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Title

Antenatal care policy in high-income countries with a universal health system: a scoping review.

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Andreia S Goncalves: Conceptualization, Methodology, Data curation, Formal analysis, Writing - Original draft preparation. **Isabel M Ferreira**: Data curation, Formal analysis, Writing - Original draft preparation. **Marcia Pestana-Santos**: Visualization, Investigation, Methodology, Writing - Reviewing and Editing. **Ana Paula Prata**: Supervision, Validation, Visualization, Writing - Reviewing and Editing. **Christine McCourt:** Supervision, Validation, Visualization, Writing - Reviewing and Editing.

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Declarations of interest

None.

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Abstract

The availability, effectiveness, and access to antenatal care are directly linked with good maternal and neonatal outcomes, making antenatal care an important determinant in health. But to be effective, care must always be appropriate, not excessive, not insufficient. Perinatal outcomes vary within and between countries, raising questions about practices, the use of best evidence in clinical decisions and the existence of clear and updated guidance.

Through a scoping review methodology, this study aimed to map the available antenatal care policies for low-risk pregnant women in high-income countries with a universal health system, financed by the government through tax payments.

Following searches on the main databases and grey literature, the authors identified and analysed ten antenatal care policies using a previously piloted datachart: Australia, Denmark, Finland, Iceland, Italy, Norway, Portugal, Spain, Sweden and the United Kingdom. Some policies were over 10 years old, some recommendations did not present a rationale or context, others were outdated, or were simply different approaches in the absence of strong evidence. Whilst some recommendations were ubiquitous, others differed either in the recommendation provided, the timing, or the frequency. Similarly, we found wide variation in the methods/strategy used to support the recommendations provided. These results confirm that best evidence is not always assimilated into policies and clinical guidance. Further research crossing these differences with perinatal outcomes and evaluation of cost could be valuable to optimise guidance on antenatal care. Similarly, some aspects of care need further rigorous studies to obtain evidence of higher quality to inform recommendations.

Keywords

High-income countries; health policy; pregnancy; antenatal care; scoping review

Background

Pregnancy and birth are major life events: for women, for a family, and the society(1). Mothers' and newborns' health is paramount for a 'good start' in life and without the right care, this 'start' can be a stressful, damaging, or even a tragic event(2). Effective maternity care is, therefore, a pivotal global health policy(3), mirrored in the Sustainable Developmental Goals(4) agenda for 2030, and, unsurprisingly, extraordinary attention to antenatal care is paid by the health services all over the world(1). The availability, effectiveness, and access to antenatal care are linked with good perinatal outcomes, making it an important determinant in the health of a whole society(1).

The World Health Organization (WHO) urges countries to expand their agendas to look beyond survival, maximising the health and potential of their populations(5). Best evidence needs to be integrated into practice, whilst certain services should be reconsidered(1). Sustainable and adequate health policies are key to delivering the best possible care to a population, responding adequately to its changing needs(6). Recommendations of care need to be meticulously considered ensuring they meet the needs of the women and babies but also ethical principles including a careful consideration of benefits versus harm. Research demonstrates the fundamental aspects of antenatal care, but governments are ultimately responsible for care provision and deciding what aspects are included in the service they provide(7). For the purposes of this review, antenatal care is all the care that a pregnant woman receives from organized health services(1) and antenatal care policy the guidance that aims to draw recommendations on the complex nature of the issues surrounding pregnancy, healthcare practices, and provision(5).

Antenatal care varies within and between countries, sometimes even inside a maternity care setting, in ways that are not fully related to clinical needs, raising questions about the assimilation of evidence into clinical decisions(8), and the existence of clear and updated guidance in the field. The evidence

clearly demonstrates the association between unnecessary clinical interventions and increased morbidity (9)(5) Yet, elements of antenatal care continue to be introduced without scientific proven benefit (e.g., cardiotocography) whilst others are not introduced despite the clear benefit for women and babies (e.g., continuity midwifery-led care models) (1).

In Europe and other high-income countries, perinatal health disparities point to the need and opportunity for improvement(10). As an example, in the latest European Perinatal report maternal mortality varied from 1.9 to 24.7 deaths per hundred thousand live births (8), vaginal birth rates from 39.4% to 77%, and cesarean rates from 16.1% to 56.9%(8). Could these discrepancies be related to the organisation of care, and could countries learn from one another?

Previous research explored models of care(11) ideal frequency of antenatal consultations(12) and characteristics of certain care models that may result in improved perinatal outcomes(3). But to the authors knowledge, no other review has focused on mapping antenatal care policy, at a country level.

To fill this gap, and to feed into further research, the purpose of this scoping review was to map the available evidence on the nature, extent, and range of antenatal care policies (concept) for low-risk pregnant women (participants) in high income countries with a healthcare system founded on the Beveridge Model (context): a health system available to all citizens and financed by the government through tax payments (13).

The results of this review will serve as base of a research project into the adequacy of the midwife-led care model for the antenatal care of low-risk pregnant women in the Portuguese National Health Service. The evidence gathered will be used in a cost-effectiveness study comparing the current general practitioner-led model of care with a proposed midwife-led care model. However, the outcomes of this review can be embraced by any country who wishes to evaluate the care they provide to pregnant women, to compare it to other countries and to revisit the evidence upon which care is provided.

Scoping review was the chosen methodology as it is the most appropriate type of review to identify and map evidence such as policy(14), or simply to identify key characteristics or factors related to a concept(15).

Review question(s):

What are the antenatal care policies for low-risk pregnant women in high-income countries with a health care system founded on the Beveridge Model?

Additionally, the review addressed the following questions:

i) What clinical aspects are assessed in the antenatal care package for low-risk women in each country?[1]

ii) How is the care organized for low-risk pregnant women in each country?

iii) Who provides care for low-risk pregnant women in each country?

iv) What evidence the guideline developers used to inform antenatal care guidance for low-risk pregnant women in each country?[1]

Inclusion criteria

This review considered documents that included policy or official guidance on antenatal care for low-risk pregnant women in high-income countries, with health care systems comparable to Portugal: Australia, Denmark, Finland, Greece, Iceland, Ireland, Italy, New Zealand, Norway, Portugal, Spain, Sweden, and the United Kingdom (UK).

Methods

This study was conducted following the JBI methodology for scoping reviews(15) and reported following the PRISMA-ScR guidance(16). An *a priori* protocol(17) has been developed, registered

[1] To increase clarity this research question was re-worded from the originally protocol.

(osf.io/h7um6), and is publicly available. The protocol was methodically followed, and the only change was the removal of “study method” item from the data collection chart.

Search strategy

Documents published in all languages from 2005 were searched in the main databases such as CINAHL Plus, Scopus, MEDLINE (PubMed) (Appendix 1), amongst others(17), on March 28^{th,} 2020. Reference lists of the articles selected for full-text review were screened for additional papers and a hand search of grey literature was conducted. Finally, field experts (academics and departments of health) were contacted.

All identified records were collated and uploaded into Mendeley v.1803 and duplicates removed. Two reviewers screened through the records (Figure1).

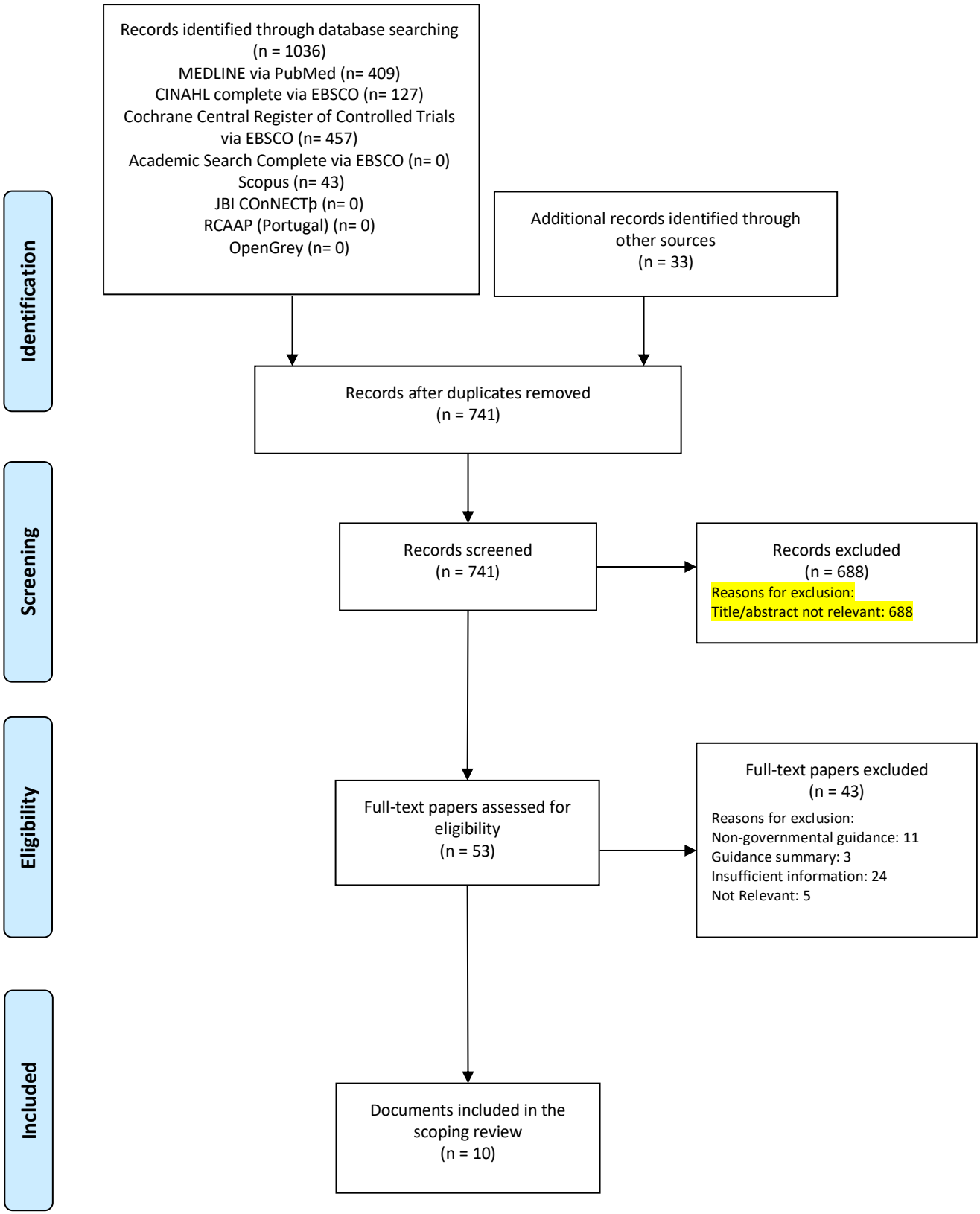


Figure 1: Flow diagram of literature search, study selection, and inclusion/exclusion process, modified from PRISMA(18)

Data was extracted using a tool(17) previously developed and piloted by the reviewers. The data charts were subsequently contrasted and merged into one. Data items included the objective, participants, concept and context of the document as well as schedule of antenatal care, organisation of care (setting, content of each consultation, antenatal screening), model of care/professionals delivering care, and evidence to support recommendations. The authors did not assess for quality of the documents, since it is not a purpose of a scoping review, but looked at the evidence utilised to inform guidance. For easier analysis of the results, data was synthesised into categories that answer the research questions and are summarised in tables (tables 1 to 7). A narrative summary and discussion accompanies the tabulated results.

This review is a secondary analysis of publicly accessible documents and therefore exempt from ethical approval(19).

Results and Discussion

The search identified 1036 records in the databases, and an additional 33 were found through other sources. After the removal of 328 duplicates and exclusions for several reasons (Figure 1) a total of 10 documents were included in this scoping review.

Characteristics of the included studies

The review identified the antenatal care policies for all eligible countries except for Greece, the Republic of Ireland, and New Zealand. This was following a thorough literature search and contact with experts in the field/departments of health. The authors concluded that these three countries do not have official governmental guidance on antenatal care.

Table 1 - Included Documents

Country	Author	Published/Last Updated
Australia	Australian Department of Health(20)	2019
Denmark	Danish Department of Health(21)	2013
Finland	Finnish Department of Health and Welfare(22)	2013
Iceland	Icelandic Department of Health(23)	2010
Italy	Italian Ministry of Health(24)	2013
Norway	Norwegian Department of Health(25)	2019
Portugal	Portuguese Department of Health(26)	2015
Spain	Spanish Ministry of Health, Social Services and Equality(27)	2014
Sweden	Swedish Association for Obstetrics and Gynaecology(28)	2016
United Kingdom	National Institute for Health and Care Excellence(29)	2019

What clinical aspects are assessed in the antenatal care package for low-risk women in each country?

The authors looked at routine clinical assessment and antenatal screening (tables 2-4). The term "routine" will be used in this section to either refer to the elements that are part of regular procedure rather than offered for a special reason or to refer to the frequency aspect of an element. Throughout the discussion the WHO(30) recommendations on antenatal care will be referenced as standard of care for most of the elements analysed. For elements not recommended by the WHO guidance, the latest available research will be used.

Table 2 - Clinical Assessment

Clinical Assessment	Australia	Denmark	Finland	Iceland	Italy	Norway	Portugal	Spain	Sweden	United Kingdom
Detailed History	1st	1st	1st	1st	1st	1st	1st	1st	1st	1st
Body Mass Index	1st	1st	1st	1st	1st	1st	1st	1st	1st	1st
Weight	1st	1st	e.c.	1st	1st	E.c.	E.c.	1st	10-12w + 24-25w + 35-36w	1st
Blood Pressure	e.c.	e.c.	e.c.	e.c.	e.c.	e.c.	e.c.	e.c.	e.c.	e.c.
Urine Reagent Strips	1st	e.c.	e.c.	e.c.	Not clear if routine check only at 1st or at e.c.	e.c.	e.c.	e.c.	e.c.	e.c.
Symphysis Fundal Height	e.c. >=24w	e.c. >=24w	e.c. >=24w	e.c. >=25w	e.c. >=28w	e.c. >=24w	e.c. >=14w	e.c. >=24w	e.c. >=24w	e.c. >=24w
Abdominal Examination to Identify Fetal Position	e.c. >=36w	e.c. >=36w	e.c. >=30w	e.c. >=36w	e.c. >=36w	a.c. >=36w	e.c. >=36w	e.c. >=36w	e.c. >=35w	e.c. >=36w
Routine Fetal Heart Rate Auscultation	Optional	Optional	e.c. >=13-18w	No	Does not provide recommendation	e.c. >=24w	e.c. >=12w	Does not provide recommendation	e.c. >=24w	Optional

1st: first consultation; w: weeks' gestation; e.c.: each consultation

The clinical assessment presents many aspects of consensus, especially where evidence is strong. The authors found differences in recommendations where evidence seems to be debatable or where practices have been long-standing yet current evidence shows differently. This is the case of routine weight measurements where some countries recommend it throughout pregnancy whilst others encourage self-monitoring (Australia), or no weight checks past the first consultation. In fact, there is no clear evidence that weight measurement has the potential to change maternal and fetal outcomes though it is well established that excessive weight gain during pregnancy is linked to negative outcomes(31). Similarly, routine urine strip tests are only done if risk factors are identified in Australia and Italy, whilst all other countries recommend both blood pressure monitoring and urine strip testing in all consultations. These have historically been conducted routinely aiming to detect pre-eclampsia. Yet, new evidence has found that urine strip testing is inaccurate in predicting significant proteinuria(32) and some experts defend that without risk factors it is unnecessary since it is of little or no benefit in predicting pre-eclampsia(33). Likewise, the amount of proteinuria does

not seem to be related to poor maternal and neonatal outcomes(34).

There is expert agreement that blood pressure monitoring is an important intervention in all antenatal care consultations, and the most important factor that influences maternal and neonatal outcomes in the case of pre-eclampsia or hypertensive disorder(34).

Lastly, though evidence is clear that intermittent fetal heart rate monitoring during pregnancy has no predictive value on the pregnancy outcome(35), many countries still recommend it routinely. Finland sustains that listening to the fetal heart rate during normal pregnancy is likely to be important to the woman and her family, which is also the reason why Australia, Denmark, and the UK recommend it as an "optional" intervention. Italy makes no recommendation and Iceland acknowledges its long tradition, though does not recommend it.

Less common routine aspects of care (e.g., abdominal circumference measurement - Portugal) were not addressed in this review.

Table 3 - Antenatal Screening: Ultrasound Scans and Chromosomal Anomaly Screening

Antenatal Screening	Australia	Denmark	Finland	Iceland	Italy	Norway	Portugal	Spain	Sweden	United Kingdom
Ultrasound Scans										
First Trimester	8-13+6w	11-13+6w	10-13+6w	No	11-13+6w	No	11-13+6w	11-13+6w	10-13+6w	10-13+6w
Second Trimester	18-20w	18w	18w-22w	19-20w	19 - 21w	17-19w	20-22+6w	18-22w	18-20w	18-20+6w
Third Trimester	No	No	No	No	No	No	30-32+6w	No	No	No
Chromosomal Anomaly Screening										
Combined 1st trimester screening (MA + NT + free β-hCG + PAPP-A)	11-13w+6	8-13+6w	11-13+6w	No	11-13+6w	No	11-13+6w	11-13+6w	10-13+6	11-13+6w

w: weeks' gestation; MA: Maternal age; NT: Nuchal translucency measurement; free ß-hCG: serum-free beta component of human chorionic gonadotrophin; PAPP-A: Pregnancy-associated plasma protein A; AFP: Alpha-fetoprotein; uE3: unconjugated oestriol.

Variations in the recommendations for antenatal screening through ultrasound scans (USS) were found, both in frequency and timing. Norway and Iceland are the only countries whose policies are

in line with WHO(30) guidance: one USS only, before 24 weeks gestation. This scan aims to detect multiple pregnancy and fetal abnormalities, estimate gestational age, reduce induction of labour for post-term, and improve a woman's pregnancy experience(5). All other countries advise an additional USS, where combined screening is offered, generally between 11-13+6 weeks gestation(36). Ultrasound scanning is considered one of the most important advances in Obstetrics in the 20th century(37) yet its performance is not without risk; such as misdiagnosis/relevance of findings and the risk of possible undesired effects(38).

Portugal is the only country that recommends a routine third trimester USS. The other countries only recommend it based on need. In fact, evidence is in favour of its selective use since in low-risk pregnancies this intervention did not prove to reduce the incidence of adverse perinatal outcomes compared to the selective cases approach(39).

Table 4 - Antenatal Screening: routine urine and blood tests

Screening test	Australia	Denmark	Finland	Iceland	Italy	Norway	Portugal	Spain	Sweden	United Kingdom
Infectious Diseases										
Rubella	1st	No	No	1st	1st +17w (if unknown or non immune)	No	1st + 18-20w (if unknown or non immune)	1st	1st	No
Toxoplasmosis	No	No	No	No	1st + repeated every 4-6 weeks (if unknown or non immune)	No	1st + 24-28w + 32-34w (if unknown or non immune)	No	No	No
Syphilis	1st	1st	1st	1st	1st + third trimester	1st	1st + 32-34w	1st	1st	1st
Human Immunodeficiency Virus	1st	1st	1st	1st	1st + third trimester	1st	1st + 32-34w	1st	1st	1st
Hepatitis B	1st	1st	1st	1st	Third trimester	1st	1st + 32-34w	1st	1st	1st
Bacteriuria	1st	1st + 25w	1st	1st	1st	1st	1st	1st	1st	1st
Group B Streptococcus	35-37w	No	35-37w	No	36-37w	No	35-37w	35-37w	No	No
Anaemia and Blood type related screening										
Full Blood Count	1st + 28w	No	1st +28w	1st + 28w	1st + 28w + 33-37w	1st + 28w	1st + 24-28w + 32w-34w	1st + 25-28w	1st + 28-29w	1st + 28w
Blood Group	1st + 28w	1st	1st	1st	1st	1st	1st	1st	1st + 28-29w	1st
Blood Group Antibody Screening	1st + 28w	1st + 25w	1st + if Rh neg: 24-26+6 + 36w	1st + 28w + 36w	1st +28w	1st	1st + 24-28w	1st + 24-28w	1st + 27-29w	1st + 28w
Gestational Diabetes										
Fasting glucose	No	No	No	No	1st	No	1st	No	10w-12w unclear if fasting or GTT	No
Glucose Tolerance Test	24w-28w	No	24w-28+6w	No	No	No	24w-28w	24w-28w	10w-12w unclear if fasting or GTT	No
Glucosuria via reagent strip	No	E.c.	No	No	No	No	No	No	No	No

1st: first consultation; w: weeks' gestation; neg: negative; RhD: Rhesus D; GTT: glucose tolerance test; neg.: negative; cons.: consultation

There is consensus in many of the investigations recommended throughout pregnancy however, once again, some areas present differences.

Denmark does not recommend a full blood count at the first antenatal check; instead, the policy recommends to universally supplement every pregnant woman with iron, a recommendation not shared by any of the other countries. Italy and Portugal additionally screen for anaemia around 32-

37 weeks gestation, which is in line with WHO(5) recommendations, since fetal demands of iron increase significantly in this period(40). Yet, there is a lack of evidence that routine screening for anaemia in asymptomatic women is necessary(41).

Blood group determination is repeated in Australia and Sweden early into the third trimester, but both policies do not provide a rationale for the recommendation. Regarding blood group antibody screening, both Finland and Iceland recommend screening three times during pregnancy, instead of the two times advised by the other countries. However, for both these countries, once the blood group and Rh-D status are determined, repeating antibody screening is only offered to rhesus-negative women.

Screening for Toxoplasmosis is not recommended in any country except for Portugal and Italy. Italy justifies that the pertinence of the recommendation is due to the high incidence of seronegative pregnant women and Portugal does not provide a rationale. The remaining countries advise prevention and education. There is a lack of evidence that antenatal screening and treatment reduces mother-to-child transmission or infection complications(42) and some authors agree that screening has the potential to do more harm than good(43).

Denmark, Finland, Norway, and the UK do not recommend rubella screening. They base their guidance on the premise that screening does not give any protection to the unborn baby(44) and being fully immunised before becoming pregnant is the most effective way to protect women against rubella in pregnancy.

Group B *Streptococcus* (GBS) is one of the tests that often creates divisive opinions. Half of the countries recommend the vaginal/anal swab test whilst the other half do not. Evidence about the benefits of universal screening is limited. Studies have identified reductions in the incidence of early-onset infected newborns, born to mothers identified positive through routine/risk-based antenatal testing and treated with antibiotics in the intrapartum period(45). On the other hand, no differences were found for late-onset of infections. Other studies highlight that infected infants are often born to Group B *Streptococcus* culture-negative mothers and only very few culture-positive mothers will

infect their babies(45). Concurrently there is a debate over the exposure to antibiotics and whether the risk of potentially harmful effects is counterbalanced, or not, by the reduction in the incidence of neonatal and maternal sepsis(45).

Finally, screening for Gestational *Diabetes Mellitus* is risk-based in Iceland, Norway, and the UK, and universal in the remaining countries. Variability is visible in the type of test used. Danish policy advises that glucosuria should always trigger a glucose tolerance test. Norway uses HbA1c test in risk-based screening in the first trimester. This variability of approaches is a mirror of the lack of clear evidence. While Gestational *Diabetes Mellitus* is a condition with a considerable prevalence, there is no universally accepted test or diagnosis regimen. Evidence also demonstrates that although gestational diabetes is more likely to be detected when all women are tested, the effects of subsequent management on health outcomes are unclear(46).

Less common routine tests are additionally recommend in certain countries. For example, this is the case of hepatitis C in Australia, and hemoglobinopathies in the UK and Italy. These additional screening tests will not be discussed in this review since their recommendation is based on specific population needs.

How is the care organized for low-risk pregnant women in each country?

Regarding the organisation of care, we looked at the schedule recommended by each country which included both the number of recommended consultations and timings (table 5).

Table 5 – Antenatal care Schedule

Country	Antenatal Care schedule	
	Number of consultations	Schedule
Australia	Primiparous: 10 Multiparous: 7	<10w; 16-19w; 20-27w; 28w; 29-34w; 35-37w; 38-40w
Denmark	7-10[a]	6-10w (GP); 13-15w (M); 21w (M); 25w (GP); 29w (M); 32w (GP); 35w (M); 37w (M); 39w (M); 41w (M) [b]
Finland	Primiparous: 9 Multiparous: 8	6-8w; 8-10w; 13-18w[c]; 22-24w; 26-28w[d]; 30-32w; 35-36w; 37-41w
Iceland	Primiparous: 10 Multiparous: 7	<12w; 16w; 19-20w; 25w; 31w; 34w; 36w; 38w; 40w; 41w
Italy	>= 4	<10w; 13-27+6w; >28w[e]
Norway	>= 8	6-12w; 17-19w; 24w; 28w; 32w; 36w; 38w; 40w
Portugal	7	<12w; 14-16+6w; 17-24w; 27-30+6w; 34-35+6w; 36-38+6w; >40w
Spain	6-9	6-10w; 11-13w; 16-17w; 20-21w; 25-26w; 29-30w; 34-36w; 38-40w; 41w
Sweden	10	[f] 10-12w; 24-25; 28-29w; 31-32w; 33-34w; 35-36w; 37-38w; 39-40w; 41-42w
United Kingdom	Primiparous: 10 Multiparous: 7	< 10w; 16w; 25w; 28w; 31w; 34w; 36w; 38w; 40w; 41w

w: weeks gestation
[a]Three consultations with general practitioner (GP) and 4-7 with midwife (M).
[b]The multiparous women see the M at 36w instead of 35 and 37w.
[c]Between 13-18w: 2 consultations, one with nurse midwife and other with doctor.
[d]Between 26-28w: only primiparas.
[e]Gestational age >28w: 2 consultations.
[f]First consultation: 1 week after positive pregnancy test.

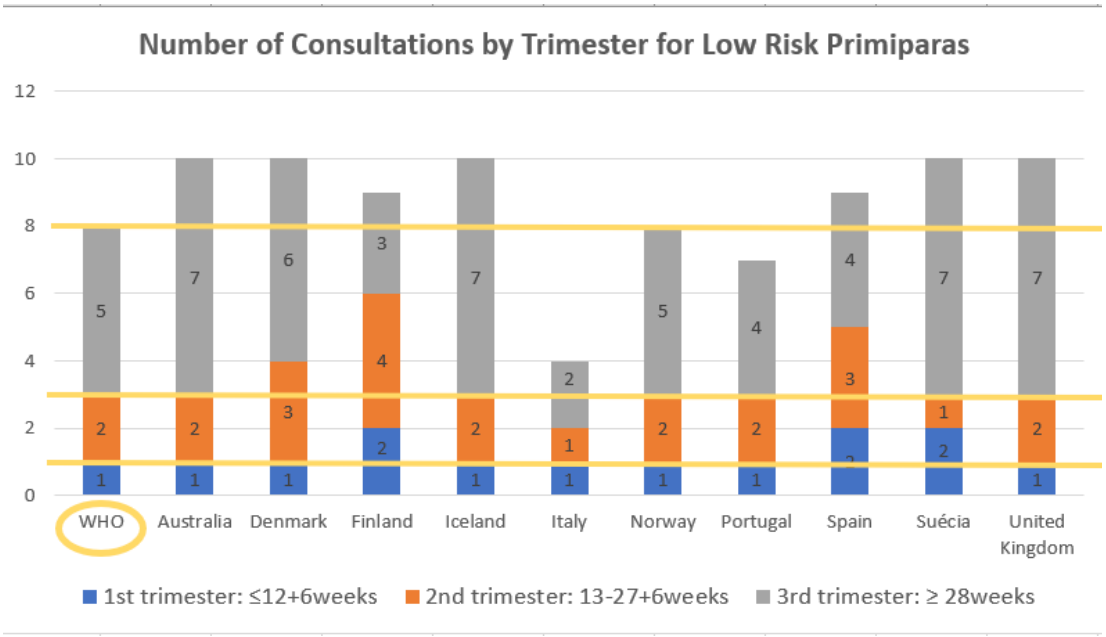
Regarding the schedule of care, the results demonstrate wide variation. Half of the countries recommend a different frequency of appointments for multiparas and primiparas; the other half recommends the same frequency. None give a clear justificiation for the recommended frequency, although NICE guidance cites a study where women over 35 years of age with previous pregnancies (amongst others characteristics) preferred fewer appointments (47). All make the reservation that the schedule of consultations should always be determined according to the woman's individual needs.

There is inconclusive evidence as to the "ideal" number of consultations; however, in 2016 the WHO doubled the recommended minimum number of consultations, from 4 to 8 (5). This was based on the probable association of the 4 consultations schedule with more perinatal deaths and evidence supporting the improvement of safety during pregnancy through increased frequency of maternal and fetal assessments to detect problems(5). Evidence also indicates that more contact between

pregnant women and a knowledgeable, supportive and respectful antenatal care provider is likely to result in greater maternal satisfaction and a positive pregnancy experience(48). Nonetheless, studies from high-income countries, comparing models with minimum 8 consultations and models with 11-15 consultations, indicate no important differences in maternal and perinatal outcomes, making the earlier more cost-effective(12).

Italy and Portugal do not meet the minimum WHO recommended frequency of consultations (figure 2). This may happen because the latest WHO recommendation was published after the Italian and Portuguese policies (2011 and 2015, respectively).

Figure 2- Number of recommended consultations for low-risk primiparas by country and WHO



The timing of the appointments also varies extensively. The most recent WHO recommendation(30) proposes one consultation in the first trimester, two in the second, and five in the third. Neither WHO(5) or the policies present a rationale for the exact gestation they recommend each consultation.

Who provides care for low-risk pregnant women in each country?

The authors looked at both the recommendation of professionals who provides care and the model of care (table 6).

Table 6 - Recommended main professional that provides care and model of care

Country	Main professional who provides care	Model of care
Australia	Mw, GP or/and OB	Specific recommendation for continuity of carer
Denmark	Mw and GP	Specific recommendations for continuity of carer
Finland	Mw and D	Specific recommendation for continuity of carer
Iceland	Mw and GP	Specific recommendations for continuity of carer
Italy	Mw, GP or/and OB	Specific recommendation for continuity of carer
Norway	Mw and/or D	Specific recommendation for continuity of carer
Portugal	Unclear. Along the document refers to D.	No recommendation
Spain	Mw or Mw and GP	No recommendation
Sweden	Mw	Specific recommendation for continuity of carer
United Kingdom	Mw or GP	Specific recommendations for continuity of carer

Mw: Midwives/Nurse Midwives; GP: General Practitioner; OB: Obstetrician; D: Unspecified Doctor

The majority of the policies recommend midwives/nurse-midwives for this role under a continuity of carer model. In fact, the best available evidence supports this recommendation and has consistently demonstrated that women cared under this model are less likely to experience intervention, and more likely to experience positive outcomes(11).

The only two countries that do not propose a continuity of carer model are Spain and Portugal. The latter does not specify the professionals responsible for the provision of antenatal care, although along the document the “doctor” is occasionally mentioned and midwives/nurse-midwives are never referred to.

Despite acknowledging that the midwife-led continuity model of care is the model that results in better outcomes for low-risk pregnant women, many countries also include shared care models with the general practitioner/unspecified doctor or general practitioner-led care. Italy and Australia are the only policies to also acknowledge obstetricians for this role. Evidence demonstrates that routine involvement of obstetricians in the care of women with uncomplicated pregnancies at scheduled times does not appear to improve perinatal outcomes compared with involving obstetricians when complications arise(49).

What evidence the guideline developers used to inform antenatal care guidance for low-risk pregnant women in each country?

Table 7 summarises how the guideline developers used evidence to support their recommendations.

Table 7 – Evidence used by guideline developers to inform antenatal care guidance

	Literature Search Strategy	Levels of evidence to support recommendations.
Australia	For all the subject areas, a comprehensive literature search was conducted. References after each section.	Levels of evidence were considered and the highest levels of evidence used.
Denmark	Does not mention the strategy for the literature search. References in a separate document.	No mention of whether levels of evidence were considered. Policy currently being updated.
Finland	For all the subject areas, a comprehensive literature search was conducted. References after each section.	Levels of evidence were considered and the highest levels of evidence used.
Iceland	The policy is based on NICE guidance for antenatal care 2008 and adapted to the national context. Does not present reference lists. There are some hyperlinks along with the document, pointing to places where references can be found, but not directly to the specific issues.	NICE considers levels of evidence for its recommendations. However the Icelandic policy is not in line with the two latest NICE updates.
Italy	The policy is based on NICE guidance for antenatal care 2008 and adapted to the national context. References after each section.	NICE considers levels of evidence for its recommendations. However the Italian policy is not in line with the two latest NICE updates.
Norway	For all the subject areas, a comprehensive literature search was conducted, and levels of evidence were established. References after each section.	Levels of evidence were considered and the highest levels of evidence used.
Portugal	Does not mention the strategy for the literature search. References at the end of the document.	No mention of whether levels of evidence were considered.
Spain	For all the subject areas, a comprehensive literature search was conducted. References at the end of the document.	Levels of evidence were considered and the highest levels of evidence used.
Sweden	Does not mention the search strategy for the literature search. References after each section.	No mention of whether levels of evidence were considered.
United Kingdom	For all the subject areas, a comprehensive literature search was conducted. References at the end of the document.	Levels of evidence were considered and the highest levels of evidence used.

The results show that all countries provide a degree of evidence for their recommendations. Most present a comprehensive literature search, where levels of evidence were established, and the highest levels of evidence used to support the recommendations. Iceland and Italy based their guidance on NICE (UK) recommendations, with adaptations to their country context yet their

recommendations are currently outdated. Denmark, Portugal, and Sweden do not mention their search strategy although they provide partial references for their recommendations.

The absence of a clear strategy to use evidence to inform guidance, as well as the use of evidence that currently is outdated, or is not the best available, demonstrates the need for the policies to be updated. The use of best available research-derived evidence is a key element in policymaking(50), nevertheless it is known that often this does not happen due to conflicts, unrelated to research, though inhibiting its use(51). Policymakers have to operate on various competing interests(50) which include finance, cultural beliefs, trade-offs, prejudice, agendas promoted by interest groups threatened by new public regulations, amongst others. All this determines whether research evidence is translated to health policy(51) and can be an explanation for the variability in the recommendations.

Limitations

Since the policies are written in the country's mother language and although the relevant information was translated into English, the authors felt they could be missing important information or interpreting differently from the intended. This limitation was minimised by asking bilingual experts to double-check and validate the extracted data. Another potential limitation is the possibility that some guidelines were missed. The authors have tried all possible approaches to overcome this through the thorough search and finally by asking field experts of the given countries to confirm that there was no national guidance for their country.

Conclusions

The analysed policies have areas of consensus amongst their practices, but relevant variations in care provision were identified. These would not be explained by essential health financing differences or levels of development since the countries are comparable, yet they can have an

impact on perinatal outcomes, pregnancy, and maternity experience, and/or costs. Some recommendations are not based on the latest best available evidence, or are outdated, and need updating.

As previously mentioned, the provision and extent of antenatal care can affect the health and well-being of women and infants. Good outcomes are directly linked with effective and affordable interventions. It is crucial and an ethical necessity that health policies are carefully developed, up to date, and based on the best available evidence, to ensure that all women and babies have the opportunity to achieve the highest standard of health.

Research correlating these results with perinatal outcomes and cost evaluation could be valuable to optimise guidance on antenatal care and consequently health care outcomes. Similarly, some aspects of care, screening (e.g., Gestational *Diabetes Mellitus,* Group B *Streptococcus)*, and others, need further rigorous studies to obtain evidence of higher quality to inform recommendations.

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Appendix 1
Search strategy conducted on MEDLINE (via PubMed) on 28th March 2020

Search	Query	Records retrieved
#1	Search (antenatal[Title/Abstract] OR "ante-natal care"[Title/Abstract] OR "antenatal care"[Title/Abstract] OR "antepartum care"[Title/Abstract] OR "prenatal care"[Title/Abstract])	43 661
#2	Search ((((policy[Title/Abstract] OR guideline[Title/Abstract] OR regulation[Title/Abstract] OR law[Title/Abstract] OR "action plan"[Title/Abstract] OR strateg*[Title/Abstract]))))	2 051 628
#3	Search ("portugal"[Title/Abstract] OR "United Kingdom"[Title/Abstract] OR Ireland[Title/Abstract] OR Australia[Title/Abstract] OR Denmark[Title/Abstract] OR Finland[Title/Abstract] OR Greece[Title/Abstract] OR Iceland[Title/Abstract] OR Italy[Title/Abstract] OR "New Zeland"[Title/Abstract] OR Norway[Title/Abstract] OR Spain[Title/Abstract] OR Sweden[Title/Abstract])	378 755
#4	Search (((pregnan*[Title/Abstract] OR gravid[Title/Abstract] OR gestating[Title/Abstract] OR childbearing[Title/Abstract] OR expecting[Title/Abstract] OR expectant[Title/Abstract])))	517 877
#5	Search ("Pregnant Women"[Mesh])	76 736
#6	Search "Prenatal Care"[Mesh]	26 222
#7	Search (((((("Health Policy"[Mesh:NoExp])) OR "Government Regulation"[Mesh]) OR "Guideline" [Publication Type]))	115 606
#8	Search ((("portugal"[Title/Abstract] OR "United Kingdom"[Title/Abstract] Search ((((((((((("Portugal"[Mesh]) OR "United Kingdom"[Mesh]) OR "Sweden"[Mesh]) OR "Spain"[Mesh]) OR "Norway"[Mesh:NoExp]) OR "New Zealand"[Mesh]) OR "Italy"[Mesh:NoExp]) OR "Ireland"[Mesh]) OR "Iceland"[Mesh]) OR "Greece"[Mesh]) OR "Finland"[Mesh]) OR "Denmark"[Mesh:NoExp]) OR "Australia"[Mesh:NoExp]	861 299
#9	#1 OR #6	58 662
#10	#2 OR #7	2 125 123
#11	#3 OR #8	1 027 484
#11	#4 OR #5	521 189
#12	#9 AND 10 AND#11 AND #12 **Filters:** Publication date from 2005/01/01 to 2020/03/28	409noa