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A call for better data for surveillance and evaluation of caesarean sections in Europe – A joint statement by Euro-Peristat and European Board and College of Obstetrics and Gynaecology (EBCOG)

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ABSTRACT

International comparisons highlight differences in healthcare practices, raising questions about the application of evidence-based care when wide variations exist between countries with similar populations and income levels. Caesarean section (CS) rates show significant variation, with national and regional averages differing widely. As a common surgical procedure, this variation affects a large number of people and may have major consequences for maternal and newborn health. Comparable health indicators are essential to analyse CS rates and understand the reasons for this variability. A review of data on CS rates in Europe in international databases, such as those maintained by Eurostat, OECD and WHO, confirmed wide variation in CS rates in Europe, from 16% to over 50%, but showed very limited data available to understand these differences. In contrast, many European countries collect a wide array of data in national health information systems which can be used to investigate variations in CS, including on the timing and indication of the CS, and key population and health system characteristics that affect risks of CS. Based on the published literature, work in the Euro-Peristat network and within the EBCOG advisory board, we propose a list of data items that should be available at the national and international levels to allow comprehensive international surveillance and evaluation of CS practices.

Introduction

International comparisons provide insight into healthcare practices, raising questions about what constitutes evidence-based care when there are wide differences between countries with similar populations and income levels. Caesarean section (CS) rates are included in most health care assessments and the use of this procedure varies greatly between countries, with recent estimates of regional averages from 5.0% in Africa to 42.8% in Latin America [1]. In European countries, the regional average was 25.7% with a range from 14.9% to 46.9% [1–3]. As one of the most commonly used surgical procedures, the number of people affected by this variation is high. The 2022 Euro-Peristat report on Perinatal Health Indicators calculated that if all European countries were able to attain the CS rate of 20.7% – which was the 25th percentile of the European distribution, 450,000 fewer women would have this procedure every year [4].

Health indicators constructed on a comparable basis are needed to enable comparisons of the CS rate and to understand the causes of these wide differences. While the CS rate is included in recommended indicator sets and published in numerous international and national health information systems, there are limits to data availability, even in Europe. It is well known that having data enables more effective public

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health stewardship. This is also true for CS rates, that are found to be lower in countries where data availability is better [5]. This joint statement assesses the data available on CS rates in Europe, identifies the limits of these data for the analysis of policies on labour and delivery and proposes guidelines for data items that are needed for monitoring and evaluating CS at an international level.

Routine data compiled on the CS rate on a European and international level

Data on the CS rate at a European level are reported by Eurostat, the statistical office of the European Union as well as the Organisation for Economic Co-operation and Development (OECD). Data are collected via a joint questionnaire which is filled in by each country and sent to Eurostat and then shared with the OECD and WHO. These data are provided by national statistical offices and are derived from hospital statistics on surgical procedures from hospital discharge summaries which cover all hospital births. Eurostat collects data from the EU member states as well as the European Economic Area and Switzerland. Data on perinatal indicators are also available in the WHO Health for All database (WFA-BD) collected from a variety of national agencies that collect data on births. However, no data for years since 2015 are available for EU countries from this source [6].

The Euro-Peristat network has also compiled data on CS in Europe at

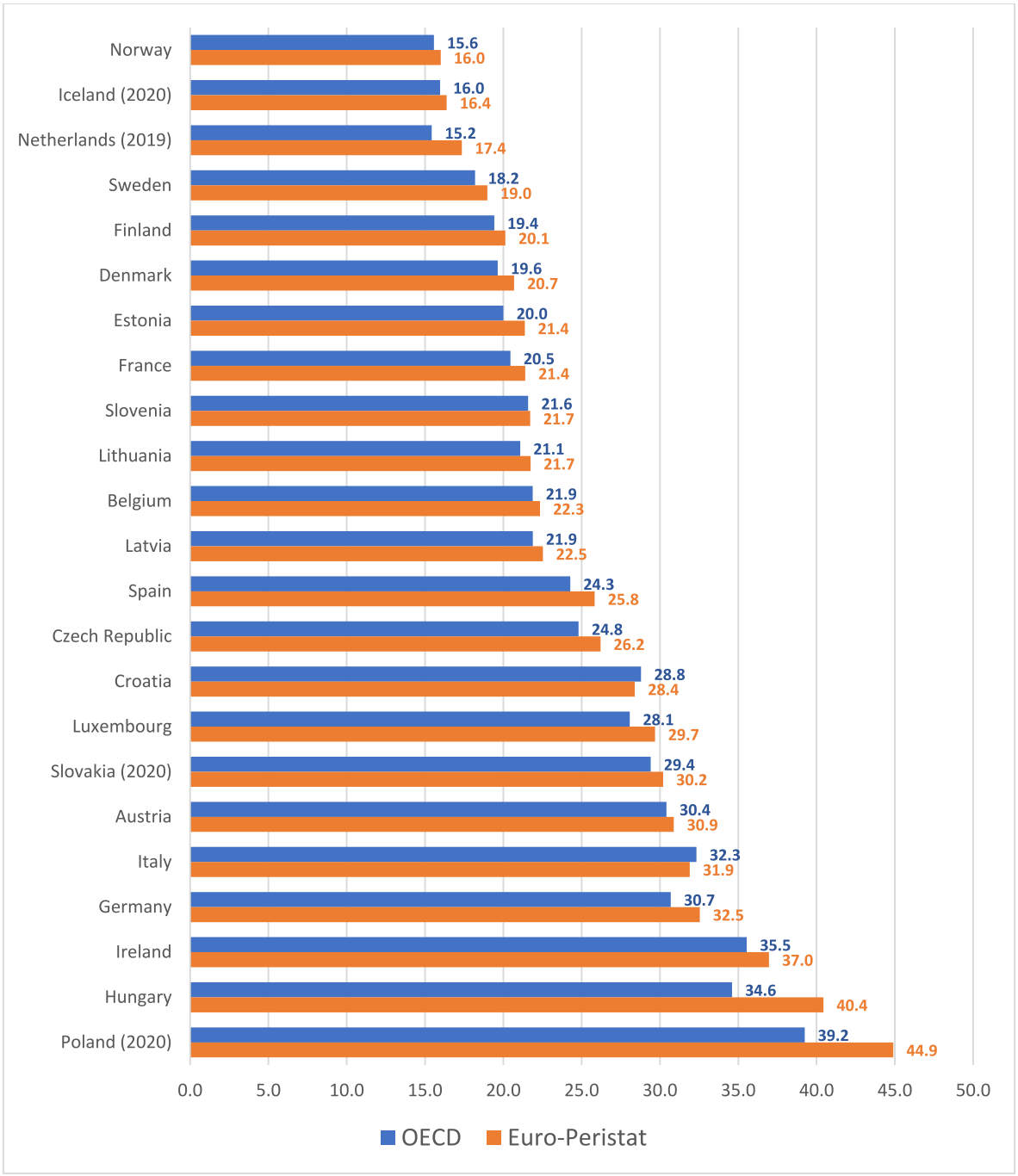

Fig. 1. Caesarean section rates in Europe in 2021, countries with data from the OECD and Euro-Peristat. NOTE: data from 2019 for the Netherlands and 2020 for Iceland, Slovakia and Poland; OECD rate = procedures per 100 live births; Euro-Peristat rate = births by CS per 100 total births. Data available through this link: https://www.oecd.org/en/data/indicators/caesarean-sections.html.

regular intervals since 2000 [7]. Euro-Peristat is a network of statisticians, epidemiologists and clinicians working with routine data on births to monitor perinatal health in Europe. The network has been funded in a succession of European projects, but it is not a database with structural funding. Sources are birth registries, civil registration data and hospital discharge data [8,9]. National teams select the sources considered to have the highest quality for providing Euro-Peristat's recommended perinatal health indicators [2]. Euro-Peristat requests data on the number of CS births, by timing in terms of onset of labour (spontaneous, induced or prelabour CS) [10] and by risk group (parity, multiplicity, presentation, previous CS and preterm status). Since 2015 data are also collected by risk factors in exclusive groups in accordance with Robson's Ten Group Classification System [5].

Variations in the CS rate in Europe: International data sources

Fig. 1 uses the latest data as reported by the OECD and Euro-Peristat to describe the variation in CS rates in Europe. Only countries with data in both sources in 2020 or 2021 are included, corresponding to the last Euro-Peristat data collection exercise. These data show the wide variation between countries ranging from 16% in Norway to 37% in Ireland. Several countries are not shown on this figure because either national data do not exist or data were not available in both sources, including Switzerland (32.6% in 2021 using OECD, no data in Euro-Peristat) Cyprus (58.9% in 2021 in Euro-Peristat, no data in OECD), and Bulgaria (46.5% in 2021 using OECD, no data in Euro-Peristat).

This figure also reveals differences between the rates reported by Euro-Peristat and the OECD, with Euro-Peristat rates being systematically higher. These differences are explained by how this indicator is collected. Data on surgical procedures from hospital discharge summaries are measured with respect to the pregnant woman having the procedure. However, for presentation and analysis purposes, OECD uses live births as a denominator to calculate a rate. This denominator provides an approximation of the population at-risk of having a CS but is discordant with the numerator because of multiple births (multiple births are counted in the denominator, but not in the numerator which is based on the number of women) and stillbirths (counted in the numerator, when there is a CS, but not in the denominator). In the Euro-Peristat network's indicator set, CS is one of the core indicators and data are collected for births (live and stillbirths). As multiples are more likely to be born by CS, they increase the CS rate when it is based on the number of babies born, as opposed to women delivering.

Some differences between rates may also be due to the use of different data sources by OECD and Euro-Peristat. Data may vary in terms of coverage or inclusion criteria. For instance, some data systems only include citizens and residents, whereas hospital data can include non-residents; some hospital discharge data systems may not include all hospitals, with private hospitals most likely to optout. Further, data about home births are not included in the denominator. The inclusion period may differ slightly (the year in hospital discharge data refers to the date of discharge, whereas birth registers define the year with respect to the date of birth). Countries also use different diagnostic and/or procedure codes to identify CS and the accuracy and completeness of the codes as well as the management of missing data may vary. Euro-Peristat collects data on missing information and accounts for it when computing its indicator, but this is not possible for rates that are established from the number of reported diagnoses or procedures identifying CS. These caveats when comparing the most basic information needed to evaluate differences in mode of delivery in a high-income country context illustrates the complexity and current limits of international reporting.

Data to analyse the variation in CS rates

Variations in the overall CS rate encapsulate wider differences between the components of this rate and raise many questions about the reasons for these differences and their consequences for maternal and child health. However, data are not currently available in routine databases to describe these differences or to answer these questions. Euro-Peristat and other European collaborations, such as, the European Cooperation in Science and Technology (COST) Action IS1405 'BIRTH' [11], as well as specific international studies [12,13], show that these data exist at a national level or can be collected in large scale studies. Many scientific publications from national studies using routine birth data have described trends and variations in the CS rate [12,14,15].

Different types of data are needed to evaluate national and international differences in the CS rate, including information about clinical situation, socioeconomic, health system and broader societal determinants that have been related to the probability of having a CS. Table 1 provides key data items for each of these data types, based on Euro-Peristat, other international recommendations and the published literature. This table includes guidance for compiling and interpreting these data in international comparisons.

Reporting and classifying the caesarean section rate

The starting point for reporting is collecting harmonised data on the overall CS rate. As illustrated above, it is important to specify what data are collected (for the mother or the baby) and how they are presented (numerator, denominator, coverage, management of missing data). The next step is to describe the timing and medical indications for the CS. Most information systems that collect data on CS distinguish between CS that are clinician-initiated before the onset of labour, also termed "indicated" or "elective", and those that occur after labour has started because of complications during labour. Two different, overlapping typologies are most commonly used: prelabour versus intrapartum and planned/elective versus emergency. The Euro-Peristat project recommends collecting data on prelabour/intrapartum, but for countries that do not have this information, data are collected on whether the CS was planned/elective or emergency, if available. Differences can exist between countries as they do between Scotland and the other nations of the United Kingdom. For Euro-Peristat publications [2,5,10], planned/elective CS have been equated with prelabour CS and emergency CS with intrapartum CS, but these definitions are not strictly the same: a number of planned CS occur after labour onset, while emergency caesareans can occur before the onset of labour. Furthermore, the perception of what constitutes an emergency situation differs between clinicians and can depend on instructions given for coding [16]. The study on international differences in CS undertaken as part of the BIRTH COST Action also used timing of CS (prelabour or intrapartum) to define groups [11]. When CS were considered emergencies without noting whether labour had started or not, these cases were assigned to intrapartum CS. Ideally, in routine systems, information would be available to describe both classifications with standardised definitions to determine urgency.

Beyond the type and the timing of the CS, defining a classification to describe the purpose or indication for the CS is complex. A 2011 systematic review of classifications for CS identified 27 different classifications and grouped them into those based on the indication (why the caesarean was undertaken), the degree of urgency (when it occurred), patient characteristics (who had the caesarean) and other factors, focused on where, how and by whom [17]. This review concluded that the patient-based classifications were most consistent and easiest to apply. Following on from this review and given the utility perceived by clinicians for audits of clinical care, Robson's Ten Group Classification System has been increasingly adopted for routine reporting of CS [3]. Items required to construct the Robson classification are onset of labour (spontaneous, induced, prelabour CS), parity, multiplicity, previous CS, fetal presentation, and gestational age. Many countries collect these items, although information about previous CS is most likely to be missing, as this requires information about previous obstetric history to be recorded in birth data – in 2015, 13 out of 31 European countries did

Table 1
Summary of data needed for comprehensive international reporting on caesarean section.

Categories	Data	Measurement and other comments
1. CS rate	N of women (or babies) delivered by CSN of total women giving birth (or babies born)	The indicator can refer to women giving birth or to babies.It can be based on total births (including stillbirths) or live births only
2. CS Classifications		
A. Type (timing) of caesarean	Prelabour/ Intrapartum CS or Programmed/ Emergency CS	Countries use different classifications for type of CS. While there is overlap between these, they are not strictly comparable (such as programmed CS that occur after labour onset). Definitions should be reported with, if possible, information on timing (whether before or after labour onset/ spontaneous or induced) and type (programmed/elective vs. emergency).
B. Ten Group Classification System, based on obstetric risk factors	6 variables needed parity number of fetuses previous caesarean section onset of labour (spontaneous/induced/CS before labour) gestational age and fetal presentation (breech/transverse/oblique)	These obstetric groups are relevant for understanding CS groups and are those included in Robson's Ten Group Classification System. All information systems should strive to collect this information to describe CS practices. The Ten Group Classification System is based on women delivering (not babies born).
C. Indications	The reasons for which the CS was carried out. These can relate to the mother, to the fetus or to both.	This information is collected in many information systems. It can be a text item or based on a set of predefined categories. However, there is no recommended international classification. Post-hoc harmonisation is difficult because national classifications are very different.
3. Population socioeconomic and health characteristics	Maternal age, ethnicity, socioeconomic group, body mass index, gestational weight gain, smoking, subfertility and use of ART, co-morbidities and health status	In addition to clinical obstetrical risk factors, defined in 2B, other maternal characteristics have been linked to risks of experiencing a CS.
4. Health system characteristics	Level of specialisation of the maternity unit Unit delivery volume Public/private status Role of midwives in maternity care, liability insurance systems, region and country	These contextual and organisational factors have been associated with CS rates after adjustment on obstetric and maternal risk. They affect clinician decision-making as well as women's options for care and their views on what constitutes optimal care.
5. Societal wealth, development, environment and culture	National income (GDP) Other measures of development (HDI) and Inequality (Gini Coefficients)	These characteristics describing the broader societal context determine health system organisation and governance and also the role of women and parents within the health system.

not have these data [5]. Another data availability and quality issue is presentation of the foetus. The quality of this information can be checked by reviewing the proportion of breech babies (about 4%) and the CS rate amongst babies with transverse presentations (should be 100%); these quality checks reveal limitations in many studies. One concern is that some risk factors will only be noted in medical records or hospital discharge summaries if they are indications for a CS and not if they are present in a vaginal birth.

Having these data at a national level is essential to support unit level audits using the Robson classification, as recommended [18]. The strength of the Robson classification is to provide a starting point for analysis of a complex problem by finding the sub-groups of women giving birth who have the highest CS rates [18]. Then, the question of "why" in a specific sub-group can be more easily analysed, and targeted interventions can be considered. Despite the usefulness of Robson classification, there are increasing calls to develop a classification based on the indications for the caesarean in order to take this process further [19–21]. Moreover, Indication-based metrics may be better suited to understanding differences in the associations of less proximate factors, including those related to maternal characteristics, health system organisation and the broader environment. For instance, investigations of socioeconomic differences in CS rates show that indications for CS differ by socioeconomic group [22].

Comparable information on indications for CS is currently very difficult to extract from existing systems. A major reason is the absence of an agreed-upon international classification system for recording and presenting indications and the poor quality of data collected about these decisions. Depending on the health information system, currently used classifications of indications can relate to the type of caesarean (those before labour versus during labour) or are classified in relation to the mother, placenta or baby. They may be derived from ICD codes describing complications during pregnancy and childbirth. Alternatively, they may correspond to procedure or intervention classifications developed for the specific health information system. Furthermore, analysing differences in indications for CS, requires expressing them in relation to complications of pregnancy or comorbidities that may or may not drive the decision for CS. Therefore, it is necessary to collect data on relevant complications of pregnancy or comorbidities for all deliveries. Such an approach would make it possible to demonstrate the feasibility of reducing CS in specific causes. However, for indications to be comparable, especially internationally, rigorous definitions are needed for the medical data to be collected. Finally, indication-based classifications also aim to identify CS done without medical indication or based on maternal request. However, identifying these CS in routine data is extremely challenging and using different definitions can have a major impact on the estimated frequency of these situations [23,24].

Other data needed for surveillance and evaluation of the CS rate

These classifications for CS aim to define the reason for the CS which can be related to maternal demographic, social and lifestyle characteristics. These characteristics have been found to affect the probability of CS, including age, education, socioeconomic circumstances, body mass index (BMI), gestational weight gain, the presence of pre-existing health conditions and other procedures, such as the use of assisted reproductive technology (ART) in many national studies [22,25–27]. However, their impact on international differences is still poorly understood, in part because these data are not available in international databases. The previously cited study undertaken as part of the BIRTH COST project found that adjusting for maternal age and other maternal characteristics did not explain the observed differences in outcomes [11]. Euro-Peristat has also found that, while age-standardised CS rates provide a different ranking of countries, they do not explain differences in CS between countries [28]. Nonetheless, having standardised rates is important to improve comparability, allow for more targeted investigation of health system or societal factors and reassure researchers and clinicians who are wary of international comparisons because of population differences [29].

To fully understand variations in European and global caesarean rates, the information in the last two categories of characteristics presented in Table 1 is vital. Health system characteristics can influence CS rates, including organisation of the health system, financial incentives for CS, the supply of obstetricians, midwives and other key health professionals, and the roles of midwives in maternity care [30–34]. Since these are the major levers for public policy, it is of utmost importance to be able to describe them and analyse their effects in different socioeconomic and organisational contexts.

Finally, the overall level of societal wealth, development and culture is needed for understanding differences and developing solutions. In particular, the issues of insufficient access to obstetric services remains a critical problem in many under-resourced countries, with widespread adverse consequences for maternal and newborn health, although both underuse and overuse coexist in many countries [1]. These broader socioeconomic and societal characteristics may also play a role within countries and lead to marked inequalities between regions.

The way forward

The breadth of disparities in CS rates in Europe shows the continuing urgent need for comparative research to understand differences in CS rates and to inform public policy. This overview documents the current lack of information on CS in international databases and aims to promote better research by providing a set of key data items that are necessary for international comparisons of CS practices. Such an approach will help to focus strategies on several key issues:

First, how to address the rising trend for first CS in many countries, thus increasing the risks of repeat CS and amplifying trends towards higher CS rates overall. The EBCOG position statement calls for action to reduce CS rates [35].

Second, to promote wider use of Robson classification at country level within Europe [3]. This will require a concerted approach led by professional organisations working alongside policy advisors at using the EU and individual country level. The EBCOG is currently updating its documents on “Standards of Care in Obstetrics and Neonatal Care” [36]. The revised draft version has recommended using the Robson classification at an individual unit level.

Third, to reinforce data systems to collect other key data items which are needed to provide a full picture of the clinical and health system characteristics that drive practice variation in high-income countries. This includes creating consensus on a common classification that can be used to collect harmonised data about the indications for CS which would make it possible to examine these in relation to population and health system factors.

Fourth, this joint statement is focused on data items needed to investigate the variation in rates, but a full analysis of CS variation would need to integrate the consequences for maternal and neonatal health. This could be done by combining the items proposed here with those in other internationally recommended outcome sets [7,37–39]. In addition, it is important that investigated outcomes also focus on those related to clinicians’ capabilities, as the frequency of use of operative procedures can have an impact on the training and skills of specialists in obstetrics and gynaecology within Europe. The EBCOG has a long-standing active Training Units Accreditation programme for the past 25 years and this dimension is key. For instance, a review of all the past hospital visiting reports [40] demonstrated that rising CS rates have a direct effect on the specialist’s ability to perform instrumental deliveries, as rates of instrumental delivery in several units were only about 1–2% per year.

Finally, this overview focused on Europe and high-income countries, but differences in CS rates are as wide between and within countries in middle- and low-income settings [1,41]. These recommended data items as well as the points set out above apply in these contexts, although other items and strategies will be relevant given differences in health systems and access to care, in particular the need to expand access to CS in emergency situations among underserved populations in many countries.

Recommendation

The Council of EBCOG along with the Euro-Peristat research group calls for action from the national professional organisations to advocate a case with their national policy advisors for the implementation of the Robson classification along with the collection of data at an individual level to develop comparative statistics and support proactive strategies to promote evidence-based CS practices.

These data should not only be collected nationally, but resources are needed to compile them using harmonised indicators at an international level to allow comprehensive and meaningful benchmarking. Post-hoc harmonisation of these classifications is extremely challenging and finding a consensus about a common outcome indicator for CS classification is a priority for future work.

We recognise that while often de-prioritised in policy and research because of the costs and complexity, high-quality international and national health information systems are vital for generating the evidence needed to improve clinical practices and health.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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