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Title

Implementation, mechanisms and effects of maternity protection legislation: a realist narrative review of the literature

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Implementation, mechanisms, and effects of maternity protection legislation: a realist narrative review of the literature

Abstract

Purpose
Most industrialized countries have introduced maternity protection legislation (MPL) to protect the health of pregnant workers and their unborn children from workplace exposure. This review aimed to assess this legislation's level of implementation, barriers and facilitators to it, and its expected or unexpected effects.

Methods
A realist narrative review was conducted. Keyword searches of the PubMed, CINAHL, PsycINFO, MIDIRS, Sociological abstracts and Google Scholar electronic databases were performed in March 2018.

Results
The 42 publications included show that the implementation of MPL is deficient in most countries. Allowing pregnant women to withdraw from work on preventive leave or sick leave is favored over workplace adaptations or worker reassignments. The publications highlight mechanisms which encourage or obstruct the enforcement of legislation at the levels of the individual, the physical and social environment, and the macrosocial context. The delay between the conception and implementation of maternity protection measures appears to be a major barrier to the efficacy of MPL. The literature also suggests that unexpected adverse effects, such as degradation in working relationships or discrimination can obstruct the implementation of protective measures.

Conclusions
This study showed the need for a better implementation of MPL during pregnancy. Further research and recommendations for improvements in MPL should consider the diverse mechanisms and effects of its implementation. Barriers and adverse effects of this implementation do not only ensure a lack of information or awareness about MPL, but are also linked to contradictions between requirements to protect employment and protect pregnancy.

Keywords

Pregnancy; Occupational Exposure; Protective legislation; Maternity protection; Literature review

Aknowledgements

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1 Introduction

1.1 Background

Although working during pregnancy does not have a general negative impact and may even have a protective effect (Casas et al. 2015; Fowler and Culpepper 2018), specific workplace exposure can harm the health of pregnant women and their unborn children. Research has shown how different physical (ionizing radiations, noise, vibrations), chemical (lead, solvents), or biological exposure may effect pregnancy outcomes (miscarriages, preterm birth,

small for gestational age) and child development (malformation, cognitive faculties) (Figà-Talamanca 2006; Fowler and Culpepper 2018; Goldman and Wylie 2017; Lafon 2010). Evidence regarding the impact of work activities is less consistent. Several publications have pointed out a link between pregnancy or fetal outcomes and ergonomic exposure (posture, lifting, standing) or work schedules (shift work, night hours) (Bonzini et al. 2009; Croteau et al. 2006; Croteau et al. 2007; Snijder et al. 2012; Stocker et al. 2014). But recent literature reviews have concluded that the risks induced by these working conditions are small (Palmer et al. 2013). Some studies also point out effects of occupational exposures on the health of pregnant women themselves (hypertension, back pain, fatigue) (e.g.Bilhartz and Bilhartz 2013; Cheng et al. 2009), but this topic is generally less investigated than outcomes pertaining to pregnancy and children's health (Figà-Talamanca 2006). However, consistent evidence indicates that occupational exposures and arduous working conditions lead to a higher rate of sick leave during pregnancy (Dørheim et al. 2013; Hansen et al. 2015; Henrotin et al. 2017; Kaerlev et al. 2004).

Many countries have implemented specific laws to protect pregnant women and their unborn children from occupational exposure, in accordance with the International Labour Organization's Maternity Protection Convention, 2000 (No. 183), and Maternity Protection Recommendation, 2000 (No. 191) (International Labour Organization 2010). This *maternity protection legislation* (hereafter MPL) requires that occupational risks to pregnancy be assessed and measures be taken to avoid the exposure of pregnant workers. This should primarily be done by eliminating risks or adapting working conditions. If this is infeasible, employees should be transferred to another post or, as a last resort, granted paid leave. These occupational health regulations fall within the domain of *differentiated protection* policies, which promote focused risk reduction targeting specific groups at risk (Hansson and Schenk 2016). This contrasts with *unified protection* policies, which attempt to establish a level of protection sufficient to protect all groups, including the most sensitive ones.

In addition to pregnancy, MPL also aims to protect new and breastfeeding mothers. We will leave aside this topic, however, because it is entangled with other policies, such as maternity leave and return to work policies. We will also leave aside two other related fields because their aims and functioning are not the same as MPL: prenatal leave and protection against pre-conception reprotoxic risks.

1.2 Review objectives and approach

The present narrative review is one part of our efforts to understand the effectiveness of MPL, with a view to improving it. The choice of a narrative design fits the purpose of the review. In fact our aim is to gain a deeper understanding of the various mechanisms and effects at stake, and to encourage new reflections on protective legislation, rather than summarize data on a more focused issue as in a systematic review (Greenhalgh et al. 2018). Indeed, the mere existence of public policies is no guarantee of their effectiveness; their impact depends on specific actors implementing them in specific contexts. This is why the present narrative review is inspired by realist approaches which combine findings from heterogeneous methods in order to describe how complex social interventions function (Pawson et al. 2005). The review does not limit itself to questions such as 'Does the legislation work?', but in line with realist approaches, it aims to consider "the interaction between context, mechanism and outcome" (Berg and Nanavati 2016; Wong et al. 2013p.2). It seeks to understand, firstly, in which circumstances and how MPL is and is not implemented, and secondly, the effects of MPL, both expected and unexpected, and how they are dependent on the contexts and actors involved (Robert and Ridde 2013). The results should help to identify knowledge gaps that will point to new avenues of research and guide the improvement of interventions resulting from MPL.

2 Methods

2.1 Review questions

In order to grasp the implementation and the effectiveness of MPL, and understand the "success, failure or mixed fortunes" (Wong et al. 2013, p. 1) of these complex policies, we defined the review questions as follows:
'What is the degree of implementation of the measures to protect pregnant workers provided for in MPL in different national contexts? What are the mechanisms which influence that implementation? What are its expected and unexpected effects, as well as the reasons which explain those effects?'

2.2 Search strategy

The literature search took place in March 2018 using the Pubmed, CINAHL, MIDIRS, PsycINFO, and Sociological Abstracts electronic databases. The search strategy in PubMed was built on using the following Medical Subject Headings (MeSH Terms): "pregnancy", "pregnant women", "women, working", "workplace", "occupational health", "occupational exposure", "occupation", "occupational health/legislation and jurisprudence" "women, working/legislation and jurisprudence" "mothers/legislation and jurisprudence".
Subsequently, keywords were adapted according to the thesaurus dictionaries in the different databases. The standard search strategy in these databases involved: ("pregnancy"[MeSH Terms]) OR ("pregnant women"[MeSH Terms]) AND (("women, working"[MeSH Terms]) OR ("workplace"[MeSH Terms]) OR ("occupational health"[MeSH Terms]) OR ("occupational exposure"[MeSH Terms]) OR ("occupation"[MeSH Terms]) OR ("occupational health/legislation and jurisprudence"[MeSH Terms]) OR ("women, working/legislation and jurisprudence"[MeSH Terms]) OR ("mothers/legislation and jurisprudence"[MeSH Terms])).
Additional search strategies involved a hand search of the reference lists, citation tracking, and a search in Google Scholar using keywords similar to those in the databases.
The table showing exhaustive search strategy for all databases is presented in annex 6.1.

2.3 Quality appraisal

We carried out a quality appraisal of the empirical articles selected with regard to the five-point list developed by Dixon-Woods (Dixon-Woods et al. 2006, p. 4):

- *"Are the aims and objectives of the research clearly stated?*
- *Is the research design clearly specified and appropriate for the aims and objectives of the research?*
- *Do the researchers provide a clear account of the process by which their findings were produced?*
- *Do the researchers display enough data to support their interpretations and conclusions?*
- *Is the method of analysis appropriate and adequately explicated?"*

In cases of doubt, articles were read a second time. However, articles were not excluded; rather, the quality appraisal helped us to evaluate the overall quality of data available. We also lessened the importance of the findings of the articles rated "low" or "weak" in quality (1 or 2) when they were not supported by other studies.

2.4 Inclusion and exclusion criteria

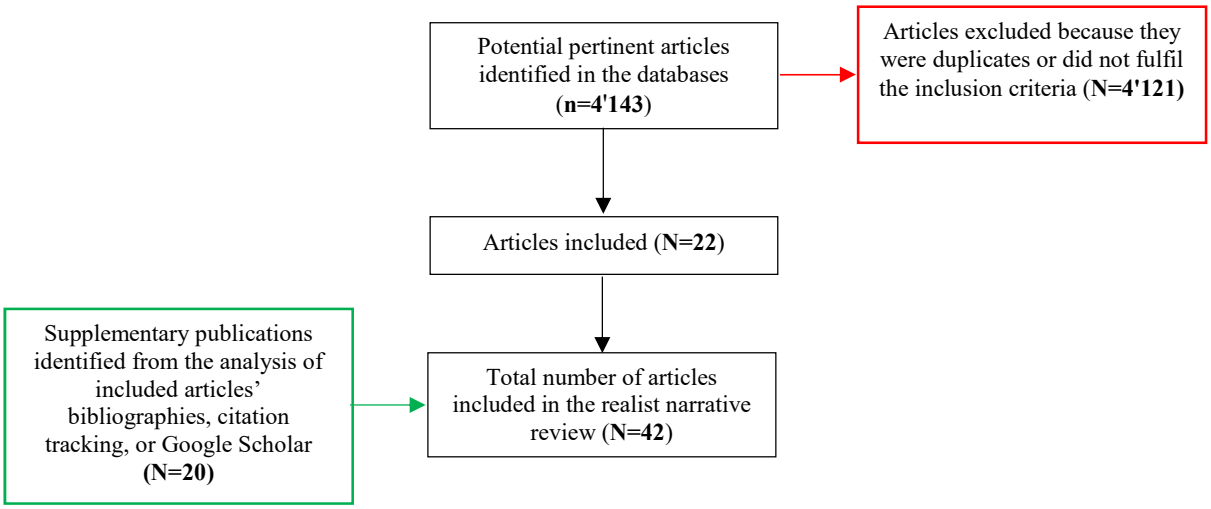
In accordance with the research objectives, we included articles dealing with the implementation of MPL, the mechanisms which influenced that implementation, and their expected and unexpected effects. We excluded articles which merely presented legal mechanisms or preventive measures but failed to examine how they were implemented.
We included articles from both peer-reviewed and non-peer-reviewed scientific journals, research reports, reports commissioned by official bodies, and academic works. Magazine articles were excluded. We included all publications in the languages understood by the authors: English, French, and Italian, and another colleague translated articles written in Polish. There were no restrictions as to the publication dates of the articles included.

3 Results

3.1 Search results

The database search retrieved a total of 4'143 records. Reading titles and abstracts (in cases of doubt, reading the full article) led to the exclusion of 4'121 records because they were duplicates or did not meet the inclusion criteria. Twenty-two articles remained for the analysis; 20 further studies were identified by a hand search of their reference lists, citation tracking or search by keywords on Google Scholar. Thus, a total of 42 studies were selected for the narrative review.
Fig. 1 show the flow of articles selected for the narrative review.

Fig. 1: Flow of articles selected



Tables 1 and 2 list the empirical studies and articles chosen from the secondary analysis, respectively, all included in the narrative review. Both tables show the study design and the region where data were collected. The last column in Table 1 shows the Dixon-Woods's criteria score. The overall quality of publications is suitable. Only 3 articles were rated as weak (score 1 or 2); the remaining was rated as good to very good (4 or 5).

Table 1: Empirical studies included in the narrative review

References	Publication type	Design	Region	Dixon-Woods's criteria score
Adams et al. (2016a)	Official report	Mixed methodology	UK	5/5
Adams et al. (2016b)	Official report	Mixed methodology	UK	5/5
Aellen et al. (2013)	Peer-reviewed	Mixed methodology	Switzerland	5/5
Andersen et al. (2008)	Peer-reviewed	Quantitative	Denmark	5/5
Andersen et al. (2015)	Peer-reviewed	Quantitative	Denmark	5/5
Aviles-Palacios et al. (2013)	Peer-reviewed	Qualitative	Spain	5/5
Bay and Simonetti (2013)	Thesis	Quantitative	Switzerland	5/5
Bouchard and Turcotte (1986)	Non-peer-reviewed	Mixed methodology	Quebec (Canada)	2/5
Brady and Monaghan (2007)	Peer-reviewed	Quantitative	Ireland	5/5
Croteau et al. (2006)	Peer-reviewed	Quantitative	Quebec (Canada)	5/5
Croteau et al. (2007)	Peer-reviewed	Quantitative	Quebec (Canada)	5/5
De Koninck and Malenfant (2001)	Unknown	Qualitative	Quebec (Canada)	4/5
Dørheim et al. (2013)	Peer-reviewed	Quantitative	Norway	5/5
Fanello et al. (2005)	Peer-reviewed	Quantitative	France	5/5
Frey et al. (2015)	Peer-reviewed	Quantitative	Germany	5/5
Gravel and Malenfant (2012)	Peer-reviewed	Qualitative	Quebec (Canada)	5/5
Gravel et al. (2017)	Peer-reviewed	Qualitative	Quebec (Canada)	5/5
Grolimund Berset et al. (2011)	Conference proceedings	Qualitative	Switzerland	1/5
Kristensen et al. (2008)	Peer-reviewed	Quantitative	Norway	5/5
Legrand (2015)	Academic report	Qualitative	France	4/5
Lembrechts and Valgaeren (2010)	Official report	Mixed methodology	Belgium	5/5
Lippel (1998)	Peer-reviewed	Quantitative	Quebec (Canada)	4/5
Makowiec-Dabrowska et al. (2003a)	Peer-reviewed	Quantitative	Poland	-
Makowiec-Dabrowska et al. (2003b)	Peer-reviewed	Qualitative	Poland	-
Malenfant and De Koninck (2002)	Peer-reviewed	Qualitative	Quebec (Canada)	5/5
Malenfant (2009)	Peer-reviewed	Qualitative	Quebec (Canada)	5/5
Malenfant et al. (2011)	Peer-reviewed	Qualitative	Quebec (Canada)	5/5
Marcinkiewicz et al. (2012)	Peer-reviewed	Quantitative	Poland	-

McDonald (1994)	Peer-reviewed	Quantitative	Quebec (Canada)	2/5
Polanska et al. (2014)	Peer-reviewed	Quantitative	Poland	-
Romito and Saurel-Cubizolles (1992)	Peer-reviewed	Quantitative	France and Italy	5/5
Rudin et al. (2018)	Official report	Quantitative	Switzerland	5/5
Saurel-Cubizolles and Kaminski (1987)	Unknown	Quantitative	France	4/5
Tarchi et al. (2007)	Unknown	Qualitative	Italy	4/5
Turcotte (1992)	Peer-reviewed	Quantitative	Quebec (Canada)	5/5

Table 2: Secondary-analysis articles included in the narrative review

References	Publication type	Design	Region
Bretin et al. (2004)	Unknown	Secondary analysis	France and Quebec (Canada)
Malenfant (1996)	Peer-reviewed	Secondary analysis	Quebec (Canada)
Malenfant (1998)	Peer-reviewed	Secondary analysis	Quebec (Canada)
Messing and Boutin (1997)	Peer-reviewed	Secondary analysis	Quebec (Canada)
Plante and Malenfant (1998)	Peer-reviewed	Secondary analysis	Finland, Denmark and Quebec (Canada)
Romano and Moreno (2010)	Peer-reviewed	Secondary analysis	European Union
Taskinen et al. (1995)	Peer-reviewed	Secondary analysis	Finland and Denmark

3.2 The features of maternity protection legislation

Council Directive 92/85/EEC of 19 October 1992, on the Introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding, has been transposed into the national laws the European Union's member states, with some variations (Commission of the European Communities 1999). Switzerland has introduced MPL via the Ordinance of 20 March 2001 on Hazardous and Arduous Work during Pregnancy and Maternity (Maternity Protection Ordinance). In Norway, the Working Environment Act of 17 June 2005 (No. 62) does not target pregnant workers specifically, but offers them rights similar to those in Council Directive 92/85/EEC (Aune 2016). In Canada, in the Province of Quebec, the Act Respecting Occupational Health and Safety, in force since 1981, provides extensive rights to preventive job transfers or withdrawal for pregnant workers.

These different legislations share common principles, however. They all include: 1) a risk analysis; 2) adaptations to workstations or a temporary reassignment of the pregnant worker to a job with no proven risk to her pregnancy; 3) *temporary leave*, including financial compensation for the worker, should the first measures not have been taken (this type of leave is called preventive leave, preventive withdrawal or special pregnancy leave, and it is distinct from sick leave). The practical application of these principles differs from one state to another and over time, however[1].

3.2.1 Risk evaluation and protective measures

We can distinguish three current scenarios concerning risk evaluation and protective measures.

1) In the European Union, according to Council Directive 92/85/EEC, and in Norway, according to the Working Environment Act, it is the employer's responsibility to evaluate the potential risks facing pregnant employees -either via a direct internal assessment or by using a specialist- and to subsequently take the necessary protective measures. Several national laws specify that occupational physicians or other occupational safety specialists are the competent authorities when it comes to the evaluation of occupational risks. Council Directive 92/85/EEC, however, does not explicitly state who is responsible for prescribing preventive leave.

2) According to the Act Respecting Occupational Health and Safety in Quebec, attending physicians, whether gynecologists or general practitioners (GPs) are responsible for evaluating the risks facing pregnant workers based on information given to them by their patients. They should then consult the occupational physician responsible for the patient's workplace, who will confirm or reject the existence of those risks. If necessary, the treating physician can write a certificate indicating which protective measures the employer should take or imposing a preventive leave (Plante 2004). Quebec does not have a pre-existing list of dangers; the Labour Standards, Pay Equity, Occupational Health and Safety Commission (CNESST) decides whether pregnant employees are eligible to protective measures.

3) In Switzerland, according to the Maternity Protection Ordinance, the employer must have a risk evaluation carried out by an occupational physician or an occupational safety specialist. The attending physician (usually a gynecologist) is responsible for checking that risk evaluation and can prescribe preventive leave should no risk analysis have been carried out or should the necessary protection measures not be effective (Praz-Christinaz et al. 2008).

[1] This also implies that, in several countries, the present legislative framework is different from the regulations in force when the studies included in this review were made.

3.2.2 Salary compensation

Table 3 summarizes the very significant differences in the current institutional sources and levels of salary compensation paid to workers on preventive leave (state of 1th September 2017). It is of note that although European Council Directive 92/85/EEC fixes neither the source nor the rate of salary compensation, it demands that the level of compensation for any preventive leave be at least equal to the rate for sick leave.

Table 3: Institutional sources and minimum levels of salary compensation in the 13 states covered by the present narrative review.

	100% Compensation	**< 100% Compensation**
Social insurance	Denmark; Spain; Norway	Belgium (90%); Finland (degressive: 90% for 56 days, then 70%); Italy (80%)
Mixed: social insurance and employer	France	Ireland (degressive: 100% for 21 days, then fixed rates)
Employer	Germany; UK; Poland	Switzerland (80%)
Insurance against occupational risks (financed by employers)		Quebec (90%)

Financing for preventive leave most often comes from a social insurance fund (in six out of thirteen states). In Quebec, the first five days' salary is paid by the employer, and then the rest of the leave is reimbursed by the employer-financed insurance against occupational risks. In France and Ireland, salary compensation is paid for through a mix of social insurance payments and direct payments by the employer (not through an insurance fund). In four countries, employers pay the whole salary compensation directly, not via an insurance fund. In seven of the thirteen states described, the salary compensation is complete; in four of them it amounts to 80% or 90% of the employee's salary, and in two countries the payment is digressive over time.

3.2.3 The range of pregnant workers covered

Legislation also varies across the range of workers covered. Thus, most systems exclude self-employed workers and those in the informal sector[2] (Bretin et al. 2004). Furthermore, some legislations require workers to have been employed for a certain amount of time before their right to financial compensation kicks-in in cases of preventive leave. These limitations raise serious questions about how well occupational health is protected in the informal sector (Berg and Nanavati 2016; Lippel et al. 2011).

3.3 Implementation of Maternity Protection Legislation

We found 15 articles dealing with the level of implementation of MPL. These studies used diverse methodologies including analyses of data about salary compensations and studies using questionnaires aimed at employees and their employers, across economic sectors or just aimed at certain professions.

[2] The ILO defines informal sectors as those where "the salaried and unsalaried activities of intentionally unregistered or partially registered companies do not respect labor and social protection regulations: illegal work, clandestine sweatshops." (Adair P (2009) Économie non observée et emploi informel dans les pays de l'Union européenne. Une comparaison des estimations et des déterminants. Revue économique 60(5):1117 -1153 doi:10.3917/reco.605.1117), p. 1121. Translated by the authors.

3.3.1 Data on pay compensation

Articles based on pay compensation data showed that rates of preventive leave varied significantly depending on the context. In Quebec, the number of pregnant workers taking preventive leave rose sharply after the introduction of relevant legislation, from 965 in 1981 to 18,604 in 1990 (McDonald 1994). Based on international comparisons at the end of the 1990s, a study by de Plante and Malenfant (1998) revealed diverse rates of preventive leaves, depending on the country. In Quebec, around 40% of women benefitted from some kind of protective measure, of whom 85% benefitted from a preventive leave (MPL was enacted in 1981), whereas only 0.1% benefitted from a preventive leave in Finland (MPL enacted in 1991), and only 1% in Denmark (MPL enacted in 1981).

3.3.2 Large-scale studies

Several large-scale studies of pregnancy and maternity, involving questionnaires commissioned by official bodies, have included questions about the protection of occupational health. A study carried out between 2008 and 2009 in Belgium, commissioned by the Institute for Equality between Women and Men, highlighted the deficient implementation of the country's MPL: 52% of the women who were employed during their pregnancies stated that "their employer failed to sufficiently inform them about their rights as pregnant workers" (Lembrechts and Valgaeren 2010, p. 80)[3]. Indeed, 62% declared that no risk analyses had been carried out (Lembrechts and Valgaeren 2010). A report commissioned by the United Kingdom government drew similar conclusions: only 49% of the 3,254 mothers included in the study "said they were informed by their employer of risks to them or their baby" (Adams et al. 2016b, p. 97). Indeed, 19% of mothers said that they had identified health hazards undetected by their employer, and 22% of these mothers said that they decided to leave their jobs because these risks had not been taken into consideration (Adams et al. 2016b). On the other hand, however, the 3,034 employers questioned in the same study claimed to protect their employees' health: 98% of them declared that their companies had carried out the general risk analyses recommended by the law, and 96% affirmed that they offered their pregnant employees flexible working conditions (Adams et al. 2016a). In Switzerland, an online questionnaire covering a representative sample of 2809 employees showed that 63% of them considered that they performed dangerous or arduous work just before their pregnancy (Rudin et al. 2018). Among the latter, only 26% felt that their employer fully informed them of the risks ; 53% reported job adjustments or transfers, but 20% declared that no change occurred in their work; 6% were granted a preventive leave. An online questionnaire covering a stratified sample of employers showed that only 16% had carried out a risk assessment (Rudin et al. 2018).

A Norwegian study of a sample of 64,136 pregnant employees, via self-administered questionnaires at around weeks 17 and 30, showed that only half of those who considered a job adjustment necessary had obtained it (Kristensen et al. 2008). In Poland, according to data from the questionnaire used by Makowiec-Dabrowska et al. (2003a), about 60% of the employees questioned described working conditions that did not comply with regulations for pregnant workers.

Studies carried out in Italy and France showed that the protection measures established by law - e.g., reassignment of the pregnant worker within the same company (in France) or a preventive leave (in Italy) - were less frequently implemented with less qualified employees: "This legislation failed to overcome pre-existing inequalities among workers and to fully

[3] Translated by the authors.

protect the very women who needed protecting the most" (Romito and Saurel-Cubizolles 1992, p. 1491).

3.3.3 Studies of specific professions

Studies aimed at specific professions have also noted failures in the implementation of MPL. In a study in Irish hospitals, physiotherapists completed a self-administered questionnaire. Only 16.4% of respondents stated that changes had been made to their working environment. Thus, the majority of pregnant physiotherapists worked in environments that were partially or completely unsuitable for pregnancy (Brady and Monaghan 2007). According to this study, employers were not fulfilling their obligations to spontaneously verify and adapt working conditions: in 83.6% of cases, "either no changes were made to the working environment, or changes were not implemented until suggestion by the physiotherapist, her colleagues or her doctor" (Brady and Monaghan 2007, p. 15). A study in Switzerland looked at the working conditions faced by pregnant physicians in a university hospital (Aellen et al. 2013). The questionnaire, completed by 117 women, showed that the protection enjoyed by pregnant women varied in line with the type of risks they faced. The maximum daily number of hours worked (9 h) was only applied in 26% of cases. On the other hand, nearly all the participants confirmed that the ban on night shifts after 32 weeks and the ban on working with cytostatic substances were followed (95% and 99%, respectively) (Aellen et al. 2013).

3.3.4 Types of measures

Several studies have examined the types of measures preferred by the actors involved. In Quebec, the data collected in interviews with pregnant employees from a number of different occupational categories, along with an analysis of relevant documentation and legislation, found that despite the law's primary goal of encouraging ergonomic adaptations to the woman's workstation or having her transferred to another role, it had in fact led, in the vast majority of cases, to her taking preventive leave and temporarily leaving the workforce (Malenfant and De Koninck 2002; Messing and Boutin 1997). On the contrary, a more recent qualitative study in ten hospitals in Quebec (Gravel et al. 2017) showed that the majority of pregnant nurses are now maintained at the workplace longer thanks to job adjustments or reassignment. Nevertheless, authors also pointed out that "the population of nurses is in a particulary advantageous position compared to other female workers because of their social status, the chronic shortage of nurses in Quebec and their sophistication in regard to health protection" (Gravel et al. 2017). The authors concluded that, these results may not be transferable for others professions.
Studies in Denmark and Finland (Plante and Malenfant 1998), France (Fanello et al. 2005; Romito and Saurel-Cubizolles 1992), Italy (Romito and Saurel-Cubizolles 1992), Poland (Makowiec-Dabrowska et al. 2003a), Switzerland (Rudin et al. 2018) and United Kingdom (Adams et al. 2016b) showed that sick leaves are used instead of preventive leaves in a significant number of cases.

In summary, studies agree that there are deficiencies in the implementation of national MPL, as well as differences in how they are applied in different national contexts and between different types of risks. Quebec seems to be an exception, with a very high rate of use of preventive leave. Nevertheless, other preventive measures (adaptations to working conditions or a temporary transfer to another position) were applied less often than preventive leave. Furthermore, future research should take into consideration the studies by Adams et al. (2016a, 2016b) indicating the divergence in perceptions between employers and employees.

3.4 Mechanisms affecting the application of legislation

A total of 34 articles revealed some of the mechanisms that favor or hinder the implementation of programs for maternity protection at work. With regards to a public health approach inspired by the Bronfenbrenner model (Story et al. 2008), we distinguished how these mechanisms worked at three different levels, without forgetting that they are also interdependent. Mechanisms acted at the individual level, at the level of the pregnant employee's social and physical environment, and at the macrosocial level.

Table 4 shows the references from the literature concerning the mechanisms that favor or obstruct the implementation of MPL by theme and subtheme, findings, and region where the study was conducted.

Table 4: References concerning the mechanisms that favor or obstruct the implementation of MPL by theme and subtheme, findings, and the region where the study was conducted

Themes and subthemes	Findings	Region	References
Mechanisms at the individual level			
Level of knowledge about legal regulations	Lack of knowledge about the rights and obligations relating to policies within MPL	Belgium; France; Ireland; Italy; Switzerland	Aellen et al. (2013) Bay and Simonetti (2013) Brady and Monaghan (2007) Grolimund Berset et al. (2011) Lembrechts & Valgaeren (2010) Romito and Saurel-Cubizolles (1992)
Employers' attitudes towards risks and protection measures	Underestimation of occupational risks	Quebec	Malenfant (1996) Malenfant (2009)
	Lack of proactivity on the part of employer	Poland	Makowiec-Dabrowska et al. (2003a)
Employees' attitudes towards risks and protection measures	Preference given to strategies involving withdrawal from the workforce (hypersensitivity to risk during pregnancy)	Quebec	Bouchard and Turcotte (1986)
	Decision to remain in a hazardous workplace (career choice, socio-economic situation, underestimation of risks, level of risk considered acceptable)	France; Quebec	Legrand (2015) Malenfant (2009)
	Perception of taking advantage of social benefits	Belgium	Lembrechts and Valgaeren (2010)
	Fear of being judged	UK	Adams et al. (2016b)
	Employees are preoccupied by the organizational and financial implications for the employer	Quebec	Malenfant and De Koninck (2002)
Physical and social environment			
Company environment and status	Company characteristics (size, sector)	France; Italy; Quebec; Switzerland	Tarchi et al. (2007) Romito and Saurel-Cubizolles (1992) Rudin et al. (2018)
	Presence of a trade union	Belgium; Quebec	Lembrechts and Valgaeren (2010) Bouchard and Turcotte (1986) Messing and Boutin (1997) Gravel et al. (2017) Lippel (1998) Malenfant (1996) De Koninck and Malenfant (2001)
	Values and cultural attitudes surrounding occupational health and safety issues	Germany	Frey et al. (2015)
Organizational implications of the implementation of MPL	Organizational and economic implications of workplace adjustments	France; Ireland; Italy; Quebec; UK	Adams et al. (2016a) Brady and Monaghan (2007)

			Lippel (1998) Malenfant et al. (2011) Romito and Saurel-Cubizolles (1992)
	Dissatisfaction or absence of workplace adjustments lead women to preventive or sick leave	France; Quebec	Malenfant et al. (2011) Fanello et al. (2005) Saurel-Cubizolles and Kaminski (1987)
Relevant stakeholders	Importance of cooperation and communication between the relevant stakeholders	European Union; Poland; Quebec; Spain	Aviles-Palacios et al. (2013) Romano and Moreno (2010) Polanska et al. (2014) Marcinkiewicz et al. (2012)
	Contradictory messages	Quebec	De Koninck and Malenfant (2001)
	Role of a third party to establish links between the medical and business worlds and participative management	Quebec	Gravel and Malenfant (2012)
Definition of risk in workplace	Relationship between representations of women's work and risk perception	Quebec	Malenfant (2009) Malenfant et al. (2011)
	Underestimation of workplace risks	Quebec; Spain	Gravel and Malenfant (2012) Malenfant (2009) Malenfant et al. (2011) Aviles-Palacios et al. (2013)
Macrosocial level			
The design of MPL and state incentives for its application	State incentives and social or health insurance system	Denmark; Finland; Italy; Norway; Quebec	Plante and Malenfant (1998) Dørheim et al. (2013) Romito and Saurel-Cubizolles (1992) Tarchi et al. (2007)
Sociocultural mechanisms	Social and gender inequalities in workplaces	France; Italy; Quebec	Bretin et al. (2004) De Koninck and Malenfant (2001) Malenfant (1996) Malenfant (1998) Malenfant and De Koninck (2002) Turcotte (1992) Lippel (1998) Romito and Saurel-Cubizolles. (1992)
	Discrimination	Belgium; UK	Adams et al. (2016b) Lembrechts and Valgaeren. (2010)
Scientific knowledge about risks	Lack of evidence-based results about occupational hazards	Quebec	Malenfant (1998)
	Omission of gender-based variables	Quebec	Messing and Boutin (1997)
	Absence of consensus in scientific community	European Union; Quebec	Lippel (1998) Romano and Moreno (2010)

3.4.1 Mechanisms at the individual level

Level of knowledge about legal regulations

Several publications have pointed out the poor level of information on and knowledge of the legal dispositions and rights surrounding occupational health. This is seen as a hindrance to the implementation of MPL. According to Romito and Saurel-Cubizolles (1992, p. 1491), it seems that in Italy, "less than half of the workers were even aware of the possibility of taking EML [preventive leave] for work reasons". A study in Ireland by Brady and Monaghan (2007) showed that only 26% of the physiotherapists questioned knew of the existence of MPL, and most of them claimed to have continued to carry out tasks which the legislation had specifically deemed to be arduous (sustained posture, long periods of standing, awkward movements, and manual handling involving risk of injury).

In Belgium, employees participating in discussion groups led by Lembrechts and Valgaeren (2010) claimed that their employers had not informed them about their legal rights with regards to maternity protection in the workplace. Furthermore, they claimed that they did not know precisely "if, when, and how" they should announce their pregnancy to their employer (Lembrechts and Valgaeren 2010, p. 101). One possible explanation for this lack of information transfer to pregnant employees, as suggested by Lembrechts and Valgaeren (2010, p. 102), was that employers themselves were unaware of some of the regulations in place.

This lack of knowledge about the legal dispositions with regards to occupational hazards was not restricted to pregnant workers and their employers, but also concerned healthcare professionals, notably gynecologists. In Switzerland, a mixed-methods study of healthcare professionals and MPL showed that 95% of the gynecologists questioned knew of the existence of legal measures concerning maternity protection in the workplace. However, only 47% were familiar with the content of the Maternity Protection Ordinance, which had entered into force in 2001 (Bay and Simonetti 2013). In the case studies examined by Grolimund-Berset et al. (2011), employers, physicians, and workers were all unaware of the legal dispositions about the prevention of occupational risks.

Employers' attitudes towards risks and protection measures

Three studies highlighted that employers' attitudes acted as brakes to the implementation of MPL. According to Malenfant (1996), the majority of employers in Quebec saw requests for preventive leave as women choosing whether or not to work on during their pregnancy, rather than as the existence of a real occupational risk to the health of the employee and her unborn child. The employers interviewed in a later study focused on hair dressing, food retail and education, also displayed skepticism towards the risks of these activities for their pregnant employees (Malenfant 2009). In Poland, Makowiec-Dabrowska et al. (2003a) showed that some employers took no action to help pregnant women in their companies; in order to avoid hazardous occupational situations, women themselves had to seek medical leave from their doctors.

Employees' attitudes towards risks and protection measures

Six studies looked at how pregnant workers' attitudes played a role in the implementation of MPL.

Data from the interviews and questionnaires collected by Bouchard and Turcotte (1986) from pregnant workers who had applied for, or who had been granted, preventive leave, showed that pregnancy made certain employees more sensitive to the potential effects of exposure to risks. This encouraged them to prioritize strategies for an early withdrawal from the

workforce, without looking for ways to improve ergonomics at their workstations: "although they say that they are prepared to take risks in normal circumstances, that is not the case when they are pregnant"[4] (Bouchard and Turcotte 1986, p. 124).
However, these findings are mitigated by the weak quality of the publication (Dixon-Wood's criteria score = 2/5) and by the fact that other studies contradicted this. According to the statements from employees collected by (Malenfant 2009, p. 219), women felt "torn between their willingness to work and their desire to take advantage of their pregnancy." Occupational dangers -whether real or perceived- were judged, interpreted, and linked to perceived feelings of control as well as workers' economic requirements and career choices. According to Legrand (2015), some employees bend over backwards in order to not stop working during their pregnancy. There are many reasons for this: although some highly qualified women "take risks with their pregnancies in the name of their careers, others, at the extreme opposite end of the professional ladder, take risks just as consciously in the name of current employment and future job retention" (Legrand 2015, p. 19)[5]. For women in precarious employment situations, health, even that of their unborn child, may prove to be of secondary importance keeping their job. Thus, some women who work "in dangerous environments without announcing their pregnancy, or who announce it as late as possible, also hesitate to ask for ergonomic improvements to their workstations" (Legrand 2015, p. 20). Adams et al. (2016b p. 94) reported that even when mothers "said risks were not fully resolved, it was most common for [them] to continue working in the same job role (72%)." In studies carried out via questionnaires in Belgium and the United Kingdom, female workers very often underlined that they had not wanted to take full advantage of their rights, or had at least hesitated before doing so, because they felt that they would have been taking advantage of social benefits (Lembrechts and Valgaeren 2010) or they had been scared of being judged by their employers or colleagues (Adams et al. 2016b).
Malenfant and De Koninck (2002) showed that female employees were sensitive to the economic and organizational difficulties which their pregnancy imposed upon their employers.

3.4.2 Physical and social environment

Company environment and status

A large-scale study in Switzerland (Rudin et al. 2018) shows that bigger companies perform risk assessments more often and offer more possibilities of job adjustments or transfers. Similarly, an Italian study by Tarchi et al. (2007) showed how small companies have more difficulties putting in place ergonomic improvements to a pregnant employee's workstation, whereas big companies have more possibilities to reclassify a pregnant worker or transfer her to another position. Data from questionnaires collected from women in France and Italy working during their first pregnancy (Romito and Saurel-Cubizolles (1992), showed that poorly qualified workers and those working in the private sector had less chance of benefitting from maternity protection measures in their workplaces. Literature from Belgium and Quebec emphasized the role of labor unions in the implementation of MPL. Indeed, the presence of a labor union within a company allows women to ensure that their health protection rights are more properly respected (Bouchard and Turcotte 1986; Gravel et al. 2017; Lembrechts and Valgaeren 2010; Messing and Boutin 1997), whereas "Non-unionized workers appear to be particularly vulnerable" (Lippel 1998, p. 278). The distinctly individual nature of a request for preventive leave is a hindrance to the proper introduction of protection measures (Malenfant 1996) which makes the presence of support even more important,

[4] Translated by the authors.
[5] All quotations of Legand (2015) translated by the authors.

particularly from a labor union. Even if MPL represents a collective right, health protection for pregnant employees is applied individually and each employee benefits from different resources (De Koninck and Malenfant 2001).
Finally, the study by Frey et al. (2015), carried out in a chemical company in Germany, showed that the company's commitment to a healthy working environment was a significant element of support to MPL: "[…] an in-depth counseling during regular annual safety instructions enhances the awareness of women of possible chemical risks during pregnancy" (Frey et al. 2015, p. 970).

Organizational implications of implementation of MPL

With regards to ergonomic adaptations to workstations, the report by Adams et al. (2016a) showed that employers are prepared to carry out moderate changes. Other studies have shown that when adaptations or job transfers are more complex, notably when they have repercussions on the organization of work for the woman's colleagues, then employers are less likely to implement MPL (Brady and Monaghan 2007; Lippel 1998; Malenfant et al. 2011; Romito and Saurel-Cubizolles 1992). According to Lippel (1998), the economic and organizational difficulties involved in adapting workstations or transferring pregnant workers meant that certain employers preferred their workers to take preventive leave. The preference for preventive leave over adapting workstations or transferring workers is of great concern to the women too. Indeed, some women are not satisfied with the solutions proposed by their employers: they may not deem the ergonomic adaptations to their workstation, or their job transfer, to be a suitable means of protecting them from occupational risks (Malenfant et al. 2011). In France, a study based on a survey administered to 2387 employees (Saurel-Cubizolles and Kaminski 1987) showed that when the employer refused a change in the working conditions, the rate of sick leave of pregnant workers increased. This study refers to old data. However, more recently, a longitudinal study in a French hospital, by Fanello et al. (2005, p. 250), also showed that following the announcement of their pregnancies, nurses who had been refused a change from night shifts to day shifts preferred to take sick leave "even though they felt quite capable of working, but during the day."[6]

Relevant stakeholders

Six studies revealed the importance of a coordination role between the different stakeholders: gynecologist or GPs, company representatives, occupational physicians, occupational health and safety (OHS) technicians, and employees (Aviles-Palacios et al. 2013; Romano and Moreno 2010).
According to Polanska et al. (2014), one large barrier to the implementation of MPL is the lack of communication between gynecologists and occupational physicians. Although according to Polish law, it is the gynecologist who must write out preventive leave notes, her knowledge of the workplace and how hazardous the employee's situation might be does not seem to be sufficient. Collaboration between the occupational physician and the gynecologist therefore seems crucial (Marcinkiewicz et al. 2012; Polanska et al. 2014).
The absence of common perceptions about occupational risks (Aviles-Palacios et al. 2013) and the absence of clear, established guidelines, may create some confusion around the measures needed, thus the different stakeholders tend to stick to their respective positions. That lack of clarity, and of a consensus position unifying the different experts involved, can impede the application of MPL. Indeed, the study by De Koninck and Malenfant (2001) revealed that pregnant workers were very sensitive to the contradictory messages they might

[6] Translated by the authors.

receive (concerning how to react with regard to their health and/or that of their unborn child), whether from their doctors, colleagues, employers, or family and friends.
Finally, the qualitative study by Gravel and Malenfant (2012), in ten hospitals in Quebec, highlighted how useful it was for employers to have support when managing adjustments to pregnant nurses' workstations. Using a specialist in occupational health risk prevention and some participative management to adjust workstations helped to produce more satisfying solutions, both for the pregnant worker and overall organizational performance (Gravel and Malenfant 2012).

Definition of risk in the workplace

In order for it to be protected against, a health risk must have been evaluated and perceived as such. However, evaluating and defining occupational risks in workplaces can be controversial.
In Quebec, the workers questioned by Malenfant (2009) thought that the risks they faced were not appropriately measurable according to the instructions in place: pregnant workers' discourse on the definition of risks to their pregnancies was mainly based on their own subjective experiences and those of their colleagues. Thus, representations of occupational risks can differ among the different actors involved: things considered dangerous by pregnant workers may not be seen as such by their employers or by the biomedical norms defining the thresholds beyond which exposure harms health. The objective scientific means of evaluating occupational risks provided for by Quebec's laws puts workers at a disadvantage when it comes to requesting preventive withdrawal or reassignment.
Furthermore, employers, professionals, and workers themselves often trivialize the occupational dangers which women face (Gravel and Malenfant 2012; Malenfant 2009). For example, the qualitative study by Malenfant et al. (2011) highlighted the fact that human resources personnel are often sceptical about the risks facing by pregnant workers, estimating that their fears are exaggerated. A study of 101 occupational health and safety technicians in Spain, using questionnaires, by Aviles-Palacios et al. (2013) showed that in 84% of cases, maternity protection was not a normal part of companies' preventive measures. Furthermore, the majority of those technicians underestimated the number of types of occupational exposures that are a risk to pregnancies.
As expressed by Malenfant et al. (2011), underestimating risks is not restricted to situations involving maternity; it is mainly the result of traditional ideas about preventive measures that were built around the notion of workers having accidents typical of those experienced by men working in the industrial sector.

3.4.3 Macrosocial level

The design of MPL and state incentives for its application

In their comparative study of Quebec, Finland, and Denmark, Plante and Malenfant (1998) hypothesized that the characteristics of different types of legislation had an impact on the extent to which they were implemented. They noted that the restrictions to Finnish legislation at that time[7], such as the fact that it did not consider biomechanical constraints, worked against its implementation. Danish legislation was also weakened by the fact that it made it the employer's duty to carry out risk analyses, thus creating a conflict of interest and making it difficult for workers to contest decisions. The authors also noted that because the costs of preventive leave were insured, and thus shared by all Quebec's employers, the latter were more likely to use that possibility.

[7] Restrictions lifted by the implementation of European Council Directive 92/85/EC.

In Norway, Dørheim et al. (2013) interpret the rate of sick leave of pregnant workers (which includes preventive leave as well as leave for medical reasons) as dependent on the economic choices made by employers. With sick leave being financed by the national welfare system, "instead of adjusting the work to pregnancy, employers may prefer pregnant women to take sick leave so as to employ a healthy person in her vacancy" (Dørheim et al. 2013, p. 528). Others studies in France and Italy have shown that pregnant employees also preferred taking sick leave to preventive leave, because the procedure was less complicated (Romito and Saurel-Cubizolles 1992).

With regard to incentive policies, Tarchi et al. (2007) demonstrated how Italy's introduction of a new administrative procedure enabled an increase in the number of workers who were transferred or put on preventive leave. Thanks to this new proceeding, employees could make work-related requests linked to their pregnancy directly to the local health service, which improved the speed of interventions (Tarchi et al. 2007).

Sociocultural mechanisms

Several publications have underlined the roles that gender and social inequalities have in the poor implementation of MPL. Some authors revealed that the difficulties in implementing preventive measures were a general reflection of the discrimination women faced in the workplace, as well as the priority given to consigning women to the domestic sphere (Bretin et al. 2004; De Koninck and Malenfant 2001; Malenfant 1996; Malenfant 1998; Malenfant and De Koninck 2002; Turcotte 1992). Most of these publications are already old, but the same questions deserve investigation in the current context of rapidly growing female participation in the workplace. A recent large-scale study by Adams et al. (2016b, p. 38) showed that half of the workers questioned had experienced discriminatory behavior linked to their pregnancies, "such as being given duties at a lower level or being treated with less respect or feeling that their opinion was less valued". Lembrechts and Valgaeren (2010) underlined that non-compliance with protective measures was just one of the range of discriminatory elements that occurred through the stages of maternity (for example, non-compliance with the right to time off work to attend prenatal examinations, to maternity leave, or to protection from being fired). Fear of experiencing these types of discrimination could discourage workers from trying to stand up for their rights.

Furthermore, research has shown that social inequalities between female workers structure maternity protection. Thus, the law in Quebec excludes the most vulnerable categories of workers from maternity protection, notably those with part-time jobs with multiple employers, self-employed professionals (whom the law does not consider as "workers" as such), and home workers (Lippel 1998). Nevertheless, even among the women who are theoretically covered by MPL, there are inequalities related to social status: poorly-qualified workers or those working in the private sector have a lower probability of being able to benefit from protective measures (Romito and Saurel-Cubizolles 1992).

Scientific knowledge about risks

According to Malenfant (1998), the lack of robust scientific evidence about pregnant women being exposed to certain risks adversely affects the introduction of protective measures. Indeed, the lack of evidence-based results creates uncertainty about whether pregnant workers actually face a *real* risk. As stated by Messing and Boutin (1997), the weakness of scientific evidence is also linked to the way in which research into occupational hazards is carried out; they sometimes *forget* the gender variable and tend to focus on the standard exposure scenarios experienced by men. Lippel (1998) showed that the absence of any consensus within the scientific community about the types or levels of exposure which would endanger a pregnant worker or her unborn child, or even the exposure threshold beyond which she could

justifiably be transferred, had legal ramifications. In the absence of definite scientific evidence, jurisprudence tends to refuse workers' requests for maternity protection. According to Romano and Moreno (2010), the lack of research into reproductive risks was still relevant, at least with regards to exposure to chemicals. This in turn meant that there were no common recommendations available to all healthcare professionals, including criteria or guidelines about occupational risks, and this obstructed effective maternity protection.

3.5 Expected and unexpected outcomes of the application of MPL

We studied 21 articles about the effects of MPL. First, we describe the studies dealing with the expected effects of MPL, and then those dealing with their unexpected effects. When possible, we investigate the reasons behind these effects.
Table 5 shows the references by theme and subtheme, findings, and the region where studies were conducted.

Table 5: References by theme and subtheme, findings, and region where studies on the expected and unexpected effects of MPL were conducted

Themes and subthemes	Findings	Region	References
Expected effects			
Effectiveness of maternity protection policies	MPL was an effective protection tool	Quebec; Poland	Croteau et al. (2006) Croteau et al. (2007) Makowiec-Dabrowska et al. (2003b)
	Loss of efficiency through delayed implementation and economic costs	Denmark; European Union; Quebec	McDonald (1994) Andersen et al. (2008) Andersen et al. (2015) Romano and Moreno (2010)
Impact on absence from work	Job adjustments reduce absenteeism	Norway	Kristensen et al. (2008)
	MPL succeeds in reconciling pregnancy and work	Quebec	Gravel et al. (2017)
Unexpected effects			
Deterioration in professional relationships	Harassment or negative comments from employer and colleagues	France; Quebec; UK	Adams et al. (2016b) Bretin et al. (2004) De Koninck and Malenfant (2001) Malenfant and De Koninck (2002)
Negative effects on employment and career	Systematic withdrawal of the worker rather than modifying her working conditions	France; Quebec	Bretin, H. et al. (2004) De Koninck and Malenfant (2001) Legrand (2015) Malenfant and De Koninck (2002) Turcotte (1992)
	Employment discrimination	Belgium; Quebec	Lembrechts and Valgaeren (2010) Lippel (1998)
Implications for representations of women's work and occupational hazards	Increased interest in research involving occupational risks and women's work	Denmark; Finland; Quebec	Malenfant (1996) Bouchard and Turcotte (1986) Lippel (1998) Taskinen et al. (1995) Gravel et al. (2017)
	Preventive leave increased gender-based divisions in the workplace	France; Quebec	Malenfant (1996) Malenfant and De Koninck (2002) Legrand (2015) Messing and Boutin (1997)

3.5.1 Expected effects

Two major themes emerged from studies about the expected effects of MPL: their effectiveness and their impact on absenteeism.

Effectiveness of the protective policies

Two case studies in Quebec compared the outcomes of pregnancies among workers for whom protective measures had been taken relatively early (before 24 weeks), relatively late, and not at all (Croteau et al. 2006; Croteau et al. 2007). These studies considered a vast range of exposure scenarios: work schedules, posture, physical effort, work organization (breaks, piecework), environmental occupational conditions (noise, exposure to tobacco smoke). Workers who had benefitted from adaptations to their working conditions during pregnancy, or who had had preventive leave, had a lower risk of giving birth prematurely or to babies small for their gestational age than those who had not. This attested to the effectiveness of the right to reassignment or preventive withdrawal.

In Poland, the interviews conducted by Makowiec-Dabrowska et al. (2003b) with 3050 employees show that the more their working conditions deviated from regulations, the more they gave birth to small-for-gestational age infants. The authors estimate that the number of small-for-gestational age infants would decrease by 28% if the working conditions met the current regulation.

McDonald (1994, p. 138), however, arrived at contradictory conclusions. The author based her analysis on an epidemiological study of 56,000 women in Montreal's hospitals, from 1982–1984, who had recently given birth or miscarried. The study only found links between fetal death or premature birth and a limited number of exposure scenarios: lifting heavy weights, other physical efforts, standing more than 8 h/day, a working week of 46 h or more, and changing shift work. By integrating data from Canada's census, McDonald estimated that, in total, 32% of pregnancies were subject to occupational exposures, but that only 6% of fetal deaths and 3.4% of premature births were attributable to working conditions and could thus have been prevented by MPL. The study also underlined that pregnant workers usually went on leave too late to prevent fetal deaths (in 70% of cases this happened after the 16th week of pregnancy). In conclusion, the author judged that the right to reassignment or preventive withdrawal was not very effective with regard to its high costs to employers (around CAD 100 million per year in the early 1990s). These conclusions are mitigated by the low quality of the publication (Dixon-Woods criteria score = 2/5). The contradictory conclusions of the studies by Croteau et al. (2006); (2007) seem to be explained not only by the differences in methodology (direct versus indirect measurements, or the range of exposures), but also by the fact that McDonald's conclusions rely on her own appraisal of a suitable cost-benefit ratio (cost of MPL - number of fetal deaths and premature births which could have been avoided). Indeed, the numbers found by McDonald (1994) could also be considered as indicators of the effectiveness of MPL.

Without entirely dismissing the usefulness of MPL, other studies have underlined that the time between conception and the implementation of protective measures means that they are ineffective against certain risks. For example, a prospective Danish study of workers in greenhouses showed that protective measures failed to prevent exposure to endocrine disruptors and neurotoxic compounds because that exposure occurred so early on in the pregnancy that women could not yet have been transferred to another position (Andersen et al. 2015; Andersen et al. 2008). Given the embryo's great vulnerability during the first weeks of gestation (Romano and Moreno 2010, p. 193), late interventions render MPL ineffective in the face of chemical or biological risks: "risk assessments carried out in workplaces only

include risks for pregnancy after the worker has informed the company, normally between the 7th and 10th week of gestation."

Impact on rates of absenteeism

Unlike studies emphasizing the costs engendered by MPL, a quantitative study in Norway by Kristensen et al. (2008, p. 565) indicated that "job adjustment was associated with reduced absence from work in pregnancy". In particular, the risk of absenteeism (> 2 weeks) decreased by nearly 11% when working conditions could be adjusted.
In Quebec, a recent qualitative study in ten hospitals (Gravel et al. 2017) shows that the majority of interviewed pregnant nurses "claim their right to keep working under precautionary reassignment legislation, with appropriate accommodations". Authors conclude that in this context, MPL succeeds in reconciling work and pregnancy.

3.5.2 Unexpected effects

The articles studied described several unexpected effects of MPL: the deterioration in relationships between pregnant workers and their employers and colleagues, the negative effects on workers' jobs and careers, and the consequences of representations of women's employment and occupational risks.

Deterioration of professional relationships

Several publications revealed that, depending on the organizational context, adjustments to workstations or job transfers could have negative repercussions, whether real or perceived, on colleagues' jobs and thus on the working relationships. In the United Kingdom, 20% of workers questioned in the study by Adams et al. (2016b, p. 69) said that they had experienced "harassment or negative comments" linked to their pregnancy from either their colleagues or employers. In an analysis of two qualitative studies carried out in Quebec on how to balance employment and pregnancy, Bretin et al. (2004, p. 156) reported that for some workers, the implementation of their right to preventive leave "signaled the start of a deterioration in the relationships in the workplace." In the same way, in the qualitative interviews done by De Koninck and Malenfant (2001) and Malenfant and De Koninck (2002), pregnant women affirmed that they had experienced colleagues who had sided with employers who were reticent to carry out preventive measures, who had shown them great hostility, and who had been the initiators of negative pressures.

Negative effects on employment and career

Several studies agreed on the fact that putting a worker on leave was usually preferred over adjusting her working conditions (Bretin et al. 2004; De Koninck and Malenfant 2001; Legrand 2015; Malenfant and De Koninck 2002; Turcotte 1992). According to Legrand (2015, p. 17), the tendency to put women on leave during their pregnancies could not only have negative effects on their career paths, but could also "encourage, without being the sole factor, attitudes of risk-denial, keeping secrets, and even hiding the pregnancy"[8].
Preventive leave can also equate to a significant financial loss for women (Lembrechts and Valgaeren 2010). Salary compensation is currently below 100% in six of the thirteen countries studied. In Belgium, the discussion groups organized by Lembrechts and Valgaeren (2010) revealed the fear that legal dispositions in favor of pregnant workers might scare employers and negatively affect women's chances of being recruited. According to Lippel

[8] Translated by the authors.

(1998, p. 276) "care must be taken to avoid the conclusion that the program is predicated on the idea that pregnant women should not be working."

Implications for representations of women's work and occupational hazards

Several authors have affirmed that by focusing on pregnancy, a uniquely female condition, MPL forgets to protect other workers, whether women or men. Furthermore, the preference for using preventive leave removed the pregnant woman from the source of danger rather than dealing with it (Legrand 2015; Malenfant 1996; Malenfant and De Koninck 2002). According to Malenfant and De Koninck (2002), the preference for putting women on leave rather than adjusting their workspaces or transferring them was problematic for a number of reasons. Firstly, it maintained gender-based divisions in the workplace. Secondly, it supported the idea that pregnancy and employment were incompatible. Finally, "leaving the workplace leads to the invisibility of women as procreative, economic and social agents, and maintains the invisibility of procreation in our society" (Malenfant and De Koninck 2002, p. 73). Finally, the focus on pregnancy and the problems encountered by pregnant women in the workplace, encouraged the idea that the presence of women in the professional world was *abnormal* and obscured the necessity to transform workplaces by adapting them to the needs of all workers (Messing and Boutin 1997).

On the contrary, other publications affirmed that MPL could expose the potential risks faced by workers, particularly women, in professional environments (Malenfant 1996). According to Bouchard and Turcotte (1986), legal measures represent significant social progress in the recognition of occupational risks, especially by labor unions. For Lippel (1998) and Taskinen et al. (1995), MPL had the indirect positive effect of promoting research into women's occupational health and the occupational exposure which they faced. More recently, Gravel et al. (2017) show that pregnant nurses do not experience protective measures in a passive manner: they are able to challenge not only working conditions but also reassignments that they judge inappropriate for their health or their career. For the authors this act of resistance could have a positive impact "not only for pregnant workers and their fetuses, but also for all personnel because work adjustments can be improved" (Gravel et al. 2017).

4 Discussion

We discuss the principal results of the review and their implications for improving maternity protection legislation (MPL); we then evoke the review's strengths and weaknesses, as well as the needs for future research which have emerged from it.

4.1 Most relevant findings and improvements to legislation/implementation

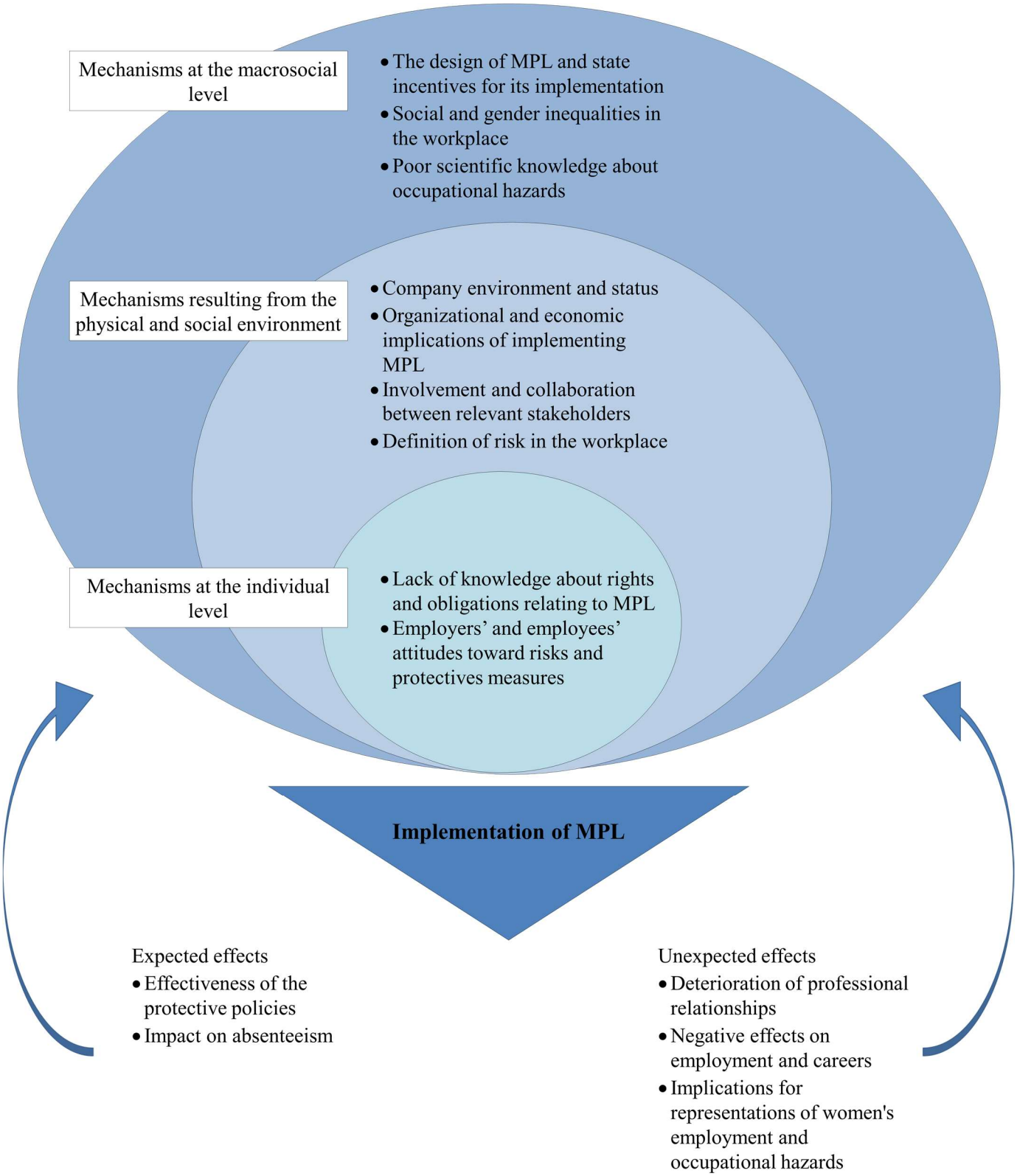
4.1.1 <u>The degree of implementation</u>

The implementation of MPL varies depending on the national context, but there were gaps in all the legislative contexts studied. Poorly qualified workers, private sector workers, and workers in small companies were particularly likely not to be covered by maternity protection measures, whereas they are also the groups most likely to face occupational hazards. This tied in with findings about inequalities in other areas of occupational health (e.g. Artazcoz et al. 2007; Belin et al. 2011; Campos-Serna et al. 2013). Workers usually go on leave, whether preventive leave or sick leave, rather than remaining at work following ergonomic adaptations to their workstations or transfer to another position. This is despite the fact that these two options are defined as the priority solutions in all the MPL studied.

4.1.2 An overview of mechanisms and effects affecting the implementation of MPL

The present narrative review revealed interdependent mechanisms operating at three levels: the individual, contextual, and macrosocial levels (**Fig. 2**). We also saw how the expected and unexpected effects of MPL had return effects on the level of implementation.

Fig. 2: Mechanisms and contexts affecting the implementation of MPL



Leaving aside some mechanisms that concern occupational health in general (Gatchel and Schultz 2012), we discuss below some of the mechanisms particularly relevant to pregnancy and highlight how MPL might be improved.

4.1.3 Findings and actions at the individual level

The results of this narrative review indicated that communication and awareness raising activities should be particularly attentive to the representations which stakeholders give to pregnancy at work and to risks.

One communication difficulty is defining the target group. In an attempt to ensure early protection (notably against chemical or physical exposure), information about risks and protection measures should be given to all women of childbearing age as soon as they are hired. However, representations of pregnancy often see it as a unique *state*, to which women do not necessarily identify; they may not feel implicated by informative interventions. Furthermore, there is also a question about the boundary between professional and private sphere: because women often keep their pregnancies secret until the end of the first trimester, how can risk prevention be maximized without interfering with their private lives?

With regards to attitudes, we found that certain women chose to continue working despite medically identified risks to their health. They often take other risks into account, such as the fast pace of work or stress, but also the deterioration of relationships with colleagues, and impacts on career paths or job retention. To be effective, any maternity protection intervention should also consider these parameters, not only biomedical risks.

4.1.4 Findings and actions at the level of the social and physical environment

At an organizational level, the unpredictability of needs for ergonomic adjustments to workstations, job reassignments, or maternity-leave cover makes companies see pregnancy as a unique problem. Companies thus tend to see MPL as less legitimate than preventive interventions which concern all members of staff. This raises the question about how to anticipate which actions should be taken.

With regards to other stakeholders, some MPL involves gynecologists or GPs, giving them the responsibility of deciding whether pregnant patients should carry on working or not. This extra actor in the field of occupational health can sharpen coordination and communication problems between stakeholders. It also raises the question of whether gynecologists and GPs have the necessary skills to deal with occupational risks. One solution might be to redefine roles, associating the occupational health physician more closely with decisions about preventive leave.

Another means of improving coordination might be the introduction of a company *risk-prevention resource person* acting as an interface between the company and healthcare professionals, but also between pregnant women and their employers (Gravel and Malenfant 2012). When coupled with participative management, this approach seems not only to favor a satisfactory solution for the pregnant worker but also for the company, notably in terms of medium- and long-term organizational performance (Gravel and Malenfant 2012). We believe that, in certain contexts, the occupational physician could play the role of the resource person.

Finally, the definition of risks is an essential precondition of preventive interventions. The different stakeholders should have the means to create a common definition of the risks facing a company's employees, despite partially divergent interests and points of view. The pregnant women's experience can prove to be complementary to expert opinions, because they have a contextualized vision of what constitutes a risk and the preventive possibilities which are appropriate to what their jobs really entail (Malenfant 2009).

4.1.5 Findings and actions at the macrosocial level

At the macrosocial level, some of the problems and solutions may reside in existing occupational health policies (Tarchi et al. 2007). However, the studies did not explore the roles played by monitoring agencies, notably labor inspectorates, whose staff numbers are often too low to exert real oversight of the application of MPL. The literature underlines the financial incentives of preventive or sick leaves for both employers and workers, as well as the cost linked to adjusting workstations and job transfers. One potential means of encouraging women to stay in work could be the introduction of a direct financial incentive rewarding strategies to analyze potential future risks and job adjustments/transfers.

4.1.6 Findings and actions on effects

One important finding of the studies on effectiveness was that protective measures were applied too late to be effective against certain types of exposure, notably chemical exposure (Romano and Moreno 2010). Risk analysis was very rarely used as a preventive tool. There are, of course, many practical barriers to imposing systematic risk analyses on companies, as well as many cultural obstacles that make women reluctant to announce their pregnancies early. For these reasons, it might also be relevant to think about a unified occupational health protection strategy (Hansson and Schenk 2016) that could complement the differentiated maternity protection currently in place and would offer earlier, broader protection against the risks of exposure on reproductive health.

This review revealed the unexpected negative effects of maternity protection measures on working relationships with colleagues and employers, women's careers and the stigmatization of pregnancy. There deserves to be more thought about how to minimize these perverse effects of MPL, for example, by using policies on gender equality at work, better employment and career protection, greater participation by female employees in decisions about work organization, or promoting a unified occupational health protection strategy.

More generally, measures encouraging occupational health would benefit from investigation and promotion from the point of view of what they can bring to the company and pregnant workers, rather than from a costs angle. The study by Kristensen et al. (2008) indicated that ergonomic adjustments to workstations reduced absenteeism. These findings are consistent with several other studies, which have shown that absence during pregnancy is highly correlated with working conditions (Hansen et al. 2015; Henrotin et al. 2017; Kaerlev et al. 2004). Other benefits, including the working atmosphere, the quality of working relationships, employee motivation, and the quality of their work, are more difficult to put a number on but are not less valuable.

4.2 Strengths and limitations

One of this review's limitations is the age of the publications. Of 42 publications, 11 are from the 1980s or 1990s. There have been some significant changes since then. Council Directive 92/85/EEC has harmonized and spread MPL across the European Union. Meanwhile, the characteristics of women's employment have changed (Bläuer Herrmann and Murier 2016), and so have the behaviors and representations linked to pregnancy. For example, comparisons of perinatal surveys in France from 1995 to 2010 have shown that in addition to women having their children later in life, there have been improvements in promoting healthy behaviors and prenatal follow-up (Blondel et al. 2012). Finally, knowledge about exposure risks has grown and become more precise (Lafon 2010). These changes do not necessarily undermine the validity of our findings about mechanisms and effects of MPL, but highlight the fact that updates and follow-ups of the old research would be useful.

Another limit to this study is the mismatch between the number of research projects and their detail, depending on the country. While Quebec was examined in 17 of the 42 publications, other countries were only looked at by a few studies and often from specific angles which did not provide a full overview of the issues involved in MPL.
Despite the diversity of contexts and research methodologies, the sum of the information in these publications allowed us to draw a consistent image (although not full one) of the implementation of MPL and its effects. With regards to methods, the quantitative studies allowed us to measure the degree of implementation of MPL and some of its effects and factors involved in its implementation. In line with realist approaches, qualitative studies were indispensable to a deeper investigation of why different actors behave in certain ways, and of what the organizational dimensions of applying MPL were.

4.3 Future research needs

The present study listed five fields where further research appears necessary.
First, there is a need for more knowledge about occupational exposure and its consequences on the health of fetuses, but also the mothers (who are less often considered), in order to improve legislation and prevention strategies.
Second, there is a need of studies combining diverse levels and types of data in order to investigate thoroughly the implementation of MPL in a national context. The review demonstrated the utility of combining quantitative and qualitative data. Because pregnancy at work involves so many complex issues for the different stakeholders, it is also useful to compare different points of view.
The third field would be testing potential solutions using action research. In addition to searching for solutions at the company level -the usual and most important level- it would be interesting to reflect on how to improve the resources available to the actors involved (information from stakeholders, pregnant workers' rights) and to develop incentive strategies at the policy level (monitoring, financial incentives). It would be pertinent to think about the links between maternity protection, in its strictest sense, and measures which companies take to promote equality, health, and the work-life balance.
The fourth field touches on differences between different legislation and their implications on the implementation of the law. As in the article by Plante and Malenfant (1998), it would be useful to compare the solutions adopted in different contexts with regards to monitoring agencies, pay during preventive leave, the list of risks considered, the actors involved in risk assessments, and taking decisions about preventive leave (notably from the point of view of their skills and independence vis-à-vis the company).
The final field requiring further research involves the economic impacts of MPL. It would be interesting to compare the costs to companies of making ergonomic adjustments to workstations or transferring pregnant workers to other jobs and the costs linked to preventive and sick leaves. Such calculations might incite companies to anticipate risky situations and develop solutions that are cheaper than absenteeism. This might also lead to thinking about how to best share the costs linked to preventive leave.

5 Conclusion

Maternity protection at work lies at the intersection between several important contemporary issues of interest to healthcare professionals, the general population, and policy-makers: protecting the health of the unborn child and the growing interest in child development (Lupton 2012); the status of women and their demands for gender equality in the workplace; the work-life balance of both parents (questions surrounding maternity, paternity, and parental leave, or the incompatibility of working hours with childcare).

The present realist narrative review explains how the significant gaps remaining between the primary objectives of maternity protection legislation (MPL) and its implementation are the result of complex issues. Some answers can be found at the technical-organizational level, such as improved information, better anticipation of risks by companies, a more suitable repartition of responsibilities between healthcare, occupational health and company actors, or more state involvement. However, other aspects are also indispensable, particularly the need to know why actors (including pregnant workers) adopt solutions outside the framework of MPL. These include going on sick leave, not announcing a pregnancy, continuing to do dangerous or arduous work, and other informal arrangements.

The goal would be to create a framework allowing all the different actors, notably pregnant workers, to make choices which improve health protection without too many negative effects on employment, income, production, professional relationships, and so on. This raises questions about job security and career paths, pregnant employees' decisional powers, and consideration of legislative incentives for companies seem essential. There is a need for clear guidelines offering equal rights for all, based on objective data, but also flexible enough to use when negotiating solutions in all situations. This is clearly complex.

This review shows that the domain of maternity protection will only progress if it is set in a broader context. On one hand, this should involve changing the framework and representations of how we balance work and maternity. Pregnancy is a difficult state to define in the professional environment (Malenfant 1996); it is neither a normal state nor an illness. When pregnancy is compared to being sick, women find themselves temporarily excluded from employment. When pregnancy is compared to a normal state, and no extra precautions are taken, health protection measures no longer seem appropriate and tend to disappear. Much thought and many actions will be needed to deconstruct representations which picture maternity and work as incompatible and to create a better, more tangible balance between them. On the other hand, the broader context will also require more thought about how better risk prevention during pregnancy can help advance the field of occupational risk reduction in general. By ceasing to set the interests of pregnant workers against those of their colleagues, pregnancy could be the lens through which the dangers facing all workers can be analyzed and subsequently eliminated.

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6 Annex

6.1 Exhaustive search strategy in all databases

Table 6: Exhaustive search strategy in all databases

Electronic database	Search strategy	Number of references found
PubMed	((pregnancy[MeSH Terms]) OR pregnant women[MeSH Terms])) AND ((women, working[MeSH Terms]) OR workplace[MeSH Terms]) OR occupational health[MeSH Terms]) OR occupational exposure[MeSH Terms]) OR occupation[MeSH Terms]) OR occupational health/legislation and jurisprudence[MeSH Terms] OR women, working/legislation and jurisprudence[MeSH Terms] OR mothers/legislation and jurisprudence"[MeSH Terms]))	3390
CINHAL	(MM "Pregnancy" OR MM "Expectant Mothers") AND ((MM "Women, Working") OR (MM "Work Environment") OR (MM "Occupational Health") OR (MM "Occupational Exposure") OR (MM "Occupations and Professions") OR (MM "Legislation") OR (MM	49

	"Rules and Regulations") OR (MM "Policy and Procedure Manuals"))	
MIDIRS	(Pregnancy.de. OR Pregnant Women.de.) AND (Working women.de. OR Workplace.de. OR Occupational health.de. OR Occupational exposure.de. OR occupation.mp. [key word])	389
PsycINFO	(pregnancy [Thésaurus] OR pregnant women [key word]) AND (working women [Thésaurus] OR workplace [key word] OR occupational health [Thésaurus] OR occupational exposure [Thésaurus] OR occupations [Thésaurus])	201
Sociological Abstracts	(MAINSUBJECT.EXACT("Pregnancy") AND (MAINSUBJECT.EXACT("Working Women")) OR MAINSUBJECT.EXACT("Workplaces") OR (occupational health [key word]) OR (occupational exposures [key word]) OR MAINSUBJECT.EXACT("Occupations")	114

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