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A NARRATIVE REVIEW ON FACTORS ASSOCIATED WITH JOB INTERRUPTION DURING PREGNANCY

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Abstract
Most women continue to work during pregnancy. However, some of them have to stop working before giving birth. Absence from work poses several challenges for employers and employees, as well as for society. The literature on absence from work during pregnancy and its determinants remains inconsistent and rather scarce. To conduct a narrative literature review on the factors associated with work interruption and on existing interventions aimed at reducing the absence prevalence during pregnancy. The review refers to published peer-reviewed articles dealing with all types of work interruption among pregnant women. Keyword searches were performed in the electronic databases PubMed, EMBASE, and Google Scholar, covering the period 2000–2022. The review, which includes 42 papers, presents a broad and comprehensive picture of factors and interventions associated with absence from work among pregnant workers. The factors appear at different levels and include factors related to the pregnant women, such as individual health and socio-demographic factors; employer and workplace-related factors, such as risk exposures and working conditions; factors related to the role of the healthcare provider; and factors related to the national context (social benefits/insurance). The determinants of absence from work during pregnancy are complex and multifactorial and involve multiple stakeholders. The discussion addresses gaps and needs in the literature on pregnancy at work and in the field of occupational health. Int J Occup Med Environ Health. 2023;36(3):303–23

Key words:
pregnancy, occupational health, absences from work, workplace intervention, narrative literature review, workplace accommodation

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INTRODUCTION

Since the 1970s, the employment rate of women, including women of childbearing age, has been increasing in many countries [1]. While the need to protect pregnant women and mothers was an early preoccupation of the International Labor Organization (Maternity Protection Convention, 1919 [No. 3]), in the 1990s and 2000s, regulations specifically targeting the safety and health of pregnant workers and their children to be born were implemented in most developed countries following Directive 92/85/EC (1992) [2] and ILO convention 183 (2000) [3].

In many Western industrialized nations, the majority of women continue to work during pregnancy. However, some take time off work. Although it is difficult to estimate the number of working days lost during pregnancy, statistics show that the proportion of women who are absent from work at some point during their pregnancy ranges from 31.7% in Sweden to 71.3% in Poland [4]. In Norway, 3 out of 4 women were absent from work for at least 1 week during their pregnancy [5]. In Denmark, pregnant workers had 6.1 days/month of absence, while non-pregnant women had only 0.95 days/month [6].

Absence from work poses several challenges for employers and employees, as well as at the societal level. Absence from work during pregnancy can have a significant economic impact on those who bear the costs. A UK study reported that part of the employers consider pregnancy as generating unreasonable costs and difficulties in terms of human resources [7]. Because of these absences, some companies even consider pregnancy as a financial risk. For employers, the absences often require replacement, disrupt the organization and planning of work, which can result in lost production and affect the quality of services. For employees, the absence from work can reduce income as salaries are rarely covered at 100%, although there are variations between countries and companies. Absence from work can also affect the mental health of the workers, as work is as an important part of life [8]. Not being able to fulfill obligations to employers, or even colleagues can lead to frustration or feelings of guilt [9].

This raises questions about the factors associated with work interruptions in order to determine to what extent, and how, absences during pregnancy could be prevented or reduced. The literature on work absenteeism during pregnancy and its various determinants is not abundant. The objectives of this work are to provide a narrative review of:

- the factors associated with work absence among pregnant women, regardless of the administrative classification of the absence (sick leave, prenatal leave, or preventive leave), and
- interventions aimed at reducing the prevalence of absences during pregnancy.

METHODS

Search methods and criteria for included studies

Mainstream literature database (PubMed) has been searched using key search terms related to pregnancy (such as pregnant, pregnancy, childbearing), and absence whatever the administrative classification of the absence (absenteeism, job interruption, sick leave, medical leave, preventive leave, prenatal leave, paid leave, work disability), and work conditions (work, worker, occupational exposure). A PubMed search was conducted, using the following medical subject heading (MeSH): ("woman" OR "women") AND ("pregnan*") AND ("leave" OR "absence*" OR "stopped working" OR "continue working" OR "return to work" OR "disabling condition") NOT ("maternity leave" OR "parental leave" OR "breastfeed*" OR "contracep*" OR "reproduct*" OR "fertil*" OR "diagn*" OR "cesarean" OR "neonatal*" OR "HIV"). The search was limited to English-language articles from western countries (Europe, USA, and Canada) and published in 2000–2022. Articles whose primary outcomes were not related to absences from work during pregnancy were excluded. The references' list of found studies have been screened for additional relevant citations that were not identified directly. The authors also

added relevant studies from Google Scholar and EMBASE, based on their own knowledge of the field.

RESULTS

Search results

The database search retrieved a total of 2748 records. Reading titles and abstracts led to the exclusion of 2728 records because they did not meet the inclusion criteria. Twenty articles remained for the analysis, 22 further articles were identified and included. The final selection included 42 papers. Selected papers are presented in a flowchart (Figure 1). The list of papers included in the narrative review is presented in Table 1. Twenty-five articles were based uniquely on Scandinavian population (Sweden: 5, Norway: 9, Denmark: 10, and Norway and Sweden: 1). The authors were also able to find American (2), Canadian (1), European (1), Spanish (1), Italian (1), French (2) studies, UK (1), and Swiss (3) articles. Five literature reviews were also included.

This document reviews quantitative and qualitative studies dealing with issues related to interruption of work activity during pregnancy. The authors developed a typology of factors distinguishing between those related to the individual, such as health and socio-demographic factors; to the workplace, such as risk exposures and working conditions; to health care providers; and to social benefits/insurance. Finally, the authors identified interventions aimed at reducing the prevalence of absences during pregnancy. The multidimensional, and multilevel typology of factors is presented in Figure 2.

Typology of factors associated with absence from work among pregnant women

Pregnant women factors

Pregnancy symptoms and pathologies

Pregnancy is associated with physical, functional, and emotional changes, that affect interactions with the workplace. It is a condition that can create or exacerbate specific health risks for working women. While some women work with little or no discomfort from pregnancy-related changes, problems such as nausea and vomiting, pain, and fatigue can affect women's work performance and well-being. The phenomenon may be reinforced when pregnancy is at risk or if women are exposed to dangerous or strenuous working conditions.

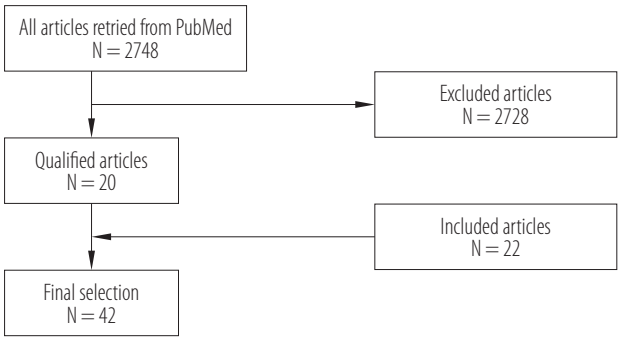

Figure 1. Flowchart of selected articles on factors and interventions associated with absence from work among pregnant workers

Several studies have examined the extent to which pregnancy-related health conditions are associated with absence (prevalence and duration). Investigating a wide range of pregnancy-related health conditions, Dorheim et al. [5] found that the major factors associated with absence from work were pelvic girdle pain and fatigue/sleep problems. Nausea, exercising less than weekly, and chronic pain before or during pregnancy were also strongly associated with absence from work in all trimesters. Among Norwegian and Swedish pregnant women, higher intensity of lumbopelvic pain (LPP) is associated with higher probability of absences [10]. Backhausen et al., found that back pain was the most common pregnancy symptom-related factors explaining work interruption [11]. Using data obtained from a cohort study conducted with a primary focus on low back pain in a population of women seeking antenatal care at a Danish Hospital, the study also reported that frequent pre-pregnancy low back pain was predictive of long-term work absence (>20 days) during pregnancy. More generally, women with pre-existing musculoskeletal pain seem to be at increased risk of work absence during pregnancy compared to those without [12].

Table 1. List of publications included in the narrative review on factors associated with absence from work during pregnancy, and interventions aimed at reducing the prevalence of absences during pregnancy

Reference	Publication year	Country	Theme
Abderhalden-Zellweger A. et al. [31]	2021	Switzerland	factors: role of the physician
Adberhalden-Zellweger et al. [41]	2021	Switzerland	interventions relying on accommodations at the workplace
Abderhalden-Zellweger et al. [43]	2021	Switzerland	interventions relying on accommodations at the workplace
Addati et al. [25]	2014	global	factors: work atmosphere and environment
Andersen et al. [50]	2022	Denmark	interventions targeting managers
Ariansen et al. [13]	2014	Norway	factors: sociodemographic and general health
Backhausen et al. [11]	2018	Denmark	factors: symptoms and pathology; sociodemographic and general health; occupational exposure
Backhausen et al. [49]	2021	Denmark	interventions targeting managers
Begtrup et al. [48]	2021	Denmark	interventions targeting managers
Bewley et al. [58]	2016	UK	interventions relying on accommodations at the workplace
Brekke et al. [20]	2013	Norway	factors: sociodemographic and general health
Dorheim et al. [5]	2013	Norway	factors: symptoms and pathology; sociodemographic and general health interventions relying on accommodations at the workplace
Elden et al. [9]	2013	Sweden	interventions relying on healthcare services utilization
Elden et al. [46]	2008	Sweden	interventions relying on healthcare services utilization
Fall et al. [28]	2013	Canada	factors: work atmosphere and environment
Frazier et al. [32]	2001	USA	factors: role of the physician
Frazier et al. [33]	2001	USA	factors: role of the physician
Gutke et al. [10]	2015	Norway and Sweden	factors: symptoms and pathology; occupational exposure
Hammer et al. [21]	2019	Denmark	factors: occupational exposure
Hansen et al. [18]	2015	Denmark	factors: sociodemographic and general health; occupational exposure
Henrotin et al. [14]	2017	France	factors: sociodemographic and general health; occupational exposure
Kaerlev et al. [6]	2004	Denmark	factors: occupational exposure; social benefit systems and insurance policy
Kihlstrand et al. [47]	1999	Sweden	interventions relying on healthcare services utilization
Kristensen et al. [44]	2008	Norway	interventions targeting accommodations at the workplace
Larsson et al. [34]	2006	Sweden	factors: role of the physician
Mastrangelo et al . [51]	2010	Italy	interventions relying on information campaigns
Melsom et al. [30]	2014	Norway	factors: work atmosphere and environment
Pedersen et al. [17]	2021	Denmark	factors: sociodemographic and general health; occupational exposure
Pedersen et al. [45]	2018	–	interventions relying on healthcare services utilization
Probst et al. [42]	2018	–	interventions relying on accommodations at the workplace
Rieck and Telle [15]	2013	Norway	factors: sociodemographic and general health
Russel et al. [27]	2007	Europe	factors: work atmosphere and environment interventions relying on accommodations at the workplace

Table 1. List of publications included in the narrative review on factors associated with absence from work during pregnancy, and interventions aimed at reducing the prevalence of absences during pregnancy – cont.

Reference	Publication year	Country	Theme
Salihu et al. [26]	2012	UK, USA, Canada and European Union	factors: work atmosphere and environment
Seglem et al. [12]	2017	Norway	factors: symptoms and pathology
Sejbaek et al. [22]	2020	Denmark	factors: occupational exposure
Selboe et al. [29]	2017	Norway	factors: work atmosphere and environment
Severinsen et al. [24]	2019	Denmark	factors: occupational exposure interventions relying on accommodations at the workplace
Stafne et al. [23]	2019	Norway	factors: occupational exposure interventions relying on healthcare services utilization
Sydsjö et al. [39]	2005	Sweden	factors: social benefit systems and insurance policy
Truong et al. [4]	2017	multiple European countries	factors: social benefit systems and insurance policy
Vigoureux et al. [19]	2016	France	factors: sociodemographic and general health; occupational exposure
Villar et al. [16]	2019	Spain	factors: sociodemographic and general health; occupational exposure; social benefit systems and insurance policy

Sociodemographic characteristics and general health

Other factors, including general health status and sociodemographic factors, may be associated with job interruption. Several studies have found that age is a variable that affects the risk of job interruption during pregnancy. In France and Norway, younger maternal age appeared to increase the risk of job interruption [13–15], and conversely, in a Spanish setting, workers aged >35 years were found to have less absence from work [16].

A recent Danish study, examined the associations between absence from work >14 days and health related risk factors, including burnout, stress, and possibility of depression, previous work absence and poor self-rated health. The results show that both poor health status and high likelihood of depression were risk factors for absence from work during pregnancy [17].

Among other factors associated with absence from work, another Danish study highlighted that multiparity, overweight, obesity, assisted reproductive therapy and prolonged waiting time to pregnancy >12 months may increase the risk of absence at work [18].

In France, social vulnerability, characterized by a disadvantaged social situation and job instability (temporary contract, low-skilled occupational status), is also reported to predict an increased risk of absence from work [19]. Absence during the first trimester of pregnancy was found to be more frequent among workers with unstable jobs and with low-skilled occupations in France [19] and with a low level of education in Norway [5]. Consistent results were reported in a Danish study [11]. After controlling for pre-pregnancy low back pain and mental disease, higher education was a negative predictor of long-term absence from work. In addition, a French study found fewer absences among women with a permanent contract [14]. Finally, the immigrant status was found to be a good predictor of absence from work among pregnant workers in Norway [20].

Work-family conflict and home-work commuting increase the risk of absence from work during pregnancy among mothers in France. However, family structure (living with a partner, having children) is not found to have an impact on work interruption during pregnancy [14]. Neverthe-

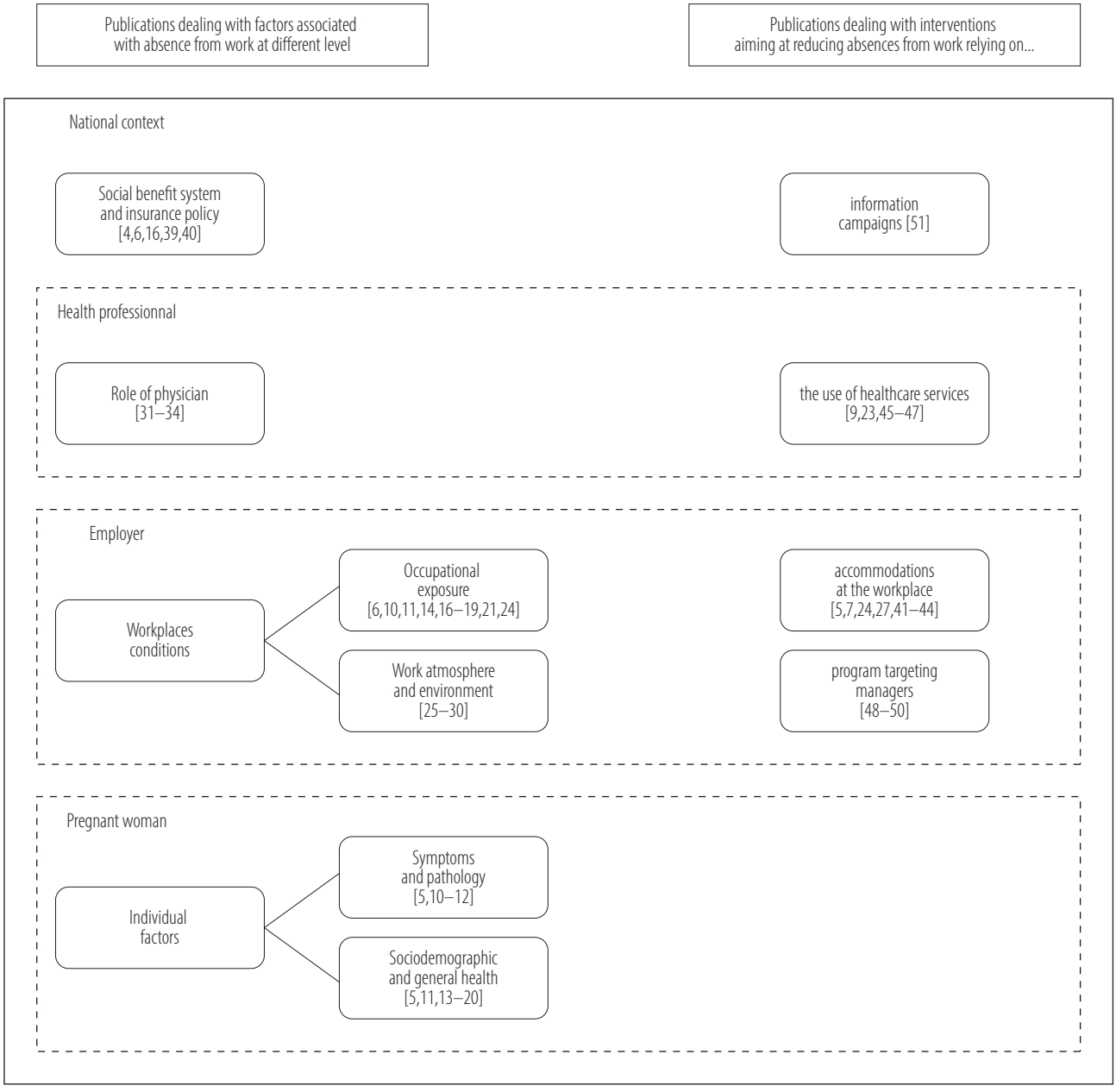

Figure 2. Multidimensional, and multilevel typology of factors associated with absence from work during pregnancy, and interventions to reduce the absences, 2000–2022

less, in Norway [5,13] and Denmark [18], multiparity is found to be associated with absence from work, especially among younger women. Multiparity appears to increase the likelihood of being absent from work and the number of days of absence.

Employer and the workplace conditions

Dangerous or strenuous occupational exposures

Absence from work during pregnancy appears to be associated with certain types of occupational exposures and activities. This may reflect the direct effect of strenuous

or dangerous working conditions, or it may be the consequence of protective legislation, that provides for job interruption if the employer is unable to adapt the job or provide a safe job.

The impact of occupational exposures on pregnancy-related absenteeism has been studied in several countries. Some studies have also looked at the amount or duration of absence. However, there is paucity of results in the literature on the proportion of absences due to occupational exposures compared with other problems, including health. For example, a study in Denmark found that less than 10% of women attributed their absence to occupational risk factors [11].

Several studies conducted in different settings and among different populations of pregnant women have shown a positive association between strenuous work and absence from work. Among Danish hospital employees, women exposed to heavy lifting, walking or standing, and night or shift work had a higher risk of work interruption [6]. In a similar medical work environment, another study complements these findings. Although most of the participants were nurses (64%) or physicians (16%), the results showed an increased relative risk of absences after night shifts compared with day shifts during all trimesters of pregnancy [21]. In Spain, among pregnant workers from a public university hospital, the risk of absenteeism and its duration were associated with exposure to occupational hazards such as ergonomic, safety, physical, and psychosocial factors. Conversely, workers with lower level of risk exposure had fewer absences [16].

More sophisticated analyses that account for potential confounders strengthen the previous results. Hansen et al. [18] examined the associations between the risk of absences between 10 and 29 completed pregnancy weeks and job characteristics (work posture, lifting at work, shift work, work hours, and job strain) among a large Danish population-based cohort of pregnant women. Accounting for several potential confounders (age, risky health behaviors, socioeconomic status, prior absences, chronic diseases, parity, pre-pregnancy BMI, and receiving support from colleagues at work), the statistical analysis showed that non-sitting work postures, lifting, shift work, number of night shifts, and high job strain were associated with an increased risk of job interruption. Yet, working >37 weekly hours was associated with a lower risk of absences. In Denmark, a more recent study that controlled for the health status of pregnant workers (i.e., level of burnout and stress and assessment of possibility of depression) also reported a positive link between strenuous work and absences from work [17]. In France, a study examined associations between 17 indicators of exposure of potential occupational hazards and work interruption [14]. The hazards included biological hazards (working with very young children, sick people, animals); chemical hazards; night work; physical hazards (standing >1 h/day, stair climbing [several times a day], forward bending ≥1 h/day, difficult postures [upper and/or lower limbs], heavy lifting >5 kg, repetitive tasks, vibration [driving], temperature [>30°C]); noise (80 dB, work on industrial machines); ionizing radiation and electromagnetic fields. Using a cumulative index of occupational hazards (0, 1–2, 3–4, >5 risks), and controlling for potential confounders (age, deprivation, demographic factors and pregnancy at risk), the results show a positive gradient between "at least 1 absence from work" and the index of occupational hazards for the 3 periods of pregnancy considered, the first, second or third trimester. Moreover, the duration of absence was found to be associated with the number of occupational hazards, ranging from an average of 38.6 days of absence for a cumulative index of 1–2 risks, to 54 days for cumulative index of >5 risks.

In addition to focusing on the association between absence from work and risk exposures during pregnancy, Sejbaek et al. [22] examined to which extent exposure

to multiple concurrent adverse occupational exposures increased the probability of being absent from work. In a Danish context, the authors also created a cumulative exposure index based on 5 occupational exposures (job demands, job control, work posture, work shift, lifting). The analysis which was adjusted for potential confounders (previous absence, age at conception, parity, fertility treatment, smoking, leisure-time exercise, BMI, and socioeconomic status) showed that a higher number of occupational exposures led to a higher probability of absence during pregnancy. More specifically, the results show that the hazard ratio increased from 1.25 for 1 occupational exposure to 2.87 for 4–5 compared with 0 occupational exposures.

Closely related, the type of occupation has also been found to influence the risk of job interruption. In Spain, nursing aides appeared to have an increased risk of absences from work compared to nurses or physicians [16]. In Denmark, the number of days of absence is highest among workers in retails, hotels, healthcare, cleaning services and social services and lowest in public administration [17]. In France, the size of the companies was found to have an effect on absence from work, with smaller companies having fewer days of absence than larger ones [14]. The timing of absences was also correlated with occupational characteristics in another French study. Women self-employed, worked long hours, held managerial positions, or worked in manual occupations were more likely to stop working during the first trimester of pregnancy [19].

These results are also found among pregnant women with LPP or low back pain. In the context of LPP in late pregnancy (gestation week 32–36) in Norway, Stafne et al. [23] found workers who did not require accommodation were less likely to be absent from work due to LPP than those who did by using multivariate analysis and controlling for several confounders (demographics and work characteristics). Previous studies reported that women with LPP and non-sedentarily occupation were twice more likely to be absent from work than those with LPP and sedentarily in Norwegian and Swedish setting [10]. In the context of pregnancy-induced low back pain, absence from work was also investigated among Danish workers. Using qualitative approach, authors underline the possibilities of workplace adaptations to reduce the time off work [24].

Work atmosphere and environment

Factors related to the workplace atmosphere, including psychological aspects and interpersonal relationships may influence absence from work during pregnancy. Despite legislation prohibiting pregnancy discrimination in the workplace [25], a review of publications in UK, USA, Canada or the European Union suggested that women still experience some form of disadvantage, both formal and informal, because of their pregnant status [26]. In Ireland, a review also reported perceptions of discrimination or unfair treatment of pregnant women in the workplace [27]. In particular, 10% of women reported experiences involving multiple financial losses, such as reduction in salary or bonus, receiving a smaller pay rise or bonus than colleagues, or being passed over for promotion because of pregnancy. However, the authors did not find any study that directly linked these treatments to absenteeism.

In Canada, a stressful atmosphere has been shown to affect the prevalence of depression among pregnant women, which increases the rate of absences [28]. Conversely, a research team in Norway found that supportive working conditions can reduce the probability of absences among pregnant workers [29]. Promoting a supportive work environment increases the probability that women will continue to work. In Ireland, women who perceived their employer as supportive were less likely to report negative health effect from work [27].

With regard to the composition of the working environment, Melsom [30] focused on how gender composition

of the workplace may affect work interruption during pregnancy. The author examined whether the long-term absences – absences >16 days – were correlated with the proportion of women at the workplace. Using Norwegian data from 2003–2011 on the total population of employees, and controlling for occupational categories, the results show a positive and significant association between the proportion of women in the workplace and absence from work during pregnancy. In other words, the absence rates of pregnant workers are higher in female-dominated workplaces than in male-dominated workplaces. According to the author, this finding is consistent with the idea of more lenient norms regarding absence from work during pregnancy among workers at female-dominated workplaces.

Role of the attending physician/gynecologist

Physicians, especially gynecologists, play a role in work restrictions/interruptions. In most countries, prescriptions for medical leave must be linked to medical reasons that limit the woman's ability to work. The nature of the pregnant woman's work (e.g., extreme physical activity, exposure to chemicals), pregnancy-related complications (e.g., twins, placenta previa), and non-pregnancy medical morbidities (e.g., cardiovascular disease) may also motivate requests for time off or workplace accommodations. In Switzerland, as in other countries, the role of gynecologists is to explain to the woman that she may be entitled to leave from work and to issue a medical certificate [31].

Very few studies have addressed the attitudes of physicians/obstetricians regarding the job-prescription of work interruption for pregnant workers. Those that have focused on this issue have emphasized that job restrictions are often prescribed by physicians. A study from the state of Georgia in the U.S. reported that among 1635 pregnant employees, 27.7% were advised by a medical practitioner to stop working during the pregnancy [32]. In this study, hospitalization during the pregnancy and a history of a previous preterm birth increased the probability that a prenatal care provider would advise the woman to stop working [32].

In a study design based on patient vignettes, physicians in the U.S. were asked whether they would recommend a job restriction because of occupational exposure for the case, and to what extent the patient's wishes would influence their decision [33]. The results show that job restriction was not associated with the physician's specialty, age, gender, the percentage of employed pregnant women in his or her practice. Physicians were not consistent in their restriction recommendations, and this was most pronounced in the low obstetric risk vignettes. Physicians reported that they would typically make a decision about work restrictions based on a combination of their own judgment and the patient's wishes. Family physicians were more likely than obstetricians to say that they would consider the patient's wishes when making a decision about a prescription of absence. According to the authors, the variability in employment recommendations suggests that some women may not receive the job modifications they need, while others may be unnecessarily restricted or withdrawn from work.

A Swedish study collected opinion of obstetricians on situations of absences from work during pregnancy [34]. A questionnaire was sent to obstetricians working in 7 public hospitals. In 46% of all contacts with pregnant women, obstetricians were unable to provide a relevant medical diagnosis to justify the interruption of work (reported as sick leave). Obstetricians felt that patients were too often sick-listed because they were accommodating women's wishes to avoid conflict. In more than half cases, obstetricians experienced a conflict in their dual role as patient's confidant and objective medical expert in certifying diagnoses and work incapability. Male and female physicians did not differ in their opinions about prescribing time off work for their patients, except for

back pain where men (73%) were more likely than women (51%) to state that back pain could be caused by pregnancy.

National context: social benefits system and insurance policy

In addition to micro and meso level factors, macro level factors related to the national context and the institutional framework of the country may play a role in the absence from work during pregnancy. The legislation on maternity leave, its duration and its distribution between before and after childbirth are factors that are likely to affect absences from work during pregnancy. Second, and related to the first point, the difference in administrative classifications of absences from work may also explain absences from work.

Maternity leave is available to mothers and is a health and welfare measure designed to protect the health of the mother and newborn child in most countries. It is usually taken before, during and immediately after childbirth. Summarizing the length of maternity leave (including prenatal and postnatal leave), Table 2 shows considerable variation across countries in focus. There is a great deal of variability between countries, both in terms of the total length of leave and in terms of the distribution of approved leave between the prenatal and postnatal periods. The total length of maternity ranges from a minimum of 14 weeks in Switzerland to a maximum of 39 weeks in the UK. All the countries included in this study except Switzerland and the U.S. offer the flexibility of using some of the weeks of maternity leave as prenatal leave (before the birth) and then reducing the length of postnatal leave. This option also varies widely between countries, ranging from 3 weeks in Norway or 4 weeks in Denmark and up to 16 weeks in Ireland. In addition, in countries in focus (except Canada and U.S.), the legislation gives the possibility to interrupt work in the event of exposure to occupational hazards during pregnancy (preventive leave).

Very few papers deal with the administrative classification of work absences and distinguish between absences from work due to illness (sick leave) and absence from work due to arduous or dangerous working conditions (preventive leave), and other reasons. This distinction was studied in the Swedish context following the introduction

Table 2. Duration of maternity and prenatal leave – entitled to benefits – in the countries in focus

Country	Leave duration		Reference
	maternity	prenatal	
Canada/Quebec	16–19 weeks depending on the jurisdiction	up to 12 weeks	35, 37
Denmark	18 weeks (mother's quota)	4 weeks	35, 36
France	16 weeks	6 weeks	35, 36
Ireland	26 weeks	up to 16 weeks (min. 2 weeks)	35, 36
Italy	21 weeks (5 months)	up to 8 weeks (2 months)	35, 36
Norway	15 weeks (mother's quota)	3 weeks (mother's quota)	35, 36
Spain	16 weeks	up to 10 weeks	35, 36
Sweden	68.5 weeks after birth split to both parents for 1 child (mother's quota – min. 13 weeks – 90 days)	up to 8.5 weeks (60 days)	35, 36
Switzerland	14 weeks starting on the day of delivery	no	35, 36
United Kingdom	39 weeks	up to 11 weeks	35
United States	no	no	38

of a pregnancy benefit in 1980 for pregnant workers in heavy occupations. The intention behind the pregnancy benefit was to ensure that women working in arduous occupations would reduce the use of their parental benefit days before childbirth or the use of sick leave certificates while being protected from occupational risks. Sydsjö et al. [39] investigated whether this benefit achieved its goals. The results do not show the expected link, as no direct association was found between sickness absence and the number of days of pregnancy benefit used. Paradoxically, the average number of days of sickness absence increased despite the introduction of the Pregnancy benefit. Financial considerations may play a role in explaining these findings. The authors also emphasize that these results are in contrast to other previous studies claiming that improving social benefits for pregnant women would limit the use of sick leaves [6].

Truong et al. [4] also found that national sick leave policies explain the different patterns of absence prevalence among pregnant women across European countries. A 3-category variable was used to identify the level of sick leave policy according to the level of wage replacement and waiting time for benefits; "high" for Norway, "medium" for Croatia, Finland, Poland, Russia, Serbia, Slovenia and Sweden, and "low" for Italy, France, the UK and Switzerland. Living in countries with "low" sick leave policies is associated with a lower probability of extending sick leaves. Other national differences, such as difference in women's perception of their own health and difference in doctors' prescribing practices, may play a role.

In Spain, nature of social benefits also seems to play a role in pregnancy-related absenteeism [16]. The study examined 2 types of situations, among healthcare workers: sickness absence and pregnancy occupational risk (POR). Women could access sickness absence benefits if they were absent from work because of health problem not related to work. The POR could be used by women when absence from work was necessary to prevent exposure to occupational risk factors that could adversely affect the pregnancy. The sickness absence is certified by a doctor and the worker receives 60–75% of her salary until she returns to work, although companies can supplement up to the full salary by collective agreement. In contrast, POR provides to the worker 100% of her salary, as the responsibility for providing adequate working conditions lies with the employers. This study highlighted that this type of social benefits is efficient, as workers use it to protect themselves against strenuous working conditions. In particular, women who are highly exposed to ergonomic, physical, and psychosocial occupational risk factors are more likely to use POR [16]. A complementary analysis by the same authors also showed that the most common reasons covered by the sickness absence benefits during pregnancy were pregnancy-related and musculoskeletal disorders. Exposure to occupational risk factors was not frequently cited as a reason covered by sickness absence benefits. As underlined by the authors, this suggests the complementarity between the 2 social security systems in the country, which allows a certain balance between work and health during pregnancy [40].

Interventions aimed at reducing absences from work

Accommodations at workplaces

Workplace accommodations are adjustments to a job's duties or work environment that make it possible to continue working safely during pregnancy. Examples of adjustments include temporary transfer to a less hazardous or strenuous job, provision of modified equipment (e.g., providing a backrest on a stool), more frequent or longer breaks, or working from home. In practice, these adjustments are not always available. In Ireland, for example, 25% of pregnant women reported that flexible workplace arrangements were not available at their workplace [27]. In Switzerland only a minority of the employees benefit from protection in accordance

with the law [41]. Indeed, the implementation of work adjustments during pregnancy may be a major challenge for several reasons that operate at different levels (pregnant women, companies, and the macrosocial level) [42]. For example, the representation of the need for accommodation may differ between actors. Pregnant women and their employers may not have the same perception of the occupational risks to which pregnant women are exposed. If the company does not consider the job to be at risk, it will be less likely to implement protective measures [43]. More broadly, there appears to be a difference in the perceptions of working conditions between employees and employers [7]. At the firm level, the organizational and economic implications of work adaptations may either support or limit the implementation of work accommodations. At the institutional level, there may be many practical barriers to imposing the implementation of protective measures on firms [42].

Some studies have attempted to assess whether adjustments were associated with reduced risks and duration of absence during pregnancy. However, this literature on the effects of workplaces accommodations on absence from work is sparse. In 2007, a Norwegian study reported that job adjustments were associated with an 11% lower risk of absence from work during pregnancy [44]. Such findings were confirmed in a context of absence from work caused by low back pain amongst Danish women [24]. Among women who interrupted their job, workplaces adaptations were associated with an increased probability of returning to work [44]. In 2012, a Norwegian longitudinal study [5] showed the effectiveness of job adjustment on absences from work. The study examined individual factors associated with work absences among women in their 17th week of gestation and the impact of adjustments on the availability at work. Two groups of pregnant women were compared: those who stated that job adjustments were available and those who stated that no adjustments were available. Although the adjustments did not totally prevent the interruption of work the duration of interruption was 1 or 2 weeks shorter for women who received work adjustments.

Use of healthcare and fitness services

Some countries have implemented programs using healthcare services or exercise interventions to reduce absenteeism during pregnancy. This is the case in Scandinavian countries, where therapeutic support programs have been offered to improve the well-being of pregnant women, reduce pregnancy related disease and/or limit job interruption.

A literature review by Pedersen et al. [45] summarizes the impact of interventions targeting absence among pregnant women in healthcare settings in 2 countries, Sweden and Norway. Results from 5 studies with a randomized controlled trial design were reported. First, the effect of 3 types of physical training were examined: aquatic exercise, 1 h of aerobic training with a therapist, and 30 min of relaxation. Among these interventions, aquatic exercise seemed to reduce the probability of absence from work: 13% of women who participated in aquatic exercise compared to 22% in the control group (no intervention). The other 2 interventions showed no effect. Second, still in Pedersen [45], 2 complementary medicine therapies were also explored. They were based on 5 sessions of craniosacral therapy and 12 sessions of acupuncture treatment. These interventions did not prove to have any effect on absence when comparing treatment and control groups.

A Norwegian randomized controlled trial investigated the effect of exercise on pregnancy-related pathologies, and work absence. Workers were invited to participate in the 2-arm study comparing the effect of a 12-week regular exercise program with standard antenatal care on absence from work due to LPP in late pregnancy [23]. Descriptive statistics show a trend toward a reduced risk of absence from work due to LPP when women are included in the exercise group. However, in contrast with

other studies [9,46,47], in the multivariate regression controlling for confounders, participation in the exercise group shows a modest effect on reducing the probability of absence from work due to LPP in late pregnancy.

Programs or feedback targeting managers

At the managerial level, a number of initiatives conducted in Denmark, have been tested to improve the work environment and reduce pregnancy-related absenteeism. For example, a manager-oriented intervention was tested in Denmark to inform managers of hospitals and days-care centers with the objective of improving working environment for pregnant women [48]. The intervention based on a short educational program was not shown to reduce absence. This evidence highlights the difficulties for managers to reduce adverse psychosocial factors through a single educational intervention. Two other studies addressed the practical challenges that managers may face with pregnancy and work accommodations. Based on qualitative interviews, a study conducted in 5 public hospitals highlights that managers invest their efforts in the working relationship with pregnant employees by adjusting their activities and work schedules, while, at the same time, balancing work tasks between all staff members. Dialogue was found to be central to understand the needs of all the employers [49]. Based on a qualitative study focusing on the experience of pregnant employers and their managers, Andersen et al [50] provide insight into how managers deal with pregnancy in the workplace in order to identify preconditions for successful workplace adaptations. The results of the semi-structured interview identify 3 dimensions for successful workplace adaptations during pregnancy: general acceptance by all employees of the needs of pregnant women's, an organizational culture that promotes occupational health in general, and professional guidance and counselling to support both pregnant workers and managers on the issue of pregnancy at work.

Information campaigns

In Italy, a study evaluated the efficiency of an educational campaign providing information about occupational risks during pregnancy and the benefits available to pregnant women [51]. There was an increase in the number of government approvals for job suspensions due to maternity protection compared with the number of job suspensions due to health problems, confirming the usefulness of providing information on the legislation and benefits available to eligible pregnant women. The authors also found that the ratio of women using maternity protection benefit over the women using sick leave increased from 1989 to 2005. This suggests that physicians (or pregnant women), previously used sick leaves to protect pregnant worker from risky work conditions because of the lack of information. It seems to show that medical prescription gradually evolves when a new policy is introduced, and that information campaigns are effective in accelerating the adaptation rate to the new policy.

CONCLUSIONS

This work highlights that the determinants of absence from work during pregnancy are complex, multifactorial, and multilevel including several stakeholders.

Complexity of factors: health status, sociodemographic and work characteristics

The review suggests that interruption or absence from work among pregnant women may be explained by a complex articulation of health status, sociodemographic and work factors. As might be expected, pregnancy symptoms and related pathologies are reasons that explain absence from work. On the individual level, the review highlights non-pregnancy-related health factors and sociodemographic factors as determinants of absences from work during pregnancy. Women with less favorable social conditions stop working earlier during pregnancy, regardless of their medical situation (risk or physiological

pregnancy) [13–19,27]. Work characteristics (risk exposition, heavy lifting, night work, etc.) are strong predictors of work absences from work [5,6,11,14,16–19,21–24,44]. The atmosphere and environment at work are also determinants of absence from work for pregnant women [25–30]. Some results, such as the lower rate of absence in small companies (in France [14]) raise the question of the possible non-take-up of social rights in certain cases.

Importance of healthcare professionals and occupational health professionals

This work highlights that determinants of absences include several stakeholders, with a particular role given to gynecologists or attending physician of the pregnant woman. The advice or recommendations of gynecologists play a role in explaining the absence from work among pregnant workers. They have 2 main roles in relation with their patients:

- trying to gain the confidence of the pregnant woman;
- certifying the woman's ability or inability to work, either because of harmful working conditions (preventive leave) or because of illness (sick leave).

For everything related to the medical dimension, i.e., management of disease and/or clinical symptoms, but also advice on specific health risk behaviors during pregnancy, gynecologists feel confident as caregivers and risk preventers [52]. However, they may struggle to effectively address occupational issues with their patients. Lack of occupational health information, and training, but also time constraints can make it difficult for physicians/gynecologists to determine whether the women are working in a safe environment [31,52]. To make an objective decision about the ability to work, physicians need information about the working conditions. However, there may be information asymmetries between gynecologists and patients about working conditions. The information reported by pregnant workers to gynecologists is usually not enough to make a decision. All this may create a gap for interpretation of working situations leading to a variability in physicians' recommendations and actions regarding cessation of work. For these reasons, in most countries, occupational physicians or occupational safety specialists evaluate working conditions and conduct risk assessments of pregnant women's workplaces. This risk assessment based on the real work of pregnant workers is an essential piece of information. In Switzerland, 2 types of medical providers may intervene with pregnant workers. Gynecologists explain to the woman that she may be entitled to stop working in the event of hazardous working conditions and in the absence of a risk analysis [31]. The occupational health physician, for his/her part, carries out the risk analysis by visiting the workplace to identify occupational hazards, assess the risks and propose preventive measures to adapt the workplace. He/she informs the employers of their obligation to inform the staff of the occupational risks by sending them the risk analysis and to adapt the pregnant worker's workplace effectively [53]. A collaborative and multidisciplinary approach is therefore essential in the process [31,53]. Gynecologists and midwives play an advising role regarding hazardous working conditions in the Netherlands, where the provision of occupational health services (OHS) is mandatory [54]. Recently, 1 pilot intervention has been carried out to try to help pregnant workers and gynecologists regarding the assessment of working conditions. Van Beukering et al. [55] evaluated the effectiveness of a care program that combines a training session for health professionals and a patient-oriented mobile Health application (mHealth) to provide pregnant women, the midwives and the obstetricians with personalized advice on work adjustments. The percentage of pregnant workers receiving advice from their health provider about how to adjust their work was higher in the treatment group. However, they received less advice and/or information from their employer. No significant differences in realized work adjustments were found between groups. Although the additional training

received by health care providers may have contributed to increased awareness and attention to occupational risks during pregnancy, this shows that work is not sufficiently adapted, since after 6 months of pregnancy, one third of pregnant workers in both groups continued to work in hazardous workplaces. The authors conclude that better involvement and participation of employers and occupational health professionals in the development of program design could increase the effectiveness of the intervention. Another interpretation would be that there are some limits to the role that the system can delegate to the caregivers. There is still a need for employer involvement in workplace accommodation. The role of the occupational physician is then to support the employer in raising awareness of occupational risks and advising him on the adjustments to be made. In Switzerland, the need to raise awareness of occupational health among gynecologists and to find ways to facilitate access to occupational health specialists has also been highlighted [31]. This also applies to pregnant workers. As most pregnant women consult midwives, they can contribute to increase knowledge of occupational risks by providing information to pregnant women, helping to identify whether the working conditions experienced by pregnant workers may be hazardous to the pregnancy and navigating the process of reporting such situations in order to make workplace adjustments [31].

In general, there is a large heterogeneity in the access to and structure of OHS in Western countries, with these services being provided either as an in-house service or by third-party occupational health service providers [54]. A common pattern, however, is that employers have to purchase OHS support, because OHS are generally not provided by the public health system. To improve workplace accommodations, there is a need to increase the number of occupational professionals to guide and support stakeholders, to increase and improve access to OHS for both pregnant workers and gynecologists (in Switzerland, the access to occupational physicians is exclusively via the employer), and to improve communication and collaboration among the 4 stakeholders: pregnant workers, healthcare providers, occupational health services, and employers.

Importance of national contexts

Another element highlighted by the literature review that may affect pregnant women's absence from work is the national context. Each country has its own laws and system regulating job interruptions in general and specifically for pregnant women [2]. In this review the determinants of pregnant women's absence from work are discussed using the generic term of absence, while the term of "sick leave" is often used to describe absence from work. Some publications were found that specify the administrative classification of pregnant women's absence and distinguish between sickness absence and absence related to the occupational risk of pregnancy (preventive leave). These publications also suggest that there may be incentives to use 1 type of certificate rather than the other to justify the absence from work. In general, research shows that the prevention of occupational risks for pregnant women is still poorly understood in some countries. As a result, work interruptions for reasons of illness – sick leave – are used more often than preventive leave. This may minimize the impact of work on health and obscure employers' responsibility for occupational risks. Consequently, from an economic point of view, absences may be paid for by social insurance schemes, such as loss of earnings, or even by taxpayers, rather than by employers. However, in some countries (e.g. Switzerland [56]), it is employer's responsibility to pay the pregnant worker's salary in situations where the interruption of work is due to occupational hazards and if no adjustment or adaptation of the position could be found. The administrative classifications – sick leave, prenatal leave, preventive leave – and their characteris-

tics (duration, financial compensation) used to justify pregnant worker absences vary from country to country. In practice, there may be financial, human, logistical or pragmatic incentives to use 1 type of leave category over another. It would be interesting to examine in more detail the extent to which the administrative classification of leave is related to the actual reasons for absence from work and the underlying incentives.

Economic issues

Work interruption can have important consequences, as they result in absences from work that impose costs on society. To the best of the authors' knowledge, there are no routine estimates of the cost of pregnancy-related absence at the country level. Only a rough estimate was found in a Polish study that reported the cost of pregnancy, childbirth and puerperium, estimated at EUR 2.96 billion or 0.75% of gross domestic product [57]. The literature on pregnancy focuses mainly on maternity leave and the burden to the economy of job interruption after childbirth [58,59]. There is a lack of study on the economic and overall impact of absence from work during pregnancy from the perspective of the stakeholders involved. Conversely, the actual and potential consequences of continuing to work despite the risks to the mother and unborn child could also benefit for more research. Some of the absences of pregnant workers are difficult to avoid because they are related to medical reasons, but this review shows that some of them could be reduced by workplace adaptations implemented at company level. According to the legal framework for maternity protection at work, it is the employer's responsibility to ensure that conditions are safe for the pregnant employee. There is little research on the impact of the implementing adaptations on the reduction of days of absence [44]. However, it appears that workplace adjustments can have an impact on the level and duration of absences from work and on the retention of pregnant workers and thus on the economic aspects.

Limitations and avenues for research

In terms of methodology, these studies suffer from several limitations. In terms of statistics techniques, the analyses would benefit from using multivariate analyses and adjusting for possible confounders in order to better evaluate the effects assessed. In general, the studies reviewed do not allow to establish a causal link between identified factors and prevalence of absences from work during pregnancy, nor between workplace adjustments and the reduction of absences among pregnant workers. Only correlations were found. In addition, it is important to note that the methodologies and designs used in the studies are different, which limits comparisons. In addition, the timing of the studies, early to mid-or late pregnancy varies or is generally not specified. The job characteristics reported and analyzed refer to those in mid-pregnancy and not before the pregnancy. In addition, the analyses have some drawbacks: the observational studies are conducted in only a few countries, on small and specific populations. Potential selection bias may exist, which may reduce the scope and validity of some results. Henrotin and Gulisano [60], who focused on studies limited to associations between occupational hazards and a specific type of absence, sick leave, also highlighted some of these limitations. Among reviewed articles dealing with adjustments issues, details on the nature of workplace adjustments are not provided. Information on adjustments remains vague and women specific needs are never detailed [23,24,44,50]. Moreover, most studies refer to specific health problems (e.g., low back pain [23,24]), or contexts such as Scandinavian populations (Norway [23,44] and Denmark [24,50]). As a result, it is difficult to extrapolate any of the findings to other contexts or countries. Further research is needed on the effects of workplace adjustments on reducing absenteeism and on the nature of adjustments made and their effects. The development of prospectively designed studies that measure the effectiveness of interventions at different levels would allow some of these shortcomings to

be addressed. Improving workplace environment can be quite challenging and may takes time as it requires the whole organization to change the way it deals with pregnancy, and, more broadly, occupational health. To the authors' knowledge, no study has examined the long-term effects of repeated educational interventions for managers and business owners to prevent pregnant workers' absences. Providing advice and guidance to employers on how to deal with pregnancy in the workplace and the process of work adjustment seems necessary.

To the authors' knowledge, no study has examined the non-take-up of job absence by pregnant workers where the medical or legal framework would allow it, although increasing attention is being paid to the non-take-up of social rights in many other areas [61]. Sociological studies have shown that some factors may encourage pregnant women to continue working despite hazardous working conditions or health problems. Quantifying the non-take-up of absence and its consequences would provide a better view of the phenomenon.

Studies on the economic impact of job interruptions during pregnancy should also be developed to better understand the role and the associated costs for the different stakeholders, including workers, employers, social insurance, gynecologist, and at the societal level. We did not find any costs benefits analysis of implementation of workplace accommodation by companies during pregnancy to reduce absences from work. However, human and financial investing in workplace adjustments could be benefit for both workers and employers in terms of improving working conditions and reducing absence from work. Workplace adjustments can allow workers to keep their position in the company, as long as possible, which should reduce both negative social impacts (isolation, discrimination, promotions) and wage losses. Employers can avoid loss of manpower, decrease in productivity, disorganization, and then financial burden. The cost-effectiveness of implementing job adjustments for pregnant women must be assessed in light of the country's insurance system and the administrative categories for classifying pregnant women's work absences. By providing monetary values, their results could also help implement workplace accommodations aimed at reducing absenteeism.

To summarize, the majority of pregnant women take time off work at some point during their pregnancy. Pregnancy is not a disease but induces physical changes that may affect woman's ability to work. If working while pregnant generally does not adversely affect the health of women or the fetus [62], withdrawal from work may be necessary in the cases of hazardous occupational exposures. However, the present review shows that pregnancy symptoms and occupational exposures do not have a steady and straightforward relationship with absence from work. Other factors may encourage or discourage the use of various forms of work interruption. The typology developed on the basis of the narrative review provides insight into the different determinants of absence from work during pregnancy. It also helps to understand the effects of interventions aimed at reducing these absences and highlights a certain number of gaps that merit to be filled in.

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