk factors		No information available.
Organisational and psychosocial risk factors		No information available.
Public health costs		<p>The following information on the cost and burden of MSDs is available:</p> <ul style="list-style-type: none"> ▪ Years lost due to disability (YLDs), years of life lost (YLLs) and disability-adjusted life-years (DALYs) as result of MSDs in 2016. MSDs are further split by: <ul style="list-style-type: none"> ▪ rheumatoid arthritis; ▪ osteoarthritis; ▪ gout; ▪ back and neck pain; ▪ other musculoskeletal disorders.
Preventive measures		No information available.
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)		No information available.
Work outcomes (quality and productivity)		No information available.

4.2.2 Quality, reliability and comparability

From 2000 onwards, national data regarding disability-adjusted life-years (DALYs), years lost due to disability (YLDs) and years of life lost (YLLs) and death rates can be obtained from the WHO website. Earlier data are not available; because of changes in the data and methodology, earlier data are not

comparable with the data from 2000 onwards. For the graphs presented in the overview report, the attributable fractions of the Institute for Health Metrics and Evaluation (IHME) have been applied to the WHO data.

4.3 EODS

In the past, the EODS collected comparative administrative data for EU countries. In the previous overview report from EU-OSHA on MSDs ⁽¹⁶⁾, information from the EODS was used to show that MSDs were the most common occupational disease in Europe.

Currently, no update is available for the EODS data: the differences between the national administrative data sources are so large that it is very difficult to harmonise the data from different countries. Consequently, there is no recent EU-based data source available on the prevalence of occupational diseases.

In the framework of this project, data on occupational diseases have been gathered for several Member States, but the different national systems make it impossible to compare these national findings (see overview report for more information). In addition, the pattern and distribution of occupational diseases currently recognised and compensated for does not accurately reflect the actual health impairments of workers because of MSDs caused by their work.

Upon inquiry, Eurostat confirmed that a pilot study for a revised EODS data collection began in 2017. Data have been obtained and are being validated. A decision on the future of the EODS is expected to be made in 2020.

4.4 ECHI

Table 13: ECHI metadata

Name of the data source	ECHI — European Commission
Website	https://ec.europa.eu/health/indicators_data/echi_en
Period/years covered by the data source	Different for all indicators. Dates back as far as 1960 for some and up to 2016.
Data collection methodology	Information for relevant health indicators comes from various data providers, which follow different data collection methods: <ul style="list-style-type: none"> Work-related health risks: data come from the last two rounds (2010, 2015) of the EWCS of Eurofound. The EWCS contains questions on jobs and company context, the social environment and working life perspectives, among many other topics. Indicators give the percentage of employees replying 'yes', 'always or most of time' or 'sometimes' to the questions. Physical activity: data come from the first wave of the EHIS of Eurostat between 2006 and 2009. The EHIS contains questions on self-reported physical activity. The physical activity indicator gives the proportion of the population practising at least 30 minutes of physical activity (moderate or intense) per day.

⁽¹⁶⁾ EU-OSHA (European Agency for Safety and Health at Work), *OSH in figures: Work-related musculoskeletal disorders in the EU — Facts and figures*, 2010. Available at: <https://osha.europa.eu/en/tools-and-publications/publications/reports/TERO09009ENC>

Name of the data source	ECHI — European Commission
	<ul style="list-style-type: none"> ▪ Long-term activity limitations: data come from the Eurostat annual survey EU-SILC, which contains a small module on health, including a question on limitation in activities due to health problems. ▪ Body mass index: data come from the second wave of the EHIS of Eurostat between 2013 and 2015. Data derived from answers are used to calculate body mass index. ▪ Accidents at work: data come from the ESAW of Eurostat.
The people interviewed	Not applicable.
Sample size	Not applicable.
Sociodemographic characteristics	<ul style="list-style-type: none"> ▪ Gender. ▪ Age. ▪ Education level. ▪ Employment status. ▪ Income level.
MSD indicators	No information included.
Health indicators (comorbidities)	Proportion of people reporting that they have long-term restrictions in daily activities.
Physical risk factors	<ul style="list-style-type: none"> ▪ Proportion (%) of people aged 15+ years reporting practice of daily physical activity. ▪ Percentage of employees who think that their health or safety is at risk because of their work. ▪ Percentage of employees who think that their health is negatively affected by their work. ▪ Standardised incidence rate of accidents at work per 100,000 workers.
Organisational and psychosocial risk factors	No information included.
Public health costs	No information included.
Preventive measures	No information included.
Employment outcomes (presenteeism, absenteeism, future career paths and return to work)	No information included.
Work outcomes (quality and productivity)	No information included.

The ECHI database is a secondary data source that is based on other primary data sources. As most of these primary data sources were already used for the overview report, the ECHI database was not used.

4.5 National administrative data on MSDs

The 10 national studies conducted as part of this project identified 22 additional national administrative data sources. These are presented in Table 14. These data sources were used in various national studies. The main findings based on these studies and/or data sources are available on EU-OSHA's website¹⁷.

These findings show the importance of in-depth studies into various parts of the theoretical framework presented in Chapter 2, but do not give rise to concrete recommendations on improving the existing set of indicators.

Table 14: National administrative data sources on MSDs

Country	National data source
Austria	Austrian Institute of Economic Research (WIFO), Stress in the workplace, work-related diseases and disability (Arbeitsplatzbelastungen, arbeitsbedingte Krankheiten und Invalidität) (see https://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=35901&mime_type=application/pdf)
Austria	Austrian Workers' Compensation Board (AUVA), Statistics on work-related diseases (Berufskrankheitenstatistik) (see https://www.auva.at/cdscontent/load?contentid=10008.633448&version=1563531738)
Austria	Austrian Institute of Economic Research (WIFO), Report on workers' absence (Fehlzeitenreport) (see http://www.hauptverband.at/cdscontent/load?contentid=10008.646602&version=1510674740)
Austria	Statistik Austria, Statcube (Statcube) (see https://www.statistik.at/web_de/services/statcube/index.html)
Denmark	Danish Working Environment Authority, Reported occupational accidents (Anmeldte arbejdsulykker) (see https://amid.dk/media/2903/arbejdsulykker-aarsopgoerelse-2012-2017.pdf)
Denmark	Danish Working Environment Authority, Digitally reported work-related diseases (Arbejdstilsynet: Digitalt anmeldte erhvervssygdomme) (see https://amid.dk/viden-og-forebyggelse/arbejdsskader/erhvervssygdomme/viden-om/statistik-om-erhvervssygdomme/)
Finland	Finnish Centre for Pensions, Registers (Eläketurvakeskuksen rekisterit) (see www.sotkanet.fi)
Finland	Social Insurance Institution of Finland (KELA) (Kansaneläkelaitos) (see www.kela.fi)
France	French National Health Insurance Fund, Annual report 2016 of sickness — occupational injuries insurance (Rapport annuel 2016: L'Assurance maladie — risques professionnels) (see http://www.risquesprofessionnels.ameli.fr/fileadmin/user_upload/document_PDF_a_telecharger/brochures/2017344_DRP_rapportDeGestion_interactif.pdf)
France	French Agency for Food, Environmental and Occupational Health & Safety (ANSES), ANSES activity report 2016 (ANSES Rapport d'activité 2016) (see https://www.anses.fr/fr/system/files/RNV3P-RA-2016.pdf)
Germany	BKK Dachverband, Digital work — digital health, health report 2017 (Digitale Arbeit — digitales Gesundheit, Gesundheitsreport 2017) (see https://www.bkk-dachverband.de/fileadmin/publikationen/gesundheitsreport_2017/BKK_Report_2017_gesamt_final.pdf)

17 National reports are available at: https://osha.europa.eu/en/publications/l_en/type_4859?text&sort_by=field_publication_date9. Synthesis report of the 10 Member States reports available at: <https://osha.europa.eu/en/publications/work-related-musculoskeletal-disorders-facts-and-figures-synthesis-report-10-eu-member/view>

Country	National data source
Germany	Federal Ministry of Labour and Social Affairs and the Federal Institute for Occupational Safety and Health (BAuA), Safety and health at work — report 2016, work accident prevention report (Sicherheit und Gesundheit bei der Arbeit: Berichtsjahr 2016, Unfallverhütungsbericht Arbeit) (see https://www.baua.de/DE/Angebote/Publikationen/Berichte/pdf/Suga-2016-barrierefrei.pdf?__blob=publicationFile&v=2)
Hungary	National Health Insurance Fund of Hungary, Database of the National Health Insurance Fund of Hungary (A Nemzeti Egészségbiztosítási Alapkezelő — NEAK adatbázisa) (no URL)
Hungary	Occupational Health Services, Reports of the occupational health services on their yearly work (A foglalkozás-egészségügyi szolgálatok jelentése az éves munkájukról) (no URL)
Hungary	National Health Insurance Fund of Hungary, Register of occupational diseases and excessive exposures (Foglalkozási betegségek és fokozott expozíciós esetek nyilvántartása) (no Internet access)
Italy	National Institute for Insurance against Accidents at Work (INAIL), INAIL database (INAIL Banca dati) (see https://www.inail.it/cs/internet/attivita/dati-e-statistiche.html)
Italy	National Institute for Insurance against Accidents at Work (INAIL), Malprof (see https://www.inail.it/cs/internet/attivita/ricerca-e-tecnologia/area-salute-sul-lavoro/sistemi-di-sorveglianza-e-supporto-al-servizio-sanitario-nazionale/malprof.html)
The Netherlands	Netherlands Centre for Occupational Diseases, NCVB statistiek — Statistics of the National Office for the Registration of Occupational Diseases (Nationale Registratie Beroepsziekten), 2018 (see https://www.beroepsziekten.nl/sites/default/files/documents/NCVB_Beroepsziekten_in_cijfers-2018.pdf)
Spain	Ministry of Labour, Migrations and Social Security, CEPROSS electronic notification system (Sistema CEPROSS de notificación electrónica). CEPROSS stands for 'Comunicación de Enfermedades Profesionales, Seguridad Social' (Communication of Occupational Diseases, Social Security) (see http://www.seg-social.es/wps/portal/wss/internet/EstadisticasPresupuestosEstudios/Estadisticas/EST231/2082)
Sweden	National Board of Health and Welfare, National record of death causes (Socialstyrelsen: statistikdatabas för dödsorsaker) (see https://www.socialstyrelsen.se/statistik-och-data/statistik/statistikamnen/dodsorsaker/)
Sweden	Swedish Work Environment Authority, Occupational accidents and work-related diseases (Arbetssskador), (see http://webbstat.av.se/QvAJAZfc/opendoc.htm?document=accesspoint%5Carbetssskadestatistik.qvw&host=QVS%40vmextapp02-hk&anonymous=true&sheet=SH_Avancerad)
Sweden	Swedish Social Insurance Agency, Social insurance in figures (Socialförsäkringen i siffror) (see https://www.forsakringskassan.se/statistik/publikationer/socialforsakringen-i-siffror)

5 Analysis of available data for the building blocks of the model

After the presentation of the revised model in Chapter 2, and the content of different data sources in Chapters 3 and 4, it is possible to determine the coverage of the topics of each building block by these data sources. This is described in sections 5.1-5.7. Section 5.8 discusses the possibility of analysing relations between different building blocks of the model (based on the available data). The possibility of joint analysis of different data sources is discussed in section 5.9. The final section focuses on the availability of data on new and emerging MSD-related risks.

5.1 Prevalence of MSDs

The descriptions of the various surveys in Chapter 3 clearly show that the prevalence of MSDs is measured differently in each survey. Different words are used to describe MSDs and different types of MSDs are distinguished (regarding their location, relation with work and longevity). This certainly has its advantages, because it means that data are collected on MSDs in general as well as on work-related MSDs, and on all MSDs (chronic and acute) as well as on chronic MSDs only. On the other hand, the fact that MSD prevalence is measured differently makes it difficult to compare results and combine datasets in analyses.

- **MSD-related questions are very diverse in the different surveys**

The variation in MSD measurements also has its disadvantages, because a direct comparison of the results of different surveys is very difficult. If the questions used in the different surveys (the LFS ad hoc module, EWCS and EHIS in particular) were similar, this would increase the possibility of comparing the outcomes of these studies. This applies in particular to the description of the type of health complaints considered to be MSDs. In the overview report, MSDs are described as 'impairments of bodily structures such as muscles, joints, tendons, ligaments, nerves, cartilage, bones and the localised blood circulation system'. In the LFS ad hoc module (2013) (on accidents at work and other work-related health problems), the question about health problems includes the category 'bone, joint or muscle problems'. This appears to be a more precise description of MSDs than the formulation used in the sixth wave of the EWCS, which refers to either backache or muscular pains (in the upper or lower limbs). The EHIS questionnaire refers only to the location of (chronic) diseases or disorders, without any reference to bones, joints or muscles. To increase the comparability of the results from the different surveys, and allow for joint analysis of the results, it is recommended that the wording of the questions in the EWCS and EHIS be changed to refer to 'bone, joint or muscle problems'.

- **Ideally, MSD questions should distinguish between three different locations**

A second recommendation refers to the location of the MSD complaints considered. The LFS ad hoc module and the EWCS both refer to three different locations of MSDs (back, upper limbs and lower limbs), while the EHIS includes only two locations (back and neck). From the perspective of comparing and combining datasets in order to carry out joint analysis, it is recommended that the EHIS also distinguishes between these three different locations (back, upper limbs and lower limbs).

- **Only one survey contains questions about work-related MSDs (LFS ad hoc module)**

Currently, only one survey (of the surveys analysed in the framework of this project) includes questions on work-related MSDs. This is the LFS ad hoc module, which measures the prevalence of MSDs as the most serious health problem ⁽¹⁸⁾. Ideally (and for comparisons and the possibility of carrying out joint analyses), it is recommended that a second survey also includes questions on work-related MSDs. Given that the EWCS targets workers while the EHIS targets the adult population, the EWCS (rather than the EHIS) would be the most appropriate survey to consider work-related MSDs.

⁽¹⁸⁾ In addition, the Flash Eurobarometer 398 also contained questions on work-related MSDs, but the Flash Eurobarometer is not used to monitor developments over time.

- **Determine the share of MSDs that are caused or made worse by work**

It may be relevant to know the share of all MSDs that are caused or made worse by work (i.e. work-related MSDs). This can be established by comparing the prevalence rates of self-reported MSDs from one data source with the prevalence rates of self-reported work-related MSDs from another source (provided that both sources use the same questions regarding MSDs). This is, however, not a very reliable estimate. To obtain a more reliable estimate, it is recommended that a single survey should include questions about MSDs in general and about work-related MSDs. The survey could first ask about the presence of MSDs and then (if present) ask to what extent respondents believe that these complaints are caused or made worse by (current or previous) work.

Such additional questions could be included in, for example, the EWCS, but these surveys target only people currently working. This implies that workers who have suffered the most from MSDs (because these complaints made it impossible for them to continue working) are not included in the sample. For this reason, it may be a good idea to include these additional questions in a survey that targets the whole adult population, such as the EHIS.

- **Difficulties in establishing trends because of changes in the questions**

This section contains several recommendations to change MSD-related questions in different surveys. A disadvantage of these changes (to be taken into account when considering such changes), however, is that the results of new waves cannot be compared with the results of previous waves. The final recommendation in this respect is therefore to try to limit as much as possible these changes, so that trends can be established from now on.

- **Large country differences**

The large country differences in MSD prevalence found in the data are remarkable. This should be analysed further. If these can be explained by institutional and/or cultural differences between countries, this would increase the reliability of the answers.

5.2 Physical, organisational and psychosocial risk factors

The sixth wave of the EWCS contains the most detailed questions regarding physical, organisational and psychosocial risk factors. Nevertheless, based on several analyses and previous studies on different risk factors, several recommendations can be made to improve the questions on these risk factors.

- **Physical factors: add 'standing' to the EWCS**

The sixth wave of the EWCS includes a question on prolonged sitting, but not on prolonged standing. This is problematic, because it makes it difficult to interpret the relation that has been observed between sitting and MSD complaints in the lower limbs: does this represent a causal relationship between sitting and (a lack of) MSD complaints, or is it due to an unmeasured causal relationship between standing and MSD complaints in the lower limbs? From the perspective of collecting more complete data on MSDs, it is therefore recommended to include questions on sitting as well as standing in the next wave of the EWCS. An example of such a question is the following question included in the EU-SILC 2017 ad hoc module on health: When you are working, which of the following best describes what you do? Would you say ...

- mostly sitting;
- mostly standing;
- mostly walking or tasks of moderate physical effort;
- mostly heavy labour or physically demanding work.

Such questions should also take into account that health effects may differ significantly between standing exactly on the spot ('static standing') and being able to move about a bit while standing ('dynamic standing'). Similarly, regarding sitting, it is advised to formulate the question in such a way that it differentiates between being able to get up from a seated position every 30 minutes and not

being able to get up, and asks if the worker is able to interrupt sitting every 2 hours for at least 10 minutes (walking, taking a break, standing).

- **Physical factors: use more precise questions in the EWCS**

The sixth wave of the EWCS includes questions regarding the prevalence of many different physical risk factors. In some cases, the answer categories provided in the questionnaire actually combine different risk factors that may have different effects on the prevalence of different MSD types. From the perspective of collecting more complete data on MSDs, it is therefore recommended to adapt the following answer categories:

- Questions on postures:
 - lifting or moving people: differentiate between lifting people and moving people;
 - carrying or moving heavy loads: differentiate between carrying heavy loads, moving heavy loads and lifting heavy loads, and be more specific on when a load is heavy (11 kg in the context of lifting).
- Question on job hazards:
 - vibrations from hand tools, machinery, etc.: differentiate between vibrations from hand tools (that cause vibrations in the upper limbs) and vibrations from machinery that may cause vibrations of the whole body.

- **Physical factors: no indicators on workstation design and tool design**

The EWCS currently does not include indicators regarding workstation design and poor tool design. It may be difficult to measure the extent to which the design of workstations and/or tools is adequate, as the requirements are likely to vary a lot between occupations. Nevertheless, it may be interesting to ask respondents for their opinion on the design of their workstations and/or tools (if relevant).

- **Organisational and psychosocial risk factors: findings from exploratory research need to be confirmed**

The EWCS currently includes many different organisational and psychosocial risk factors. For the overview report an exploratory approach was followed, where many of these risk factors were included as explanatory variables in several logistic regressions (with MSD prevalence as the dependent variable). For several of these risk factors, a significant relation with MSD prevalence was established. It is recommended that these findings are confirmed (or refuted) in future studies to obtain a better understanding of the underlying mechanisms.

- **Physical, organisational and psychosocial risk factors: search for relevant combinations**

With so many different organisational and psychosocial risk factors, the model becomes very complex. To reduce the complexity of the model, different exploratory cluster analyses were performed in search of combinations of different risk factors that often occur together. However, this has not resulted in new insights.

Another approach is also possible: rather than searching for combinations of risk factors that often occur together, one could search for combinations of risk factors that reinforce each other with regard to their effect on the development of MSDs. In terms of the logistic regressions that have been estimated, this would imply a search for significant interactions between two (or even more) different (physical, organisational and/or psychosocial) risk factors. Given the many risk factors that are available in several datasets (especially in the EWCS), the possible number of interactions is very large. An exploratory approach where all possible interactions are examined is therefore not recommended. Instead, findings from previous studies should be used to formulate a limited number of hypotheses on which risk factors could reinforce each other. These hypotheses can then be tested.

5.3 Sociodemographic factors

Almost all surveys include indicators for the four sociodemographic variables that the overview report focused on (age, gender, educational level and country of birth). The coverage of this building block of the model is complete and there is no need to gather additional indicators.

If different sociodemographic indicators are available, it becomes relevant to choose which of these indicators to focus on. For example, the overview report contains many graphs of information on the prevalence of self-reported MSDs and other building blocks of the model. For many of the topics covered in these graphs (especially those based on data from the EWCS or EHIS), it is possible to present results by gender, age group, educational level or country of birth, or by a combination of these factors (e.g. gender × age). This would, however, result in a large number of graphs. To increase the readability of the overview report, it was decided to focus on the sociodemographic factors that were significantly related to the variables of interest (rather than including all possible graphs).

5.4 Social, political and economic environment and occupation

The social, political and economic environment of workers is mainly represented by country and sector. Country and sector are almost always available, as is the occupation of workers.

▪ Continue the search for explanations for the country differences in self-reported MSD prevalence rates

As mentioned in section 3.1.3, the prevalence rate of MSDs varies considerably between countries. It is recommended that additional analysis is conducted to search for explanations for these country differences. Country differences may be due to differences in social security systems (access to social support, prevention of poverty), differences in MSD awareness among workers or cultural differences in the willingness of respondents to report (work-related) health problems. Examining whether these country differences are related to the differences in self-reported MSD prevalence first requires the availability of reliable indicators (such as the type of social security system, MSD awareness and other potentially relevant cultural indicators). If available, these indicators could be used to enrich a dataset with MSD indicators (such as the LFS ad hoc module, the EWCS or the Flash Eurobarometer 398). These indicators could then be added to logistic regression models explaining MSD prevalence. To account for the fact that some of the explanatory variables are defined at the country level rather than the individual level, such a logistic regression should preferably be estimated using multilevel analysis.

5.5 Accidents at work and occupational diseases

5.5.1 Accidents at work

As discussed in Chapter 2, the theoretical framework of work-related MSDs has been revised to include accidents at work as an additional building block. The relationship between accidents and MSDs is complex as causality may run both ways: work-related accidents can result in (acute) MSDs, but pre-existing MSDs may also cause work-related accidents. This applies not only to work-related accidents but also to other types of accidents.

For a better understanding of the relations between accidents and MSDs, the following information on accidents is required:

- the share (and type) of accidents that occur while at work (work-related accidents);
- the share (and type) of accidents that result in acute MSDs;
- the share (and type) of accidents that are (partially) caused by MSDs.

▪ Use the ESAW to estimate the share of accidents resulting in acute MSDs

The second of these three questions can be (partially) answered based on the ESAW database. This database includes information on all registered work-related accidents, including the type of injury and the part of the body injured. Several types of injury occurring in several parts of the body may be interpreted as acute MSDs (e.g. dislocations, sprains and strains in the lower limbs and bone fractures in the upper limbs). This makes it possible to estimate (a lower boundary for) the share of accidents resulting in acute MSDs. The outcomes of this type of analysis may differ between countries, because incidence rates of non-fatal accidents are not comparable for all countries (only between Member States with the same accident notification system — insurance or universal social security).

- **Include additional questions on accidents in surveys**

To answer the other two questions regarding the relation between accidents and MSDs, it is recommended that additional questions are included in surveys on MSDs and/or accidents (such as the EWCS, EHIS and LFS ad hoc module). In the case of respondents reporting MSDs, additional questions could ask:

- whether these complaints were caused or made worse by an accident (at work or elsewhere);
- whether these complaints have resulted in an accident (at work or elsewhere).

Once such data are available, it would be possible and important to analyse the relation between the prevalence of MSDs and accidents (at work).

5.5.2 Occupational diseases

Occupational diseases are registered at the national level. Each country has its own specific rules regarding which conditions or diseases are recognised as occupational diseases. These rules are closely related to the health insurance regimes in these countries.

As mentioned in section 4.3 the differences between these national data sources made it impossible to construct a dataset with recent comparative EU statistics on the numbers and types of occupational diseases (including information on the share of occupational diseases that are recognised as MSDs). The fact that the EODS project was not continued constitutes an important data gap: without comparable EU-wide data researchers can examine statistics on occupational diseases at national level but, as long as these statistics cannot be compared, it is impossible to present an overview for the EU as a whole.

Eurostat is currently evaluating a pilot study for a revised EODS data collection. This would be a valuable source of comparable data on the recognised occupational diseases related to MSDs.

5.6 Preventive measures

Two of the identified surveys include information on preventive measures. Information obtained from ESENER has been used to enrich the EWCS with aggregate information on the percentage of employees working in establishments where one or two specific MSD measures are provided (per country and sector), and the average number of measures provided in establishments (per country and sector).

The Flash Eurobarometer 398 also includes information on preventive measures, although this is not specifically aimed at reducing MSDs. Nevertheless, it may be worthwhile aggregating this information as well (e.g. per country and occupation) and adding it to the EWCS dataset.

Although these data sources provide valuable information on the usage of preventive measures, recommendations can be made to enable more information to be gathered regarding this building block of the model.

The first recommendation is to gather information on integrated measures. The second wave of ESENER includes questions on four different kinds of preventive measures regarding MSDs (rotation of tasks to reduce repetitive movements; encouraging regular breaks for people in uncomfortable working positions; provision of ergonomic equipment; equipment to help with lifting or moving). These measures can be regarded as single measures: interventions addressing one specific risk factor. However, as discussed in the overview report, single-measure interventions appear to be less effective than integrated measures (measures including a combination of actions targeting several factors). One of the recommendations from the overview report is to promote and disseminate these more integrated approaches. To monitor the actual usage of such integrated measures, it is recommended that the next wave of ESENER also includes several questions on usage.

ESENER can be used to determine the attention paid to preventive measures at the enterprise level, but it is not clear how many employees in these enterprises actually make use of these measures. The second recommendation is therefore to include the questions on preventive measures used in ESENER in an employee survey (such as the EWCS or the LFS ad hoc module on accidents at work and work-related health problems). Employees could be asked whether various preventive measures

are available to them. If so, follow-up questions may include whether they have actually used these measures and whether they benefited from these measures. If not, further follow-up questions may include whether they believe that they would benefit from such measures.

5.7 Impact of MSDs

MSDs have an impact on health outcomes (the health of workers, as well as public health), on employment outcomes (presenteeism, absenteeism, future career paths and return to work) and on work outcomes (quality and productivity).

5.7.1 Health outcomes

There is no indication of a lack of indicators on health outcomes. Several of the identified surveys include questions about the general health situation of employees. The EWCS, EHIS and LFS ad hoc module also contain more detailed questions about comorbidities. Information on hospitalisations (such as the number of hospital discharges per 100,000 people related to MSDs) is available from the European HFA family of databases. HFA data are published by WHO and are collected from several sources, including WHO and Europe's technical programmes, partner organisations (for instance Eurostat), United Nations agencies and the Organisation for Economic Co-operation and Development (OECD), as well as a network of country experts.

Regarding the public health costs and burden of MSDs, less information is available at the European level. The only data source used for the overview report was the WHO health statistics regarding the number of DALYs due to musculoskeletal disorders.

5.7.2 Employment outcomes

Absenteeism is well covered in many surveys. Regarding the link with MSDs, it is recommended that respondents reporting MSDs and absenteeism are asked if their absenteeism is partly caused by their MSDs.

Presenteeism is concerned with people who work while they are actually ill. It refers to productivity losses resulting from real health problems. Presenteeism can be measured in many different ways. A first impression of the size of the presenteeism problem can be obtained by determining the share of workers who worked while feeling ill during the past year. This has been done in the overview report, based on a question from the EWCS about the number of days that respondents worked while being sick. A more precise indicator for presenteeism would be obtained if respondents could indicate to what extent their productivity was reduced during these days. Although a question along these lines could be included in the EWCS, it is doubtful whether respondents could give an accurate answer to this question and this is therefore not recommended.

The aspects of future career paths and return to work are not covered well by the identified surveys. ESENER includes a question about enterprise policies to support employees to return to work after a long-term sickness absence, but it is not clear to what extent these policies are actually used. It is therefore recommended that a question on such policies is included in an employee survey, such as the LFS ad hoc module. For example, people reporting that they have been absent from work for a long period because of sickness could be asked whether their enterprise has helped them to return to work and whether they benefited from this support.

5.7.3 Work outcomes

Work outcomes such as quality and productivity of work are not well covered in the identified surveys. One of the reasons for this lack of information may be that employee surveys are not a good way to collect quantitative information on these issues. Both quality and (labour) productivity are difficult to measure through a survey. In addition, for many occupations it is very difficult to obtain a quantitative measure for productivity at the individual level. Reliable estimates can often be obtained only at the establishment or enterprise level (if productivity at these levels is divided by the number of workers, an indicator of individual labour productivity can be obtained — this is, however, an indicator of the average labour productivity of workers, not the productivity of a specific individual worker).

One option would be to include questions concerning the recovery of workers from an average working day: is the worker tired in the evening, is he/she still tired the next morning and is he/she still tired after the weekend? The more recovery time is needed, the more likely it is that productivity at work will be lower (although separate research may be needed to examine this relationship). At the same time, a long recovery time is also related to presenteeism and sustained employability.

To examine the relation between MSD prevalence and productivity, studies at the establishment or enterprise level are recommended. Preferably, these studies should be based on a joint analysis of administrative data on establishments or enterprises (including information that can be used to compute labour productivity measures, such as the value added per employee) and enterprise surveys (including information on the share of workers with MSDs). Such a joint analysis may be feasible for individual countries, but not at the European level.

5.8 Examining relations between building blocks

Experts agree that combined exposure to physical and psychosocial risks is a serious emerging risk (risk factors for MSDs are multifactorial). Exploratory analyses conducted for the overview report show that several interaction effects can be found between risk factors and sociodemographic factors, but interactions between physical and psychosocial risk factors have not been examined. These should be examined in future research. For a better understanding of the underlying mechanisms, it may be better to carry out small-scale studies in a single country among a homogeneous group of workers first, combining information from surveys with other kinds of data (observations, measurements, input from occupational physicians, etc.), although current privacy regulations should be taken into account. This may give a better insight into interactions between different factors, which may later be tested in large-scale studies. This may also result in different approaches to measuring exposure to risk factors (rather than asking about individual risk factors, ask about risk-increasing combinations of risk factors?).

The revised framework includes the moderating effects of sociodemographic variables on risk factors (the effect of risk factors on MSD prevalence may vary based on gender, educational level, age, country of birth). Exploratory analyses conducted for the overview report confirm the presence of such moderation effects, but these effects are not very large. Differences in exposure to risk factors (by gender, age, country of birth, educational level) appear to be more relevant. Searching for the moderation effects of these variables will therefore be less relevant in future studies. Instead, as mentioned in section 5.2, it is recommended that interaction effects between different risk factors are investigated.

Large surveys designed to monitor developments in many health issues and working conditions may not always be suited to examine in detail the relations between different aspects of the framework. This may require dedicated surveys (in one or several countries) focusing on the causes and consequences of MSDs, and/or complementing data from surveys of workers with data obtained from occupational physicians, etc. With current privacy regulations, this requires specific attention; small-scale studies may be carried out first to obtain experience with this approach.

A possible exception is the relation between MSD-related preventive measures and the prevalence of self-reported MSDs. If an employee survey with questions on MSDs also included questions on preventive measures (as recommended in section 5.6), it would be possible to examine the relation between the presence and usage of MSD-related preventive measures and the probability that employees actually report MSDs. This would be especially relevant for occupations and/or employees with a high risk of developing MSDs.

5.9 Joint analysis of different data sources

Many different data sources have been identified that contain information on one or more building blocks of the theoretical framework on work-related MSDs. These include surveys as well as administrative data sources, at European as well as national levels. The most common way of analysing these data sources is to analyse each data source individually. The two examples below show that a joint analysis of two or more of these data sources is also possible, and that such a joint

analysis can answer research questions that cannot be answered by analysing each of these data sources on its own.

- **Adding aggregated findings from ESENER to the EWCS**

For the overview report, several logistic regressions were estimated based on EWCS data. These regressions set out to examine the likelihood of workers reporting MSDs. For some of these regressions, the EWCS data were enriched by adding aggregated data from ESENER. Observations from the EWCS refer to workers and observations from ESENER refer to enterprises, which makes it impossible to match these two datasets at the level of individual observations. It is, however, possible to add aggregated data from one survey to the other survey. For the overview report, data from ESENER were aggregated at the level of country × sector. For example, for each country and for each sector, the average number of preventive measures provided in establishments (weighted by the number of employees involved) was estimated (although ESENER is an establishment survey, it can be used to obtain indicators regarding the population of employees because of the employee-based weights included in the ESENER data files).

Matching two datasets this way is possible only if both datasets define certain subpopulations exactly the same way. In the case of the EWCS and ESENER, both surveys include the same indicators for country and sector, which makes it possible to add the aggregated information obtained from ESENER (for each country and sector) to the EWCS dataset.

- **A joint analysis of ESENER, the EWCS and the LFS**

In a recent study for EU-OSHA, TNO, the Netherlands Organisation for applied scientific research, combined information from three different European surveys: the second ESENER, the sixth EWCS and the 2013 LFS ad hoc module on accidents at work and work-related health problems ⁽¹⁹⁾. A slightly different approach was applied to combine the information from the different data sources. TNO aggregated the data from the different surveys at the level of sectors and countries. However, only the aggregated data were used for further analysis (rather than combining the aggregated data from two surveys with the individual observations from the third survey).

The resulting dataset (with aggregated data from three different surveys) contains data on two different levels (countries, and sectors within countries). This made it possible to conduct different analyses (correlations and regressions) in a multilevel setting. By using employer and employee surveys, this study could relate the perceptions and opinions of employees to awareness and actions undertaken by enterprises. For example, one of the findings from this study is that the risk awareness and risk management by enterprises is related to employees' perceptions of their exposure to risks and the self-reported (work-related) health outcomes (including MSDs) mentioned by employees.

- **Advantages of joint analysis**

These examples show the added value of combining data from different sources. Generally, combining different data sources has several advantages:

- Research questions can be answered that cannot be answered through separate analysis of the underlying individual data sources.
- Although combining different existing data sources is a complex task, it is less expensive than conducting an additional survey to collect all of the required information.

As mentioned earlier, these advantages can be realised only if the different datasets define certain subpopulations in exactly the same way. The more detailed these subpopulations are (e.g. defined by NUTS region rather than by country; by two-digit NACE classification rather than by one-digit classification; including enterprise size class), the more detailed and reliable the results will be.

Given these advantages, it is recommended that joint analysis is applied more often. For example, the EWCS data may be enriched with indicators about various economic, institutional and/or cultural

⁽¹⁹⁾ EU-OSHA (European Agency for Safety and Health at Work), *Health and safety risks at the workplace: A joint analysis of three major surveys*, 2017. Available at: https://osha.europa.eu/sites/default/files/publications/documents/Health_and_safety_risks_at_work_joint_analysis_report.pdf

variables that may differ between countries (or even regions) and/or sectors. These indicators may be macroeconomic variables, but they could also be obtained by aggregating results from administrative data sources and/or surveys at appropriate levels of aggregation.

5.10 New and emerging MSD-related risks: sedentary work

One of the research questions that this methodological review set out to answer concerns the availability of indicators on new or emerging MSD-related risks. These are the risks of sedentary work (prolonged sitting and standing), and organisational and psychosocial risk factors.

As discussed in section 5.2, the surveys that were used for this study do not include enough information on sitting and standing, and recommendations have been made on including additional questions on sitting and standing in the next wave of the EWCS. It should be mentioned, however, that some studies have raised doubts about the usefulness of such questions. In a study on sedentary behaviour at work, Holterman et al. (2017, p. 42) reported that 'A systematic review devoted to detrimental health effects of occupational sitting found limited evidence for an independent association with musculoskeletal pain' ⁽²⁰⁾. As a possible explanation for this lack of evidence, the authors argue that the extent of (prolonged) sitting is very difficult to measure using self-reported surveys: data on the amount of time spent sitting that are collected through questionnaires are not a reliable measure of the actual amount of time spent sitting, and these data are 'therefore generally regarded to have severe limitations when used in studies of occupational sedentary behaviour' (p. 42 ⁽²¹⁾).

What complicates the research on the effects of sitting is that sitting for short periods of time may also have positive effects, such as relieving the load on the hip joints and legs, especially after standing for a long time (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, 2008, p. 18 ⁽²²⁾). This indicates that, in the case of sitting (and probably also in the case of standing), a certain threshold exists: the amount of time people need to sit (without standing up) before their risk of health problems increases. Such threshold values have not yet been established (Holtermann et al., 2017, p. 42 ⁽²³⁾). Until then, it is not recommended that a question is developed for employee surveys that includes such threshold values.

In section 5.2 it was recommended that a question on 'what best describes what you do' with regard to sitting and standing is included in the next EWCS, based on a question from the EU-SILC 2017 ad hoc module on the working conditions of employees (with responses of mostly sitting, mostly standing, mostly walking or tasks of moderate physical effort, and mostly heavy labour or physically demanding work). In the absence of reliable estimates for threshold values that can be used in specific questions on sitting and standing, this may be a good alternative to measure the prevalence of this new emerging MSD-related risk.

⁽²⁰⁾ Holtermann, A., Schellewald, V., Mathiassen, S., Gupta, N., Pinder, A., Punakallio, A., Veiersted, K., Weber, B., Takala, E., Draicchio, F., Enquist, H., Desbrosses, K., Penahora García Sanz, M., Malinska, M., Villar, M., Wichtl, M., Strebl, M., Forsman, M., Lusa, S., Tokarski, T., Hendriksen, P. and Ellegast, R., 'A practical guidance for assessments of sedentary behavior at work: a PEROSH initiative', *Applied Ergonomics*, 2017, 63, pp. 41-42. Available at: <http://dx.doi.org/10.1016/j.apergo.2017.03.012>

⁽²¹⁾ Holtermann, A., Schellewald, V., Mathiassen, S., Gupta, N., Pinder, A., Punakallio, A., Veiersted, K., Weber, B., Takala, E., Draicchio, F., Enquist, H., Desbrosses, K., Penahora García Sanz, M., Malinska, M., Villar, M., Wichtl, M., Strebl, M., Forsman, M., Lusa, S., Tokarski, T., Hendriksen, P. and Ellegast, R., 'A practical guidance for assessments of sedentary behavior at work: a PEROSH initiative', *Applied Ergonomics*, 2017, 63, pp. 41-42. Available at: <http://dx.doi.org/10.1016/j.apergo.2017.03.012>

⁽²²⁾ Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, *The ups and downs of sitting — sitting at work and elsewhere*, 2008. Available at: https://www.baua.de/DE/Angebote/Publicationen/Praxis/A66.pdf?__blob=publicationFile&v=1

⁽²³⁾ Holtermann, A., Schellewald, V., Mathiassen, S., Gupta, N., Pinder, A., Punakallio, A., Veiersted, K., Weber, B., Takala, E., Draicchio, F., Enquist, H., Desbrosses, K., Penahora García Sanz, M., Malinska, M., Villar, M., Wichtl, M., Strebl, M., Forsman, M., Lusa, S., Tokarski, T., Hendriksen, P. and Ellegast, R., 'A practical guidance for assessments of sedentary behavior at work: a PEROSH initiative', *Applied Ergonomics*, 2017, 63, pp. 41-42. Available at: <http://dx.doi.org/10.1016/j.apergo.2017.03.012>

6 Findings

Developing good policies to reduce the prevalence and impact of MSDs involves analysing relevant data and drawing the right conclusions from these analyses. It is therefore important to have good and consistent data on MSDs that highlight the main issues and to properly analyse these data to provide a well-founded evidence-based approach to help policy-makers, researchers, the OSH community and enterprises guide their work(ers) and their own activities in preventing and better managing this health problem.

This methodological report sets out to answer seven research questions. In this chapter the main findings from the previous chapters are used to answer these research questions.

6.1 Sufficiency of comparable comprehensive data on MSDs

The first research question is whether sufficient and up-to-date comprehensive data on MSDs are available that are comparable across all Member States (and, if this is not the case, what the main shortcomings are and how the situation can be overcome).

Based on the discussion of the identified European survey data and administrative data on MSDs, this question can be answered as follows:

- In general, the identified surveys and administrative data sources are of high quality.
- Most data sources are comparable across all Member States. One important exception is the information on occupational diseases. National data sources are available, but in recent years it has not been possible to construct a dataset with harmonised comparative EU statistics on the numbers and types of occupational diseases. Eurostat is currently evaluating a pilot study for a revised EODS data collection. This would be a valuable source of information on occupational diseases.
- Several indicators on MSD prevalence are available. These tend to show large differences between countries that currently cannot be explained. If these differences could be explained (e.g. by institutional and/or cultural differences between countries), this would increase the reliability of these findings. It is therefore recommended that these country differences are analysed further.
- Not all building blocks of the framework are covered by the identified data sources; in particular, information on sedentary work, accidents at work (and their relation with MSDs) and preventive measures is limited. Suggestions on how this can be improved are presented in the remainder of this chapter.

6.2 Main indicators for the prevalence and impact of MSDs

The second research question concerns the main indicators or questions (or kinds of questions) used for measuring the prevalence and impact of MSDs in general and of more specific disorders. Can a typology be established (throughout surveys/administrative datasets/countries)? If this is the case, what is the added value/are the limitations of these different types of indicators/questions (compared with each other)?

MSDs are defined as medically established periarticular diseases of the limbs and spine, and multiple or localised pain syndromes (Roquelaure, 2018⁽²⁴⁾). When measuring MSDs through surveys, however, they are not identified based on the clinical nature of the complaint, but on the location of the complaint. As mentioned in the overview report, this makes it difficult to separate health complaints caused by musculoskeletal overstrain from health complaints caused by other factors. It is likely that statistics based on self-reported MSDs overestimate the prevalence of MSDs as they include health problems that clinically are not recognised as MSDs

⁽²⁴⁾ Roquelaure, Y., *Musculoskeletal disorders and psychosocial factors at work*, Report 142, European Trade Union Institute, Brussels, 2018.

The discussion on the identified European surveys has shown that each of these surveys measures MSDs in a different way. Different words are used to describe MSDs and different types of MSDs are distinguished with regard to their location, their relation with work and their longevity:

- Regarding their relation with work, most surveys are currently concerned with MSDs in general. The LFS ad hoc module is currently the only European survey that includes questions concerning work-related MSDs. It is therefore an important source of information for studies on MSDs. The next LFS ad hoc module on accidents at work and work-related health problems is planned to take place in 2020.
- Regarding their location, most surveys distinguish between three different types of MSDs (in the back, upper limbs and lower limbs), but the EHIS includes only two locations (back and neck).
- Regarding their longevity, the EHIS is concerned with chronic MSDs, while the other surveys do not distinguish between acute and chronic MSDs.

Although it is an advantage that different surveys currently cover all of these dimensions (relation with work, location and longevity), the variation in the way that the questions are formulated also makes it difficult to compare results and to combine datasets in analyses.

One of the suggestions is to include ‘body mapping’ in questionnaires concerning MSDs. Workers’ own perceptions, understanding and experience of their own body would allow them to indicate exactly where they experience complaints, distinguishing between different body areas (lower limbs, back region, upper limbs). This would prevent certain types of MSDs from being missed. This type of questioning is also easy to understand for migrant workers and takes less time.

6.3 Missing MSD indicators

The third research question is about missing questions or indicators with regard to MSDs, as well as MSD risk factors.

The analysis of the available data for the building blocks of the model in the previous chapter did not suggest that there are any missing questions or indicators regarding self-reported MSDs, but that administrative data (at the EU level) on recognised occupational diseases are not available.

Regarding MSD risk factors, indicators on (prolonged) sitting and standing are missing. The EU-SILC 2017 ad hoc module on health included a relevant question, with mostly sitting, mostly standing and mostly walking as possible descriptions of a person’s working conditions, but the results from this survey were not yet available at the beginning of this study.

6.4 The advantages of joint analysis

The fourth research question is about the added value of a joint analysis of different datasets. Two recent examples show that a joint analysis of two or more of these data sources not only is possible, but also can answer research questions that cannot be answered by analysing each of these data sources on its own. This is especially the case if the different data sources involved are collected at different levels, such as when an employee survey such as the EWCS or LFS is combined with an employer survey such as ESENER.

Another advantage of a joint analysis of existing data sources is that this will often be less expensive than conducting an additional survey to collect all of the required information.

A joint analysis of different datasets requires that data from at least some of the datasets are aggregated to a higher level (e.g. country x sector). This is only possible if the different datasets define certain subpopulations in exactly the same way. In addition, this means a loss of information (differences between individual respondents within a specific country and sector can no longer be examined).

6.5 Data gaps and comparability

The fifth research question asks what has been learned from the data analyses carried out for the overview report in terms of data gaps, comparability, etc.

Once the available data were compared with the theoretical framework on work-related MSDs developed for the overview report, the following gaps became apparent:

- The multifactorial nature of the causes of MSDs: risk factors for MSDs are multifactorial and can be divided into physical, organisational and psychosocial risk factors. There is a need for a better understanding of the possible interactions between these risk factors. The individual relations between these risk factors and MSD complaints have been discussed in the overview report, but it is not clear the extent to which different risk factors can reinforce each other.
- The relation between MSDs and accidents at work is not yet well understood. Accidents influence MSDs and MSDs influence accidents. This relationship should be explored, but currently European surveys do not include questions that can be used to examine this relationship.
- Likewise, the employment and work effects of MSDs are not well established.
- While surveys such as the EWCS, LFS and ESENER can be used to examine relations between the prevalence of MSDs and indicators for different building blocks of the model, they cannot be used to determine the causality of these relations. More generally, surveys alone cannot provide a full picture of the prevalence, causes and consequences of MSDs. This requires that survey data are complemented with other sources of information (from, for example, occupational physicians).

Annex 1: Identification of relevant data sources

This annex presents the methodology that was applied to identify the European data sources that were used for this study. Relevant data sources were identified using the following steps:

1. determine criteria for data sources;
2. prepare a longlist of data sources;
3. prepare an inventory of the characteristics of each data source;
4. select data sources that meet all criteria.

Determine criteria for data sources

▪ Topics covered by the data source

The data sources should contain data on (types of) MSDs and topics related to MSDs that were included in a preliminary version of the framework:

- MSDs:
 - different types of MSDs;
 - work related or not;
 - chronic or not;
- economic environment:
 - sector;
- organisation of work:
 - prevention activities;
 - occupation;
 - physical, organisational and psychosocial risk factors in the workplace;
- sociodemographic and individual factors:
 - gender, age, educational level, country of birth;
- impact of MSDs
 - health and safety outcomes;
 - economic costs and burden.

Only a few data sources were expected to cover all of these topics; the criterion was therefore that each data source should include information on a sufficient number of these topics.

▪ Origin of the data

The data sources should be based on surveys or administrative data at the EU level. Only existing and available sources should be used.

▪ Preference for recent data and trends

Data sources that contain comparable data for several years are preferred, as these offer the possibility of identifying and analysing trends over time.

Prepare a longlist of sources

At the start of the project, a shortlist of possibly relevant data sources was made available. Among other things, this shortlist was based on the data sources that were used for the previous EU-OSHA report on work-related MSDs ⁽²⁵⁾. Additional data sources were identified:

- by requesting that the scientific committee and the researchers involved in this project review the shortlist of data sources and add potentially relevant additional data sources;

⁽²⁵⁾ EU-OSHA (European Agency for Safety and Health at Work), *OSH in figures: Work-related musculoskeletal disorders in the EU — Facts and figures*, 2010. Available at: <https://osha.europa.eu/en/tools-and-publications/publications/reports/TERO09009ENC>.

- by asking experts from EU-OSHA to indicate potentially relevant additional data sources;
- by scanning the results of the literature review for potentially relevant additional data sources.

The resulting longlist was discussed with experts from EU-OSHA.

Prepare an inventory of the characteristics of each source

For all data sources from the longlist, an inventory was made of relevant characteristics. To structure this process, a data source template was designed and discussed with EU-OSHA. This template records the following characteristics:

1. Name of the data source.
2. Internet access.
3. Characteristics of the data source.
4. Period/years covered by the data source.
5. In the case of administrative data records:
 - units of measurement;
 - definitions used.
6. In the case of surveys:
 - methodology of the data collection;
 - Type of people interviewed (e.g. employees or inhabitants);
 - survey sample and size;
 - availability of specific MSD-related information on the following elements and associated specific questions and answer options on MSDs:
 - prevalence of (types of) MSDs;
 - different risk factors for MSDs;
 - presence of prevention activities for MSDs;
 - labour market outcomes related to MSDs;
 - public health outcomes related to MSDs;
 - impacts and economic costs/burdens as a consequence of MSDs;
 - likely expectations regarding future prevalence of MSDs, by different types of MSD;
 - information on expected impacts derived from MSDs in the mid and long term.
7. General assessment of the data source:
 - comparability, quality and reliability of the data;
 - availability of up-to-date information;
 - data collection methods;
 - coverage, assessment of whether there might be under- or over-representation of specific groups;
 - possibility to analyse trends;
 - operationalisation issues;
 - quality.

After approval, the template was used to collect relevant characteristics from all data sources on the longlist.

Select final data sources

The final inventory of characteristics for all data sources on the longlist indicates that not all data sources from the longlist meet all relevant criteria. For example, some data sources are based on secondary data only (rather than on surveys or administrative data), while other data sources do not contain any information regarding MSD prevalence. Table 15 shows all data sources from the longlist, indicating which data sources were used in the overview report.

Table 15: Characteristics of data sources used for this study (source Panteia 2019)

Data source	Nature of data	Supplier	Used in overview report
Labour Force Survey (LFS) ad hoc module 2013	Survey	Eurostat	Yes
European Health Interview Survey (EHIS)	Survey	Eurostat	Yes
European Survey of Enterprises on New and Emerging Risks (ESENER)	Survey	EU-OSHA	Yes
European Working Conditions Survey (EWCS)	Survey	Eurofound	Yes
European Statistics on Accidents at Work (ESAW)	Admin. data	Eurostat	Yes
WHO European Health for All (HFA) database	Admin. data	WHO	Yes
WHO European Mortality Database (MDB)	Admin. data	WHO	Yes
European Quality of Life Survey (EQLS)	Survey	Eurofound	No
European Social Survey (ESS)	Survey	ESS ERIC	No
Eurobarometer	Survey	European Commission	No
Survey of Health, Ageing and Retirement in Europe (SHARE)	Survey	SHARE Research Data Centre	No
European Core Health Indicators (ECHI)	Admin. data	Eurostat	No
European Occupational Diseases Statistics (EODS)	Admin. data	Eurostat	No
Health at a Glance	Admin. data	OECD	No

The European Agency for Safety and Health at Work (EU-OSHA) contributes to making Europe a safer, healthier and more productive place to work. The Agency researches, develops, and distributes reliable, balanced, and impartial safety and health information and organises pan-European awareness raising campaigns. Set up by the European Union in 1994 and based in Bilbao, Spain, the Agency brings together representatives from the European Commission, Member State governments, employers' and workers' organisations, as well as leading experts in each of the EU Member States and beyond.

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