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Summary

Background Multi-country studies assessing the quality of maternal and newborn care (QMNC) during the COVID-19 pandemic, as defined by WHO Standards, are lacking.

Methods Women who gave birth in 12 countries of the WHO European Region from March 1, 2020 - March 15, 2021 answered an online questionnaire, including 40 WHO Standard-based Quality Measures.

Findings 21,027 mothers were included in the analysis. Among those who experienced labour (N=18,063), 41·8% (26·1%- 63·5%) experienced difficulties in accessing antenatal care, 62% (12·6%-99·0%) were not allowed a companion of choice, 31·1% (16·5%-56·9%) received inadequate breastfeeding support, 34·4% (5·2%-64·8%) reported that health workers were not always using protective personal equipment, and 31·8% (17·8%-53·1%) rated the health workers' number as "insufficient". Episiotomy was performed in 20·1% (6·1%-66·0%) of spontaneous vaginal births and fundal pressure applied in 41·2% (11·5% -100%) of instrumental vaginal births. In addition, 23·9% women felt they were not treated with dignity (12·8%-59·8%), 12·5% (7·0%-23·4%) suffered abuse, and 2·4% (0·1%-26·2%) made informal payments. Most findings were significantly worse among women with prelabour caesarean birth (N=2,964). Multivariate analyses confirmed significant differences among countries, with Croatia, Romania, Serbia showing significant lower QMNC Indexes and Luxemburg showing a significantly higher QMNC Index than the total sample. Younger women and those with operative births also reported significantly lower QMNC Indexes.

Interpretation Mothers reports revealed large inequities in QMNC across countries of the WHO European Region. Quality improvement initiatives to reduce these inequities and promote evidence-based, patient-centred respectful care for all mothers and newborns during the COVID-19 pandemic and beyond are urgently needed.

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Keywords: COVID-19; European Region; maternal; newborn; facility; quality of care; questionnaire; respectful maternity care; survey; WHO

Introduction

The COVID-19 pandemic has increased the existing challenges of all health systems, and the quality of maternal and newborn care (QMNC) worldwide has been particularly affected.[1,2] During the pandemic, even among high income countries of the World Health Organisation (WHO) European Region, multiple studies, including a systematic review[1,3-5] have documented a deterioration in key indicators, such as: reduced utilisation of maternal and newborn health services, increased number of stillbirths, increased medicalization of care (more caesarean sections and induction of labours), reduced family involvement, low support and uptake of breastfeeding, and amplified maternal anxiety and stress.

The ability of the healthcare system to withstand the COVID-19 pandemic has differed between countries and within countries over time.[1–5] Many institutions, organizations and agencies quickly reacted and recognised the importance of following appropriate procedures of maternal and newborn care, and called for action to support respectful family-centered care during the COVID-19 pandemic.[6–8] Nevertheless, especially in the early phases of the COVID-19 pandemic, inappropriate protocols for the management of pregnancy, birth and postnatal care were applied in many settings, and violations of human rights were documented, such as unnecessary separation of the baby from the mother. [8,9] However, there is a lack of multicountry studies documenting the impact of the pandemic on different domains of the QMNC around the time of childbirth.

Even before the COVID-19 pandemic, evidence from large national surveys and other sources had

Research in context

Evidence before this study

We searched Medline on September 6, 2021 with no language nor date restrictions using the string ("Quality of Health Care"[Mesh] OR "quality of care" OR survey) AND ("COVID-19"[Mesh] OR "SARS-CoV-2"[Mesh] OR "COVID-19" OR "SARS-CoV-2") AND ("Maternal Health Services"[Mesh] OR "maternal health services" OR "maternity care" OR "newborn health services" OR "neonatal health services" OR "maternal health" OR "newborn health"). Despite the importance of quality of care for improving maternal and neonatal health, there is a lack of multicountry studies investigating with a comprehensive set of indicators the quality of maternal and newborn care (QMNC) during the COVID-19 pandemic, from the perspective of mothers, as key service users. Previously published studies were either single country, or had relatively small samples, or explored only specific aspects such as utilization of health services, mental health, breastfeeding practices, clinical manifestations of COVID-19-, or focused on specific populations such as small and sick newborns, or stillborn infants.

Added value of this study

This study reports the results of a multicountry online survey on the QMNC in 12 countries of the WHO European Region, based on the perspective of 21,027 mothers who gave birth during the COVID-19 pandemic. The QMNC was evaluated comprehensively, by collecting 40 WHO Standard-based Quality Measures, divided in four domains as per the WHO framework: provision of care; experience of care; availability of human and physical resources; and organisational changes due to COVID-19. Mothers reported significant gaps in the QMNC, with large inequalities across countries of the WHO European Region, with countries such as Croatia, Serbia, and Romania consistently showing a worse QMNC -as identified by the 40 indicators and by the QMNC Index- than other countries. However, no country was free from reported gaps in QMNC. Measures of patient-centred respectful care and availability of resources were reported as substandard in most countries.

Implications of all the available evidence

This study highlights that there is a pressing need to implement adequate health policies to reduce inequities in the QMNC across countries of the WHO European Region. Quality improvement initiatives are urgently needed at all levels of the health systems, to ensure that all women have access to and receive high-quality, evidence-based, equitable, and patient-centred respectful care, during the COVID-19 pandemic and beyond.

highlighted gaps in the QMNC in countries of the WHO European Region.[10–15] According to recent reports, while maternal mortality is increasingly rare in the WHO European Region, up to half of such deaths are associated with substandard care, and therefore preventable.[10] Similarly, mistreatment of women during and after facility-based childbirth had been documented before the COVID-19 pandemic.[15–17]

Inappropriate case management and poor quality of care may be harmful to women and their newborns, violate women's and newborns' rights, deter women from seeking future health care, and may have implications for the mental and physical health of mothers and newborns.[18] In 2016, the WHO developed a list of Standards for improving the QMNC.[19] A questionnaire based on the WHO Standards[19] to measure QMNC from the perspective of key service users (mothers) at health facility level was recently developed and validated.[20] The use of a standardized method to measure service users' perspectives on the QMNC allows for comparisons of data across settings and over time. This study aimed at analysing maternal perspectives on the QMNC around the time of childbirth at facility level during the COVID-19 pandemic, and at comparing findings across countries of the WHO European Region. We also assessed how individual factors (ie, clinical or socio-demographic characteristics) were independently associated with the QMNC Index through multivariable regression models.

Methods

Study design and participants

This is a cross-sectional study, and is reported according to the Strengthening the Reporting of Observational Studies (STROBE) in Epidemiology guidelines for cross-sectional studies.[21] The STROBE Checklist is included as **Supplementary Table 1**.

Women ≥18 years-of-age who gave birth from March 1, 2020 up to the end of the data collection period (March 15, 2021) were invited to participate in an anonymous online survey. Women who did not match the inclusion criteria, or who did not give birth in a facility in the WHO European Region were excluded.

The online survey was made available in 16 languages. Women were invited to participate in the study in their preferred language regardless of which country they gave birth in. The survey was actively promoted by project partners in 12 countries of the WHO European Region, through a predefined dissemination plan, which included as main approaches social media, organizational websites, and local networks including mothers' groups and Non-Governmental Organizations (details on the data collection periods by each country team are reported in **Supplementary Table 2**).

Data collection tool

Data were collected using a structured online questionnaire, based on the WHO standards,[19] and recorded using REDCap 8.5.21 - © 2021 Vanderbilt University, via a centralized platform. The questionnaire included

40 questions on one key indicator each, equally distributed in four domains: the three domains of the WHO Standards[19]- provision of care, experience of care and availability of human and physical resources- and the additional domain on key organisational changes related to the COVID-19 pandemic. Questions on the individual characteristics of the participants (eg, clinical and socio-economic background) were also included.

The process of questionnaire development, validation, and previous use has been reported elsewhere.[20,22,23] During the first months of the COVID-19 pandemic, the questionnaire was further optimized throughout a Delphi including 26 experts from 11 countries of the WHO European Region and adapted for an online survey. Details on the questionnaire development, validation and adaptation for the online survey are reported in **Supplementary Figure 1.** Briefly, the questionnaire was reduced in length (ie, including only 40 Quality Measures) and wording was adapted to an online survey; it was translated and back-translated in each language following guidance of The Professional Society for Health Economics and Outcomes Research (ISPOR) Task Force for Translation and Cultural Adaptation Principles of Good Practice.[24]

Two tailored versions of the questionnaire were conceived at time of questionnaire development, one for women who underwent labour and one for those who had a prelabour caesarean section (CS), differing only by few questions, as appropriate (for example, women who did not experience labour were not asked about pain relief during labour). In the questionnaire, women were provided with the case definition of labour recommended by the National Institute of Health and Care Excellence (NICE) guidelines.[25] Additionally, indicators were tailored to take into account different modes of birth (spontaneous vaginal, instrumental vaginal, and elective or emergency CS). Each version included a total of 40 key Quality Measures.

The 40 key indicators contributed to a composite QMNC Index, which was developed drawing on previous examples of other quality indexes,[26] as a complementary synthetic measure of QMNC, with higher scores indicating higher adherence to WHO Standards.

Statistical analyses

A minimum required sample size of 300 women for each country was calculated, based on preliminary data from other studies[15,20] on the hypothesis of an average QMNC Index (our primary outcome and dependent variable) of 75% ±7·5% (300 ±30 points, out of 400) and confidence level of 99·5%. This sample was also adequate to detect a minimum expected frequency on each quality measure of 3% ± 3%, with a confidence level of 99·5%. Since this was not an intervention study, and there was no risk for the enrolled cases, the upper limit of the sample was not predefined.

We performed a descriptive analysis, calculating absolute frequencies and percentages for socio-demographic variables and each of the 40 key Quality Measures. Since Quality Measures differed between the two groups of women, those who underwent labour and those who had a prelabour CS, findings are presented separately; differences in characteristics of two groups were tested with a chi square or a Fisher exact test as appropriate. Women were grouped in these two categories as follows: mothers with vaginal birth were considered as having experienced labour; women with emergency CS were categorised based on their report of having undergone labour or not, which was informed by the NICE definition of labour[25] provided to them in the questionnaire. Odds ratios (OR) were calculated to assess differences in the 40 key Quality Measures between the two groups adjusting for all socio-demographic variables, type of professionals assisting the birth, newborn admission in neonatal intensive or semi-intensive care unit, mother admission in intensive care unit and multiple birth.

For the primary analysis, duplicates and cases missing 20% or more answers on 45 key variables (including the 40 key Quality Measures and five key socio-demographic variables: date of birth, age, education, parity, whether the women gave birth in the same country where she was born) were excluded. To further assess robustness of findings, two sensitivity analyses were conducted: 1) in the first scenario, we included women who answered 100% of the 40 key Quality Measures (N=15,399); 2) in the second scenario, we included women with up to 90% missing answers on 45 key variables (N=22,130) as performed by other authors.[27]

The QMNC Index was calculated based on the predefined criteria for all women providing an answer on all the 40 key Quality Measures. A predefined score (eg, 0-5-10 points) was attributed to each possible answer of each of the 40 questions on Quality Measures, with higher scores indicating higher adherence to WHO Standards. The QMNC Index was calculated for each domain as the sum of all points in that domain, and could range from 0 to 100, while the total QMNC Index was calculated as the sum of all points and could range from 0 top 400 (for more details see **Supplementary Table 3**). The QMNC Indexes were presented as median and interquartile ranges (IQRs) since they were not normally distributed. For countries with sample size over 300, a subgroup analysis was performed to analyse differences in the QMNC Indexes among countries.

Additionally, we performed multivariable regression models with the QMNC Index as the dependent variable and included all socio-demographic variables, birth mode, and type of professionals assisting the woman during birth as independent variables, to account for potential confounders. Given that the QMNC Index was

a continuous variable not normally distributed, we conducted a multivariable quantile regression with robust standard errors (SEs).[28] Quantile regression is an extension of linear regression used when the conditions of linear regression are not met; it allows modelling at different quantiles of the outcome where associations between exposure and outcome can differ.[28] We modelled the median, the 0·25th and 0·75th quantile. We chose this modelling approach given statistical evidence of heteroskedasticity[28] for parity, country where the women gave birth, education, year women gave birth, mode of birth, and presence of a midwife in the team who assisted the birth (Breusch-Pagan/Cook-Weisberg test $p<0·001$, H_o: no heteroskedasticity). A graphical representation (kernel density) of the QMNC Index was plotted for each independent variable. The categories with the highest frequency were used as reference.

A two tailed p-value <0·05 was considered statistically significant. Statistical analyses were performed using Stata/SE version 14.0 (Stata Corporation, College Station, TX, USA).

Ethical aspects

The anonymous online survey was approved by the Institutional Review Board of the coordinating centre: the IRCCS Burlo Garofolo Trieste (IRB-BURLO 05/2020 15.07.2020), and by the ethical committees of three other countries: Portugal (Instituto de Saúde Pública da Universidade do Porto, CE20159); Norway (Norwegian Regional Committee for Medical Research Ethics, 2020/213047) and Germany (Bielefeld University ethics committee, 2020-176). Since this was an online survey that mother could decide to join on a voluntary basis, and no data elements that could disclose maternal identity were collected, a formal approval was waived by the ethical committee of the other countries. The survey was conducted according to General Data Protection Regulation (GDPR) regulations. Prior to participation, women were informed of the objectives and methods of the study, including their rights in declining participation, and each provided consent before responding to the questionnaires. Anonymity in data collection during the survey phase was ensured by not collecting any information that could disclose participants' identity. Data transmission and storage were secured by encryption.

Role of the funding source

This research was funded by the Institute for Maternal and Child Health IRCCS Burlo Garofolo, Trieste, Italy. The funding source had no role on study design, data analysis, data interpretation, and reporting.

Results

Out of 29,665 women accessing the online questionnaire, 26,463 (89·2%) provided consent to participate. Among the 24,432 women who met the inclusion criteria, 21,027 (86·2%) were included in the analysis after exclusion of cases missing 20% or more key variables and suspected duplicates (Figure 1).

The absolute number of women responding to the survey varied among the 12 countries, with Italy (4,813 women), Sweden (4,800), Norway (3,220), Slovenia (2,092), and Portugal (1,685) being the countries with the largest samples (Table 1). When the sample collected in each country was compared to the estimated total births during the study period, it accounted for at least 1% of the total expected births in eight countries. (**Supplementary Table 4**). A total of 345 cases were collected from another 24 countries (Table 1).

Most (88·5%) women were 25 to 39 years old; about two thirds (67·7%) had either a university degree or a postgraduate degree while about one quarter (24·5%) a high school education; around one third (38·0%) had a previous birth. Most women (91·1%) gave birth in a public hospital, and about half (51·7%) were assisted by an obstetrician-gynaecologist doctor during birth. Overall, 4,989 (23·7%) women had a CS birth, while 1,928 (9·2%) had an instrumental vaginal birth.

Key differences in the characteristics of women who had prelabour CS compared to those who laboured (**Supplementary Table 5)** included: older age (29·7% vs 17·6% of mothers older than 35 years, $p<0·001$), giving birth in a private facility (13·5% vs 5·5%, $p<0·001$), more frequently being assisted by a doctor during birth (81·2% vs 46·9% $p<0·001$), presenting a higher frequency of multiple births (4·1% vs 0·8% $p<0·001$), newborns admitted in neonatal intensive or semi-intensive care unit (14·5% vs 7·3%, $p<0·001$), and mothers admitted to intensive care unit (4·9% vs 1·1%, $p<0·001$).

Figures 2 **to** 5 show findings on each of 40 key Quality Measures, in the groups of women who underwent labour (Panel a) and for those with prelabour CS (Panel b). Data are reported as median frequency on the total sample (grey dot) and as median frequency on the sample of women giving birth in each country (coloured dots). More detailed data are reported in **Supplementary Tables 6-9**.

In the domain of provision of care (Figure 2, **Supplementary Table 6**), out of the total number of women who underwent labour (N=18,063), 1,642 (9·1%) women did not have skin-to-skin with their newborn, 2,339 (12·9%) did not breastfeed within the first hour, 5,630 (31·1%) received inadequate breastfeeding support, 3,505 (19·4%) did not have continuous rooming-in, and 5,673 (31·4%) did not receive immediate attention when needed. For most Quality Measures there were wide variations between countries, with a tendency among women giving birth in the same country to report similar findings on different Quality Measures:

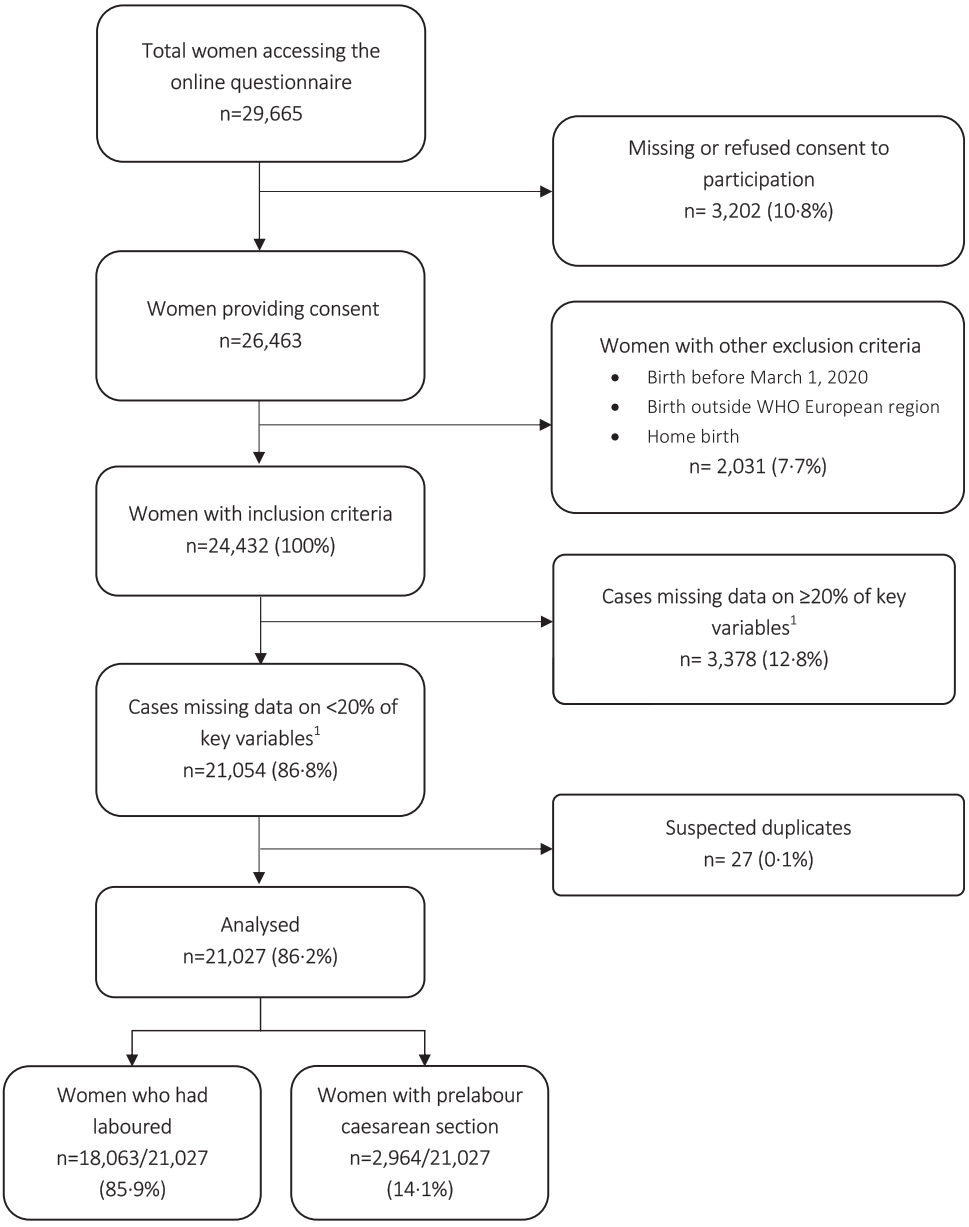

Figure 1. Flow diagram - Note:[1] We used 45 key variables (40 key Quality Measures and five key socio-demographic questions).

lack of skin-to-skin ranged from 0·5% Luxemburg to 64·4% in Romania; lack of early breastfeeding, inadequate breastfeeding support, lack of rooming-in, and lack of attention when needed were consistently lower than the total sample in Luxemburg (4·7%, 16·5%, 5·5%, 20·2% respectively) and higher in Serbia (69·9%, 56·9%, 55·6%, 60·7%). Similarly, other measures of provision of care varied largely across countries: 3,764 (20·8%) women did not receive any pain relief method during labour, and this frequency varied in between 6·4% in France to 46·2% in Serbia. Episiotomy was performed in 2,832 (20·1%) of women with spontaneous vaginal birth (6·1% in Sweden to 66·0% in Romania), and fundal pressure applied in 41·2% (11·5%in France to 100% in Romania) of instrumental vaginal births.

Large variations were observed on all Quality Measures of experience of care (**Figure 3**, **Supplementary Table 7**). Overall, 11,198 (62·0%) women had limitations imposed regarding the presence of a companion of choice (12·6% in Spain to 99·0% in Serbia); 6,039 (42·8%) of those with spontaneous vaginal birth could not choose their birth position (32·4% in Italy to 81·9% in Croatia); 1,033 (53·6%) did not provide consent for an instrumental vaginal birth (35·9% in Sweden to 81·8%

	N=21,027 n	%
Country		
Italy	4,813	22·9
Sweden	4,800	22·8
Norway	3,220	15·3
Slovenia	2,092	9·9
Portugal	1,685	8·0
Germany	1,081	5·1
Serbia	630	3·0
Romania	571	2·7
France	544	2·6
Croatia	458	2·2
Luxembourg	441	2·1
Spain	347	1·7
Other countries[1]	345	1·6
Year of giving birth		
2020	11,458	54·5
2021	8,752	41·6
Missing	817	3·9
Gave birth in the same country where were born		
Yes	19,021	90·5
No	1,523	7·2
Missing	483	2·3
Age range		
18-24	949	4·5
25-30	7,323	34·8
31-35	8,213	39·1
36-39	3,070	14·6
≥40	992	4·7
Missing	480	2·3
Educational level[2]		
None	8	0·1
Elementary school	46	0·2
Junior High school	1,100	5·2
High School	5,152	24·5
University degree	8,725	41·5
Postgraduate degree / Master's /Doctorate or higher	5,515	26·2
Missing	481	2·3
Parity		
1	12,554	59·7
>1	7,992	38·0
Missing	481	2·3
Mode of birth		
Vaginal spontaneous	14,110	67·1
Instrumental vaginal	1,928	9·2
Caesarean section	4,989	23·7
Elective caesarean section	1,995	9·5
	2,025	9·6
Emergency caesarean section during labour		
Emergency caesarean section prelabour	969	4·6
Type of facility		
Public	19,160	91·1
Private	1,387	6·6
Missing	480	2·3
Type of healthcare providers who directly assisted the birth[3]		
Midwife	18,153	86·3
Nurse	8,068	38·4
A student (ie, before graduation)	3,450	16·4
Obstetrics registrar / medical resident (under post-graduate training)	3,780	18·0
Obstetrician-gynaecologist doctor	10,876	51·7
I don't know (healthcare providers did not introduce themselves)	1,802	8·6
Other	3,029	14·4
Other characteristics		
Newborn admitted in neonatal intensive or semi-intensive care unit	1,740	8·3
Mother admitted in intensive care unit	347	1·7
Multiple birth	260	1·2

Table 1 *(Continued)*

***Table 1*: Characteristics of respondents**

Notes:

[1] Other countries: Belgium (n=122); Austria (n=41); UK (n=36); Finland (n=28); Bosnia Herzegovina (n=27); Switzerland (n=21); Denmark (n=15); Greece, Ireland, Netherlands, Ukraine, Andorra, Montenegro, Russian Federation, Lithuania, Iceland, Poland, Turkey, Hungary, Albania, Cyprus, Latvia, Macedonia, and Czech Republic (each fewer than 10 cases).

[2] Wording on education levels agreed among partners during the Delphi; questionnaire translated and back translated according to ISPOR Task Force for Translation and Cultural Adaptation Principles of Good Practice.

[3] More than one possible answer.

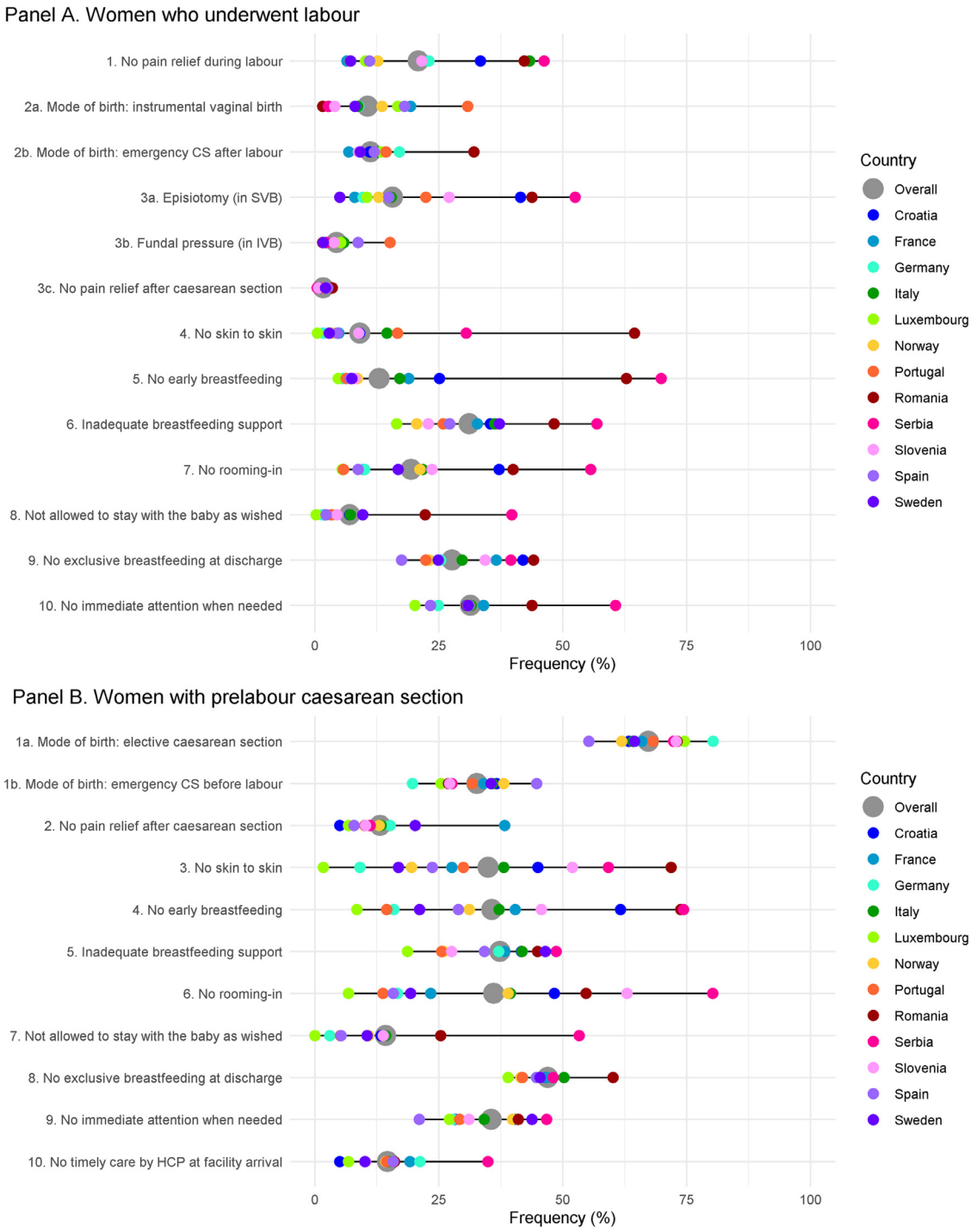

Figure 2. Provision of care – Notes: Data are reported as median frequency on the total sample (grey dot) and as median frequency on the sample of women giving birth in each country (coloured dots); horizontal grey line represents the range of the median frequencies. All the indicators in the domain of provision of care are directly based on WHO standards. Indicators identified with letters (eg, 3a, 3b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births). Abbreviations: CS = caesarean section; HCP = health care provider; IVB= instrumental vaginal birth; SVB = spontaneous vaginal birth.

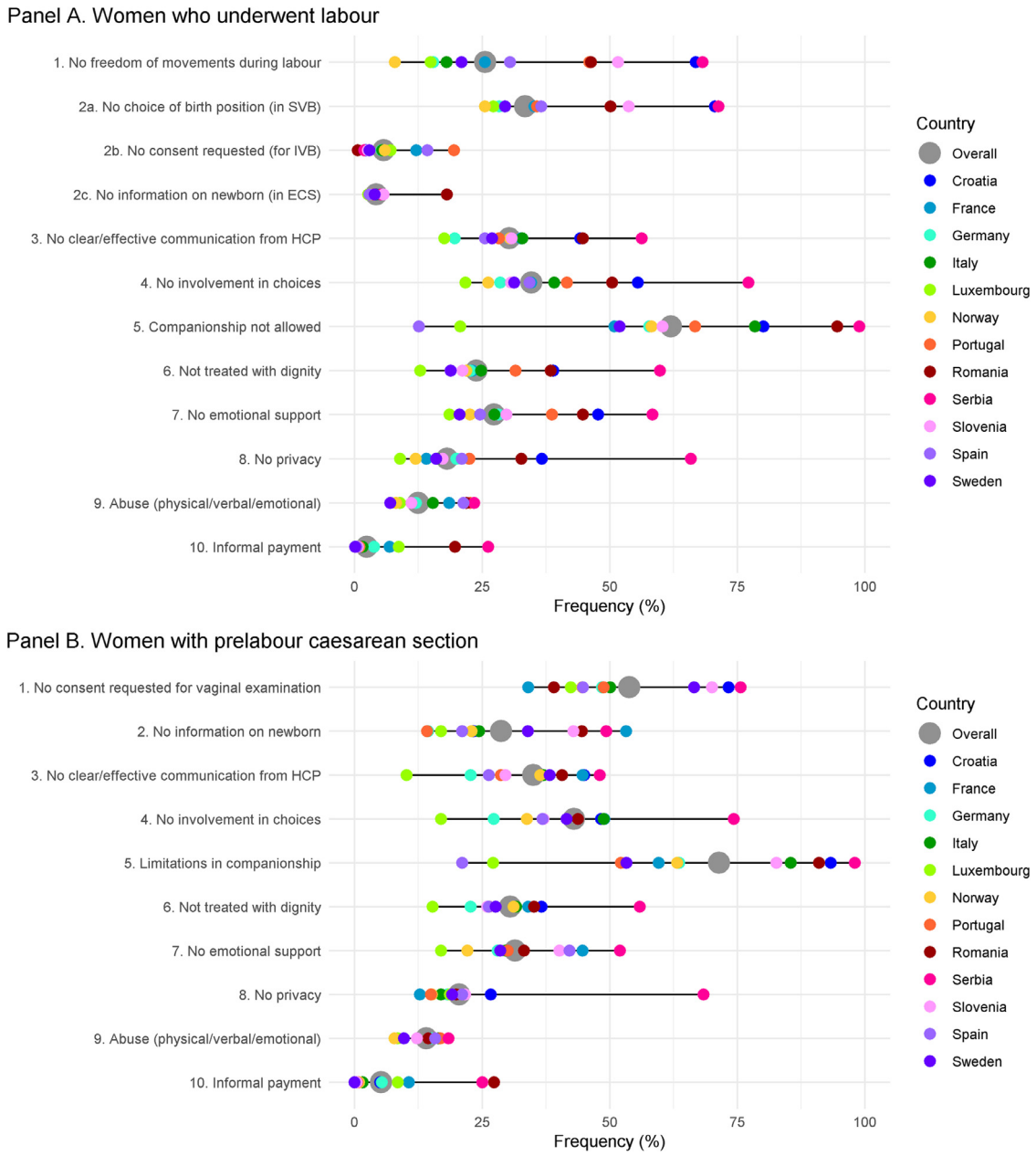

Figure 3. Experience of care — Notes**:** Data are reported as median frequency on the total sample (grey dot) and as median frequency on the sample of women giving birth in each country (coloured dots); horizontal grey line represents the range of the median frequencies. All the indicators in the domain of experience of care are directly based on WHO standards. Indicators identified with letters (eg, 2a, 2b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 2a was calculated on spontaneous vaginal births; 2b was calculated on instrumental vaginal births). Abbreviations: ECS = emergency caesarean section; HCP = health care provider; IVB= instrumental vaginal birth; SVB = spontaneous vaginal birth.

in Croatia); 5,473 (30·3%) did not experience clear communication from health workers (17·5% in Luxemburg to 56·3% in Serbia); 6,259 (34·7%) did not feel involved in choice related to the medical interventions they received (21·7% in Luxemburg to 77·2% in Serbia); 4,315 (23·9%) felt they were not always treated with dignity (12·8% in Luxemburg to 59·8% in Serbia); 2,256 (12·5%) reported abuses (7·0% in Sweden to 23·4% in Serbia), and 2·4% (0·1% in Sweden to 26·2% in Serbia) made informal payments.

Findings in the domain of availability of physical and human resources (Figure 4, **Supplementary Table 8**)

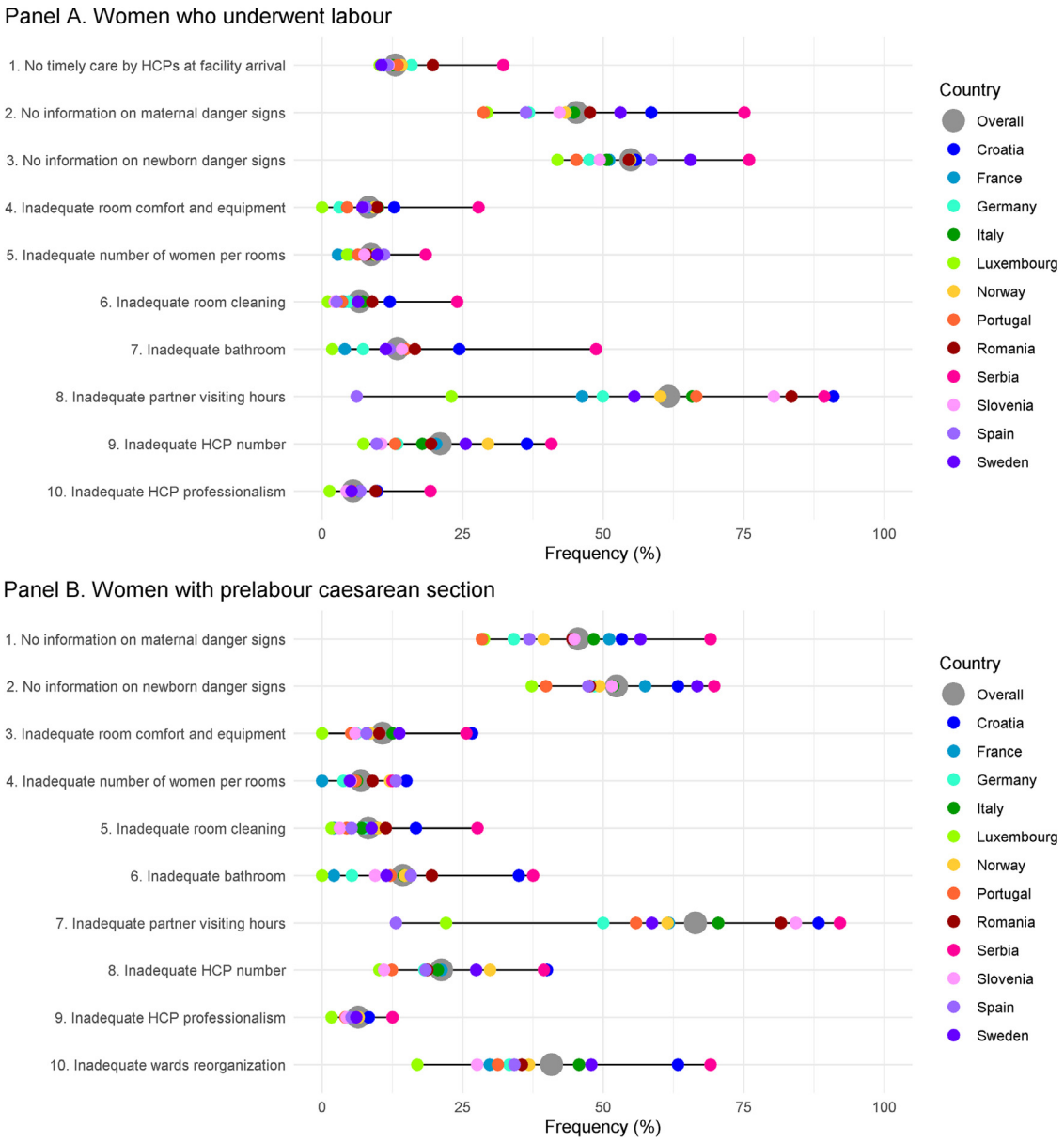

Figure 4. Availability of physical and human resources – Notes: Data are reported as median frequency on the total sample (grey dot) and as median frequency on the sample of women giving birth in each country (coloured dots); horizontal grey line represents the range of the median frequencies. All the indicators in the domain of resources are directly based on WHO standards. Abbreviations: HCP = health care provider.

also showed large variations in frequencies between countries, with a tendency among women giving birth in the same country to rate QMNC consistently across different Quality Measures: 1,202 (6·7%) women reported insufficient/very bad room cleaning (1·0% in Luxemburg to 24·1% in Serbia); 2,421 (13·4%) reported insufficient/very bad bathroom facilities (1·8% in Luxemburg to 48·7% in Serbia); 3,798 (21·0%) women rated as insufficient/very bad the number of health care professionals compared to the workload (7·3% in in Luxemburg to 40·8% in Serbia). Overall, 11,132 (61·6%) women (23·0% in in Luxemburg to 89·3% in Serbia) felt that the visiting hours for partners/relatives was insufficient/very bad.

Key findings in the domain related to organisational changes due to the COVID-19 pandemic (Figure 5, **Supplementary Table 9)** revealed that 9008 (49·9%) women perceived a reduction in QMNC due to the COVID-19 pandemic (38·5% in Luxemburg to 60·7% in Serbia). Difficulties in attending routine antenatal visits

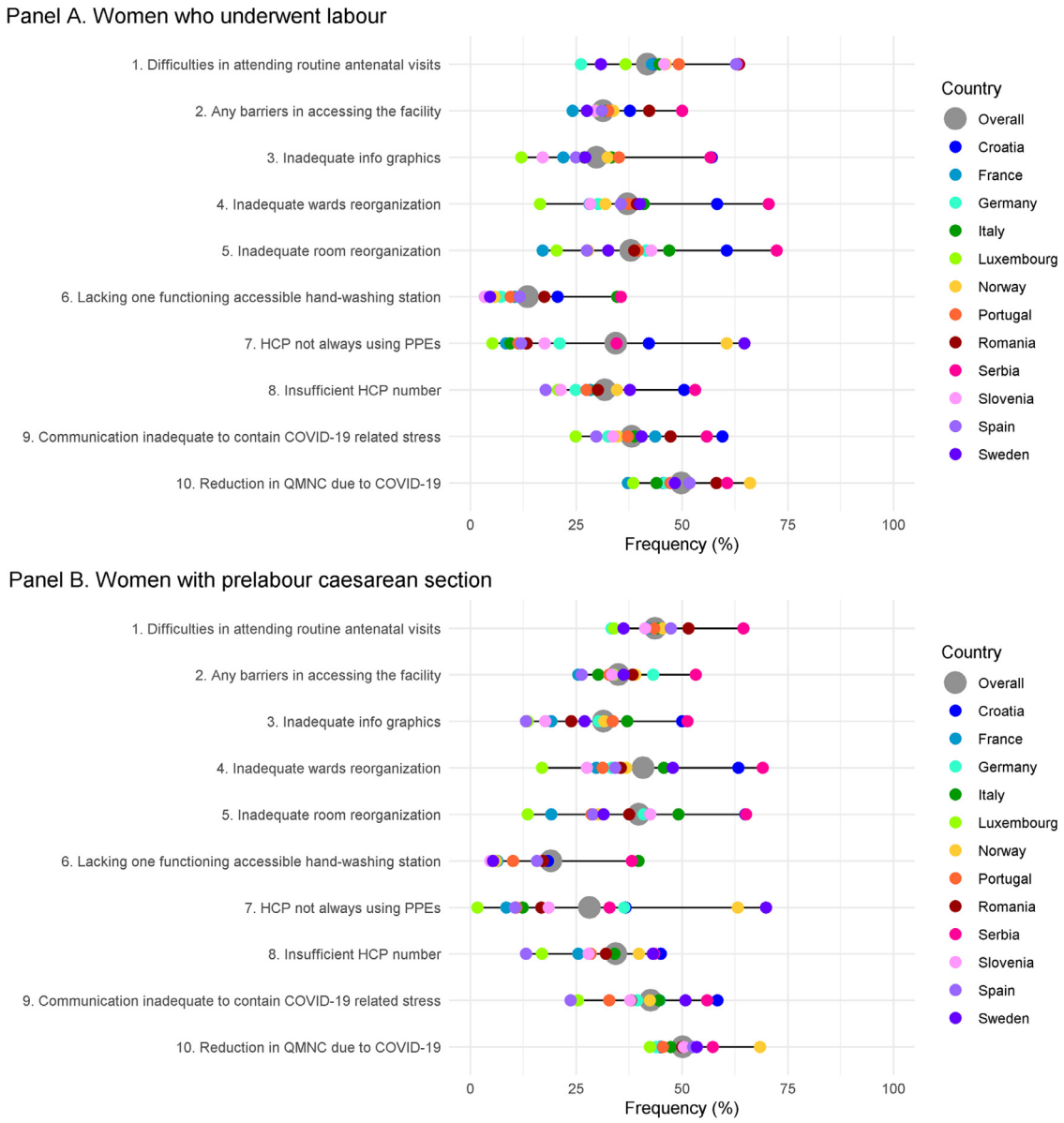

Figure 5. Reorganizational changes due to COVID-19 — Notes: Data are reported as median frequency on the total sample (grey dot) and as median frequency on the sample of women giving birth in each country (coloured dots); horizontal grey line represents the range of the median frequencies. Indicator 6 in both panels was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalised) supplied with water and soap or with disinfectant alcohol solution. Abbreviations: HCP = health care provider; PPE = personal protective equipment; QMNC = quality of maternal and newborn care.

due to the COVID-19 pandemic were experienced by 7,556 (41·8%) women, (26·1% in Germany to 63·5% in Romania). Overall, 2,454 (13·6%) women reported the lack of at least one functioning and easily accessible hand washing station near or inside the room where the mother was hospitalised (4·7% in Luxemburg to 35·6% in Serbia) while 6,218 (34·4%) reported that health workers were not always using personal protective equipment (PPE) (5·2% in Luxemburg to 64·8% in Sweden).

Among the group of women who had a prelabour CS, general gaps in the QMNC were more frequent, compared to the group of women who did experience labour (Supplementary Table 10), when adjusted for all socio-demographic variables, type of professionals assisting the woman, newborn admission in neonatal intensive or semi-

intensive care unit, mother admission in intensive care unit and multiple birth. Key significant differences include: no skin-to-skin (35·0% in those who did not experienced labour vs 9·1% in those who did, adjusted OR 3·39 95%CI 3·02-3·81); no early breastfeeding (35·7% vs 12·9%, adjusted OR 2·95 95%CI 2·63-3·30), no rooming-in (36·1% vs 19·4%, adjusted OR 1·68 95%CI 1·50-1·89), not allowed to stay with the baby as wished (14·3% vs 7·0%, adjusted OR 1·35 95%CI 1·15-1·58), no exclusive breastfeeding at discharge (47·0% vs 27·7%, adjusted OR 1·76 95%CI 1·60-1·94), limitations imposed regarding the presence of a companion of choice (71·5% vs 62·0%, adjusted OR 1·25 95%CI 1·13; 1·39), and health care provider not always using PPEs (28·2% vs 34·4%, adjusted OR 1·17 95%CI 1·04; 1·31). Few Quality Measures highlighted better practices in the group of women with prelabour CS who reported lower OR for: lack of emotional support (adjusted OR 0·88 95%CI 0·80-0·98); lack of privacy (adjusted OR 0·84 95%CI 0·75-0·95); abuses (adjusted OR 0·86 95%CI 0·76; 0·98); and inadequate number of women per rooms (adjusted OR 0·81 95%CI 0·67-0·96).

The QMNC Index (Supplementary Figure 2) varied between countries, with Luxemburg, Spain, Germany, France, Norway, and Sweden presenting a significantly higher median QMNC Index than the total samples ($p<0·001$ in all comparison except Sweden $p=0·003$). Italy, Romania, Croatia, and Serbia had a lower median value than the whole sample ($p<0·001$ on all comparisons). The median QMNC Indexes of Slovenia and Portugal were not significantly different from those of the overall sample (Supplementary Table 11).

Sensitivity and multivariate analyses

Findings of the sensitivity analyses were similar to findings of the primary analysis (**Supplementary Figures 3-4, Supplementary Tables 12-15**).

In the multivariate analysis (**Supplementary Table 16**, Figure 6), when adjusted for other variables, compared to the reference country (Italy), women who gave birth in Croatia, Romania, and Serbia reported significantly lower median QMNC Index while women who gave birth in other countries had significantly higher QMNC Index, either for all or at some of the QMNC Index quantiles analysed. The largest QMNC Index variations were rated by women who gave birth in Serbia and Luxembourg (coefficient variation at the 0·25th, 0·50th and 0·75th quantile respectively for Serbia: -100, -105, -90; Luxemburg: +55·0, +35·5, +20).

When corrected for other variables (**Supplementary Table 16**, Figure 7), a significant higher median QMNC Index with increasing larger coefficients at lower quantiles was found in multiparous women, women who gave birth in a private facility, in year 2021, and women who were assisted either by a midwife or an obstetrics and gynaecology doctor (coefficient variation at the 0·25th, 0·50th and 0·75th quantile:+20·0, +13·2, +10·0 for multiparous women; +28·3, +28·6, +20·0 for private hospital; +21·7, +16·8, +10·0 for women who gave birth in 2021; +31·7, +24·5, +15·0 for women with a midwife who assisted the birth; +10·0, +6·4, +0·0 for women with an obstetrics and gynaecology doctor who assisted the birth). Coefficients of all quantiles were statistically significant except for women with an obstetrics and gynaecology doctor who assisted the birth.

Young mothers aged 18-24 years, instrumental vaginal births and CS had a significant lower QMNC Index and coefficients becoming increasingly larger at lower quantiles (-11·7, -10·9, -5·0 for 18-24 years-old mothers; -23·3, -20·5, -15·0 and -28·3, -21·8, -15·3 for instrumental VB and CS respectively).

Discussion

This is the first multicountry study investigating women's perceptions of the quality of health care around the time of childbirth at health facilities across the WHO European region during the COVID-19 pandemic, using a comprehensive set of WHO Standards-based Quality Measures. The study collected data primarily from 12 countries of the WHO European Region and highlighted that even in rich countries in the WHO European Region, during the first year of the COVID-19 pandemic, many aspects of the QMNC - especially those related to patient-centred respectful care and availability of resources- were reported as substandard from mothers' perspectives. Notably, but not unexpectedly, large inequalities between countries of the WHO European Region were observed. These inequalities were systematic in their distribution and being potentially preventable, they should be called "inequities". [29]

Notably, very good examples of QMNC were also reported. However, even among countries with the higher observed QMNC Indexes, participant mothers reported some gaps. For example, in Luxemburg, 31·3% of women reported to have been subjected to fundal pressure in instrumental vaginal birth, 42·2% were not asked for consent before vaginal examinations, 12·8% reported that they were not treated with dignity, and 38·5% reported a reduction in the QMNC due to COVID-19 (**Supplementary Tables 5-8**). The study also pointed out specific gaps. For example (**Supplementary Table 7**), Swedish mothers reported the highest rate of healthcare workers not wearing PPEs among all countries (64·8%). General shortages in the availability of PPE during the beginning of the pandemic along with varying regional recommendations and stringent efforts to reserve PPEs for suspected or confirmed cases of COVID-19 make these findings plausible.[30,31]

Results of this study are in line with previous reports, showing substantial inequities in key maternal and newborn health care indicators, such as maternal deaths, number of stillbirths, caesarean section and exclusive breastfeeding rates, across countries of the

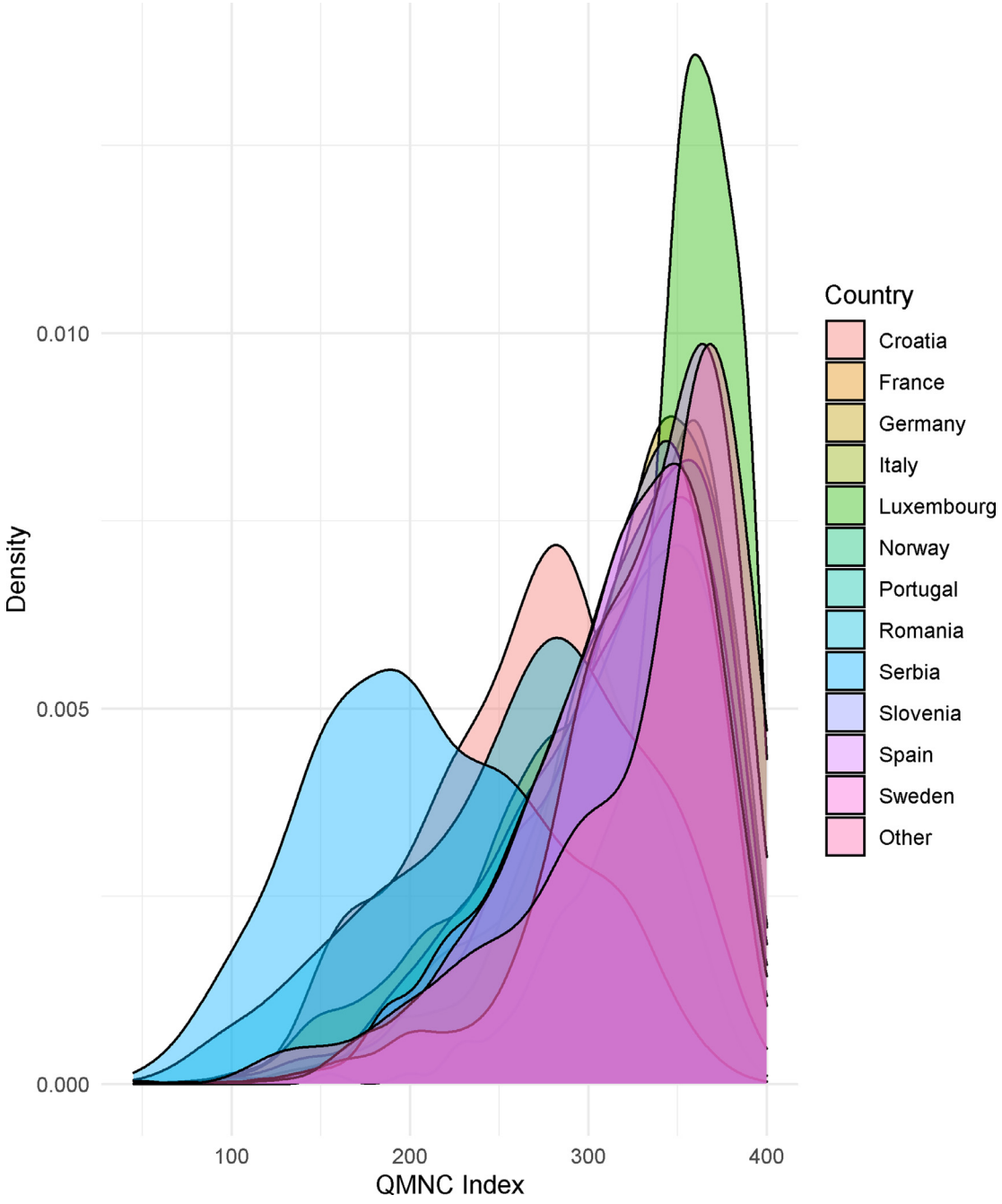

Figure 6. QMNC Index by country of giving birth - Abbreviations: QMNC = quality of maternal and newborn care.

WHO European Region, even before the COVID-19 pandemic.[10,13] Previous national reports and surveys have also documented over-use of medical interventions (including episiotomies, labour induction, and fundal pressure), low use of appropriate procedures for pain control, mistreatment of women, shortages of adequate physical and human resources, and high out-of-pocket payments, with large heterogeneity of practices between countries and between institutions in the same country.[11-15,32-35]

The COVID-19 pandemic was of unprecedented magnitude, and the world was largely unprepared to face it. Our study did not aim at comparing data before and after the COVID-19 pandemic, since comparable data are lacking for most countries. Rather, this study aimed at providing a description of the QMNC during the pandemic, using a comprehensive list of 40 WHO Standard-based Quality Measures, which may allow for comparison over time. Future studies should further

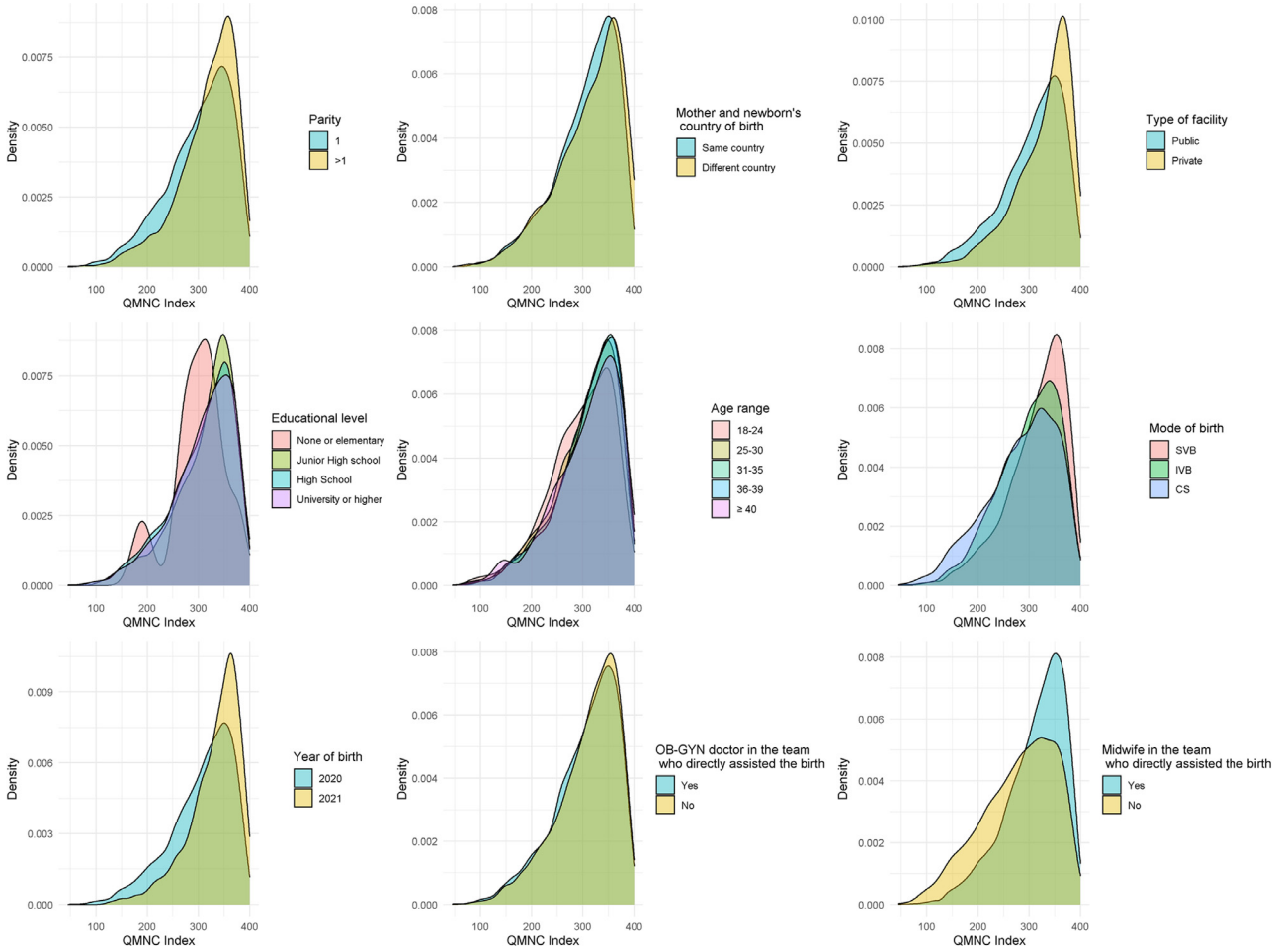

Figure 7. QMNC Index by other variables used in quantile regression analysis - Abbreviations: CS = caesarean section; IVB = instrumental vaginal birth; OB-GYN = obstetrics and gynaecology; QMNC = quality of maternal and newborn care; SVB = spontaneous vaginal birth.

explore to what extent gaps in the QMNC reported in this study were due to the COVID-19 pandemic, or if they will persist beyond it. Standardized systems to routinely measure and compare all domains relevant to QMNC over time and across countries, especially variables related to the experience of care and respectful maternal care, are still lacking and data on QMNC are often not readily available to inform policy and practice in a timely manner.[33–37] Systems to monitor QMNC across countries and over time are urgently needed, even in the WHO European Region. Such systems should aim to link Quality Measures to the individual sample characteristics, since, as shown in this study, Quality Measures may be affected by patient characteristics.

A strength of the study was the use of a standardized validated questionnaire, which allowed for the first time a comparison between countries, on a set of 40 prioritized Quality Measures based on the WHO Standards.[19] The questionnaire explored all domains of the WHO QMNC framework,[19] including several measures of respectful maternal care[36] and the additional domain of organizational changes due to COVID-19. The sample collected accounted for a considerable proportion of the total number of births expected during the study period, at least for eight countries. The study aimed at collecting the perspective of key service users (ie, mothers), in line with what is recommended to countries by WHO as a crucial strategy to monitor the QMNC.[35]

A limitation of this study is that the overall sample of women participating in the survey had a relatively high level of education compared to the expected in the overall general population, but it is difficult to estimate how this selection may have affected study findings. Higher women' s education[15,17,24,38] has been reported as associated with receiving better QMNC (and in this scenario our data could overestimate the actual QMNC), but it is also possible that mothers with higher education were more empowered to freely express their views, and were more critical toward the health system thereby underestimating the QMNC.[15,17]

Similarly, we cannot exclude that, this being a voluntary survey, the sample was self-selected toward women with a higher interest in participating. However, again it is difficult to estimate how this may have affected results: both mothers with either a positive or a negative experience of care may have had a special interest in reporting their experience. Overall, 89.2% of women who accessed our survey online provided consent to participate, suggesting that many women are willing to provide their perspective, when invited to. Certainly, digital poverty may have reduced access to the survey. In the future other complementary methods of participation which do not rely exclusively on internet access, may be necessary for a more comprehensive sample.

We also acknowledge that this online survey lacked important information on the sample, such as more information on maternal and newborn characteristics and outcomes. When questions for the online survey were prioritized, the study network considered it critical not to overload respondents with too many questions, which may drastically reduce the response rate and the overall data completeness.

We acknowledge that reporting national averages may mask intra-country heterogeneity in findings, while different dissemination periods among countries may also have affected results. This is the first paper produced by the IMAgiNE study network, and more detailed results by country and regions, as well as per periods of the COVID-19 pandemic will be the subject of extensive upcoming publications.

Most of the 40 key Quality Measures included in this survey were primarily binary measures which are relatively easy to recall (eg, early breastfeeding yes/no, informal payments yes/no, etc), which increase reliability and comparability of data. However, as for many other surveys on QMNC, some of the measures (eg, those of respectful maternal care such as respect and dignity, and the question on the overall quality of care in respect to the COVID-19 pandemic) were open to women's subjective judgment. Comparison between countries for subjective measures should be interpreted with caution, acknowledging that individual women's perceptions may be affected by individual and national culture, norms, and expectations.[17,38] Evidence has shown that mistreatment of women, including disrespect and abuse, may be normalized and therefore under-reported in some settings,[17,38] while in other settings where the population is more empowered and has higher expectations for QMNC, women may be more critical of the health system. For example, data from Spain, one of the three countries with the highest proportion of women reporting having suffered abuses (20·8%), should be interpreted both considering recent large studies reporting high rates (38·3%) of obstetric violence, and co-existing major efforts from many agencies and bodies during the last 15 years in promoting the concept of respectful maternal care.[39] Overall, most indicators of QMNC lack robust validation and many are open to subjectivity or recall bias.[17,18,34]

Overall, this study adds to previous evidence[1,10,13,31-34,37-40] suggesting that health care around the time of childbirth needs to be driven by evidence-based practices, programmes, and policies, to achieve sustainable maternal and newborn health and wellbeing worldwide. The WHO Standards should be monitored and upheld, including during times of crisis such as the current global pandemic.[19,35] Further implementation research is needed to evaluate how to better incorporate service users' perspective on the QMNC in routine data collection systems, and how to triangulate these data with other indicators such as health outcomes. However, existing evidence should be translated now into appropriate health policies and plans to improve QMNC and reduce inequities in QMNC across the WHO European Region. Policymakers at all levels (individual facility, national, regional, global level) in the health sector and

in other related sectors (eg, education and others) need to ensure that all women receive high-quality, evidence-based, equitable, and patient-centred respectful care during the COVID-19 pandemic and beyond.

Contributors

ML conceived the study, with major inputs from EPV, BC and additional input from all other authors.
All authors promoted the surveys and supported the process of data collection.
IM analysed data, with major inputs from ML.
ML wrote the first draft, with major inputs from all authors.
All authors have approved the final version of the manuscript for submission.

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Declaration of interests

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Dr Emma Sacks has received research funding from the World Health Organization related to the mistreatment of women and newborns in health facilities. The project has no impact on the present manuscript outside of similar topics. She is the former co-chair of the Newborn Health Working Group of the Global Respectful Maternity Care Council.

Other authors have none to declare.

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Availability of data

Data can be made available on reasonable request to the corresponding author.

Disclaimer

The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.lanepe.2021.100268.

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Quality of facility-based health care around the time of childbirth during the COVID-19 pandemic: online survey investigating the maternal perspective in 12 countries of the WHO European Region

Supplementary Material

Contents

Supplementary Table 1 Checklist of items that should be included in reports of cross-sectional studies

	Item No	Recommendation	Pages
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1,3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8-19
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-19
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	8-19
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were	8-19

		included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	17
Discussion			
Key results	18	Summarise key results with reference to study objectives	19
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19-20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	23

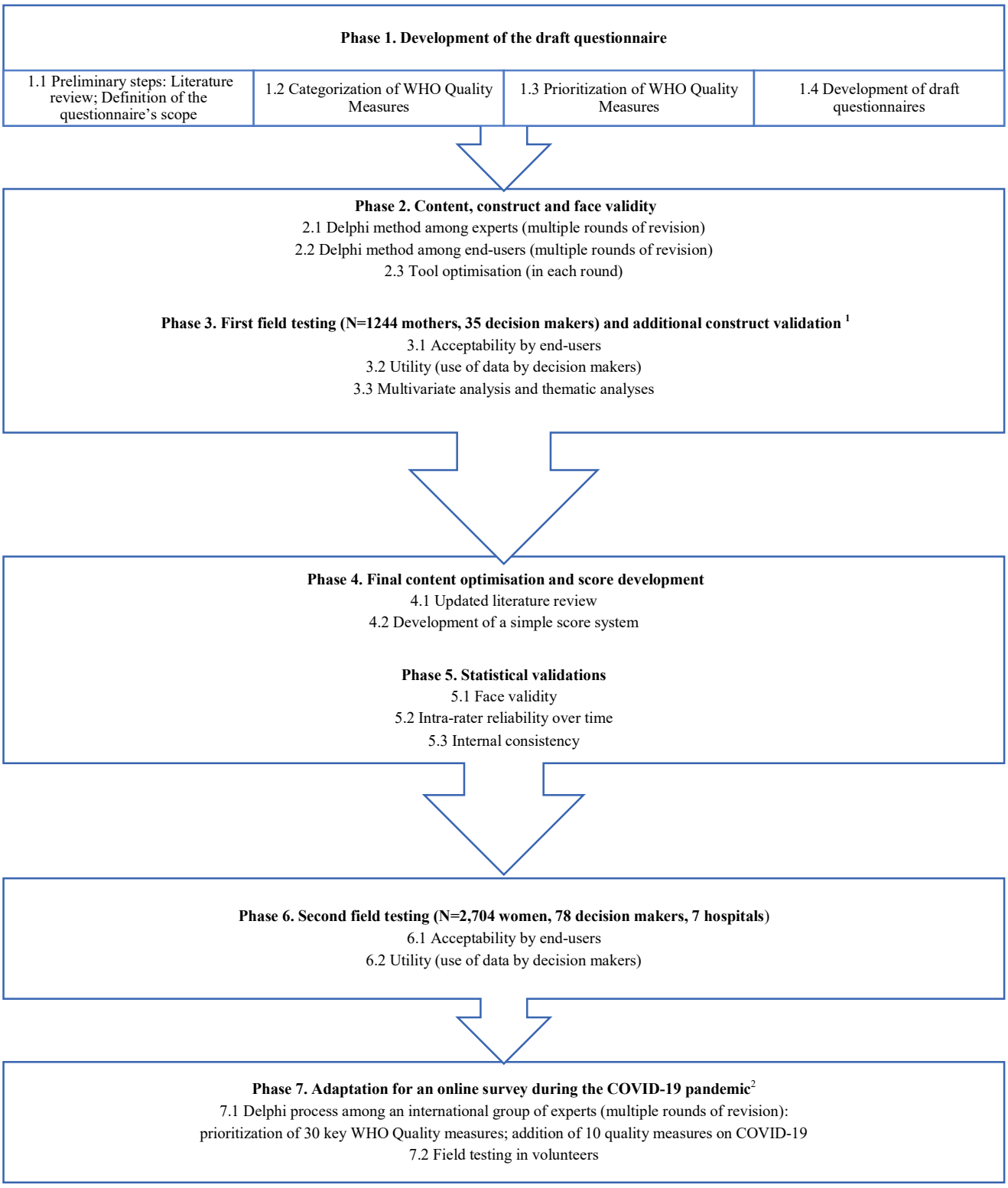
Notes: * Give information separately for exposed and unexposed groups.

Supplementary Table 2 Data collection period by language

	Languages*	Date of online availability	Country team responsible
Dissemination under direct responsibility of a specific country team	Romanian	02/09/2020	Romania
	Slovenian	20/10/2020	Slovenia
	Portuguese	13/11/2020	Portugal
	Serbian	17/11/2020	Serbia
	Italian	18/11/2020	Italy
	Swedish	26/11/2020	Sweden
	German	02/12/2020	Germany and Luxembourg
	Croatian	03/12/2020	Croatia
	Spanish	07/12/2020	Spain
	Catalan	07/12/2020	Spain
	French	07/12/2020	France** and Luxembourg
	Norwegian	10/02/2021	Norway
Dissemination not under direct responsibility of a specific country team for this round of data collection	English	02/09/2020	NA
	Bosnian	18/09/2020	
	Albanian	06/11/2020	
	Russian	09/11/2020	
	Bengali	20/01/2021	
	Arabic	20/01/2021	
	Hindi	20/01/2021	
	Nepalese	20/01/2021	
	Chinese	20/01/2021	

Notes: *All links always available to all countries after start date; ** Roll up in France on 13/01/2021.
Abbreviation: NA = not applicable.

Supplementary Figure 1 Questionnaire development and validation



Additional details on Phase 7

During the first months of the COVID-19 pandemic, the questionnaire was further optimized and adapted for an online survey. Specifically:

1 The online format was chosen due to lower costs of dissemination and possibility of quicker responses in many countries (1-3). The questionnaire was shortened to 30 key WHO Quality measures in order to improve acceptability and questions were adapted for an online survey, ie. including clear explanations for women (such as, for example, the meaning of "active labour" in order to standardized answers).

2 To be able to collect data related to the emergency, 10 key questions relevant to the COVID-19 pandemic, prioritized among recommended indicators in existing WHO guidelines, professional association statements, protocols released by European countries (4-24), were added.

Questions were selected through a Delphi process, including 26 experts from 11 countries of the WHO European Region with the following different backgrounds: clinical staff directly involved in the QMNC, sociologists, psychologist, anthropologist, public health experts, lactation consultants and reproductive rights advocates. Experts were asked to assess comprehensiveness and clarity of the questions, suggest rewording or additional relevant questions if necessary, using and *ad hoc* template. Criteria to reach consensus were pre-defined (25). The final questionnaire was field tested in volunteers' mothers.

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Supplementary Table 3 Quality of maternal and neonatal care index score system

	Number of questions	Score options for each answer	Total score (range)
Provision of care	10	0, 5, 10	0 - 100
Experience of care	10	0, 5, 10	0 - 100
Availability of physical and human resources	10	0, 5, 10	0 - 100
COVID-19	10	0, 5, 10	0 - 100
QMNC Index	40	0, 5, 10	0 - 400

Abbreviation: QMNC = Quality of maternal and neonatal care

Supplementary Table 4 Proportion of participants compared to expected number of births within the study period based on 2019 data by country

Country	Sample collected in each country	Contribution to total sample (% of N=21027)	Country births 2019	% of births collected on total birth in 12 months*
Norway	3220	15·3	54404	5·9
Luxemburg	441	2·1	6320	7·0
Slovenia	2092	9·9	18794	11·1
Sweden	4800	22·8	114523	4·2
Portugal	1685	8·0	86579	2·0
Croatia	458	2·2	35985	1·3
Italy	4813	22·9	420084	1·2
Serbia	630	3·0	64757	1·0
Romania	571	2·7	185677	0·3
Germany	1081	5·1	778100	0·1
France	544	2·6	753000	0·1
Spain	347	1·7	360617	0·1

Notes: * Women who gave birth from March 1, 2020 up to the end of the data collection period (March 15, 2021) were invited to participate in an online survey; data collection approximated to 12 months.

Supplementary Table 5 Comparison of the characteristics of responders between women who underwent labour and women with prelabour caesarean section

	Women who underwent labour N=18063 n (%)	Women with prelabour caesarean section N=2964 n (%)	p value
Country			
Italy	3973 (22· 0)	840 (28· 3)	<0· 001
Sweden	4355 (24· 1)	445 (15· 0)	<0· 001
Norway	2989 (16· 5)	231 (7· 8)	<0· 001
Slovenia	1838 (10· 2)	254 (8· 6)	0· 007
Portugal	1298 (7· 2)	387 (13· 1)	<0· 001
Germany	949 (5· 3)	132 (4· 5)	0· 067
Serbia	478 (2· 6)	152 (5· 1)	<0· 001
Romania	315 (1· 7)	256 (8· 6)	<0· 001
France	497 (2· 8)	47 (1· 6)	<0· 001
Croatia	398 (2· 2)	60 (2· 0)	0· 536
Luxembourg	382 (2· 1)	59 (2· 0)	0· 662
Spain	309 (1· 7)	38 (1· 3)	0· 090
Other countries [1]	282 (1· 6)	63 (2· 1)	0· 025
Year of birth			
2020	16366 (90· 6)	2731 (92· 1)	<0· 001
2021	1181 (6· 5)	119 (4· 0)	0· 007
Missing	516 (2· 9)	114 (3· 8)	0· 003
Gave birth in the same country where were born			
Yes	16367 (90· 6)	2654 (89· 5)	0· 066
No	1301 (7· 2)	222 (7· 5)	0· 576
Missing	395 (2· 2)	88 (3· 0)	0· 008
Age range			
18-24	880 (4· 9)	69 (2· 3)	<0· 001
25-30	6541 (36· 2)	782 (26· 4)	<0· 001
31-35	7068 (39· 1)	1145 (38· 6)	0· 605
36-39	2472 (13· 7)	598 (20· 2)	<0· 001
≥40	710 (3· 9)	282 (9· 5)	<0· 001
Missing	392 (2· 2)	88 (3· 0)	0· 007
Educational level [2]			
None	7 (0· 0)	1 (0· 0)	0· 897
Elementary school	40 (0· 2)	6 (0· 2)	0· 837
Junior High school	931 (5· 2)	169 (5· 7)	0· 215
High School	4413 (24· 4)	739 (24· 9)	0· 556
University degree	7580 (42· 0)	1145 (38· 6)	0· 001
Postgraduate degree / Master's /Doctorate or higher	4699 (26· 0)	816 (27· 5)	0· 082
Missing	393 (2· 2)	88 (3· 0)	0· 007
Parity			
1	10906 (60· 4)	1648 (55· 6)	<0· 001
>1	6764 (37· 4)	1228 (41· 4)	<0· 001
Missing	393 (2· 2)	88 (3· 0)	0· 007
Type of facility			
Public	16684 (92· 4)	2476 (83· 5)	<0· 001
Private	986 (5· 5)	401 (13· 5)	<0· 001
Missing	393 (2· 2)	87 (2· 9)	0· 010
Type of healthcare providers who directly assisted the birth [3]			
Midwife	16371 (90· 6)	1782 (60· 1)	<0· 001
Nurse	6337 (35· 1)	1731 (58· 4)	<0· 001
A student (ie, before graduation)	3171 (17· 6)	279 (9· 4)	<0· 001
Obstetrics registrar / medical resident (under post-graduate training)	3003 (16· 6)	777 (26· 2)	<0· 001
Obstetrician-gynaecologist doctor	8470 (46· 9)	2406 (81· 2)	<0· 001
I don't know (healthcare providers did not introduce themselves)	1455 (8· 1)	347 (11· 7)	<0· 001
Other	2442 (13· 5)	587 (19· 8)	<0· 001
Other characteristics			
Newborn admitted in neonatal intensive or semi-intensive care unit	1311 (7· 3)	429 (14· 5)	<0· 001
Mother admitted in intensive care unit	201 (1· 1)	146 (4· 9)	<0· 001
Multiple birth	139 (0· 8)	121 (4· 1)	<0· 001

Notes: [1] Other countries: Belgium (n=122); Austria (n=41); UK (n=36); Finland (n=28); Bosnia Herzegovina (n=27); Switzerland (n=21); Denmark (n=15); Greece, Ireland, Netherlands, Ukraine, Andorra, Montenegro, Russian Federation, Lithuania, Iceland, Poland, Turkey, Hungary, Albania, Cyprus, Latvia, Macedonia, and Czech Republic (each fewer than 10 cases); [2] Wording on education levels agreed

among partners during the Delphi; questionnaire translated and back translated according to ISPOR Task Force 25 for Translation and Cultural Adaptation Principles of Good Practice; [3] More than one possible answer·

Supplementary Table 6 Results on provision of care

Women who underwent labour

	Overall n (%)	Croatia n (%)	France n (%)	Germany n (%)	Italy n (%)	Luxembourg n (%)	Norway n (%)	Portugal n (%)	Romania n (%)	Serbia n (%)	Slovenia n (%)	Spain n (%)	Sweden n (%)	Other countries n (%)
N	18063	398	497	949	3973	382	2989	1298	315	478	1838	309	4355	282
1. No pain relief during labour	20·8 (20·2; 21·4)	33·4 (28·8; 38·1)	6·4 (4·3; 8·6)	23 (20·3; 25·6)	43·3 (41·8; 44·8)	10·2 (7·2; 13·2)	12·7 (11·5; 13·9)	7·2 (5·8; 8·6)	42·2 (36·8; 47·7)	46·2 (41·8; 50·7)	21·5 (19·7; 23·4)	11 (7·5; 14·5)	7·2 (6·4; 8·0)	18·8 (14·2; 23·4)
2. Mode of birth														
2a. IVB	10·7 (10·2; 11·1)	2·8 (1·2; 4·4)	19·3 (15·8; 22·8)	8·9 (7·0; 10·7)	8·6 (7·8; 9·5)	16·8 (13; 20·5)	13·5 (12·3; 14·8)	30·8 (28·3; 33·3)	1·6 (0·2; 3·0)	2·7 (1·3; 4·2)	4·0 (3·1; 4·9)	18·1 (13·8; 22·4)	8·1 (7·3; 8·9)	9·2 (5·8; 12·6)
2b. ECS during labour	11·2 (10·8; 11·7)	11·1 (8·0; 14·1)	6·8 (4·6; 9·1)	17·1 (14·7; 19·5)	12·7 (11·7; 13·7)	13·4 (9·9; 16·8)	8·9 (7·9; 9·9)	14·3 (12·4; 16·2)	32·1 (26·9; 37·2)	8·8 (6·2; 11·3)	8·8 (7·5; 10·1)	12 (8·4; 15·6)	9·1 (8·3; 10)	13·5 (9·5; 17·5)
3a. Episiotomy (in SVB)	20·1 (19·4; 20·7)	48·1 (42·8; 53·4)	10·9 (7·7; 14·1)	13·1 (10·6; 15·6)	19·6 (18·2; 21)	15 (10·7; 19·3)	16·6 (15·1; 18·1)	40·7 (37·1; 44·3)	66 (59·6; 72·4)	59·3 (54·7; 64)	31 (28·7; 33·3)	21·3 (15·8; 26·8)	6·1 (5·3; 6·9)	25·7 (19·9; 31·5)
3b. Fundal pressure (in IVB)	41·2 (39; 43·4)	90·9 (73·9; 107·9)	11·5 (5·1; 17·8)	65·5 (55·3; 75·6)	67·9 (63; 72·9)	31·2 (19·9; 42·6)	18 (14·3; 21·8)	49·2 (44·4; 54·1)	100 (100; 100)	84·6 (65; 104·2)	95·9 (91·5; 100)	48·2 (35·1; 61·3)	21·4 (17·1; 25·7)	26·9 (9·9; 44)
3c. No pain relief after CS	15·2 (13·6; 16·8)	11·4 (2·0; 20·7)	32·4 (16·6; 48·1)	11·7 (6·8; 16·7)	13·1 (10·1; 16)	13·7 (4·3; 23·2)	18·4 (13·8; 23·1)	10·8 (6·3; 15·2)	10·9 (4·8; 17)	4·8 (0·0; 11·2)	8·7 (4·3; 13)	21·6 (8·4; 34·9)	23·1 (19; 27·3)	10·5 (0·8; 20·3)
4. No skin to skin	9·1 (8·7; 9·5)	9·0 (6·2; 11·9)	4·8 (2·9; 6·7)	1·7 (0·9; 2·5)	14·5 (13·4; 15·6)	0·5 (0·0; 1·2)	3·5 (2·9; 4·2)	16·6 (14·6; 18·7)	64·4 (59·2; 69·7)	30·5 (26·4; 34·7)	8·8 (7·5; 10·1)	4·5 (2·2; 6·8)	2·9 (2·4; 3·4)	5·3 (2·7; 7·9)
5. No early breastfeeding	12·9 (12·5; 13·4)	25·1 (20·9; 29·4)	18·9 (15·5; 22·4)	5·6 (4·1; 7·0)	17·1 (15·9; 18·3)	4·7 (2·6; 6·8)	8·6 (7·6; 9·6)	6·3 (5·0; 7·6)	62·9 (57·5; 68·2)	69·9 (65·8; 74)	8·1 (6·9; 9·4)	7·1 (4·3; 10)	7·4 (6·7; 8·2)	10·3 (6·7; 13·8)
6. Inadequate breastfeeding support	31·2 (30·5; 31·8)	35·4 (30·7; 40·1)	32·8 (28·7; 36·9)	27·1 (24·3; 29·9)	36·3 (34·8; 37·8)	16·5 (12·8; 20·2)	20·5 (19·1; 22)	25·9 (23·5; 28·3)	48·3 (42·7; 53·8)	56·9 (52·5; 61·3)	22·9 (20·9; 24·8)	27·2 (22·2; 32·1)	37·2 (35·8; 38·7)	23 (18·1; 28)
7. No rooming-in	19·4 (18·8; 20)	37·2 (32·4; 41·9)	9·9 (7·2; 12·5)	10 (8·1; 11·9)	21·7 (20·5; 23)	5·5 (3·2; 7·8)	21·2 (19·7; 22·7)	5·8 (4·5; 7·0)	40·0 (34·6; 45·4)	55·6 (51·2; 60·1)	23·6 (21·7; 25·6)	8·7 (5·6; 11·9)	16·8 (15·7; 17·9)	12·4 (8·6; 16·3)
8. Not allowed to stay with the baby as wished	7·0 (6·7; 7·4)	7·0 (4·5; 9·5)	2·0 (0·8; 3·2)	1·6 (0·8; 2·4)	7·1 (6·3; 7·9)	0·3 (0·0; 0·8)	3·6 (2·9; 4·3)	3·3 (2·3; 4·3)	22·2 (17·6; 26·8)	39·7 (35·4; 44·1)	4·5 (3·5; 5·4)	2·3 (0·6; 3·9)	9·7 (8·8; 10·5)	4·3 (1·9; 6·6)
9. No exclusive breastfeeding at discharge	27·7 (27; 28·4)	42 (37·1; 46·8)	36·6 (32·4; 40·9)	25·4 (22·6; 28·2)	29·7 (28·3; 31·1)	24·9 (20·5; 29·2)	23·2 (21·6; 24·7)	22·3 (20·1; 24·6)	44·1 (38·6; 49·6)	39·5 (35·2; 43·9)	34·3 (32·2; 36·5)	17·5 (13·2; 21·7)	24·9 (23·6; 26·2)	20·9 (16·2; 25·7)
10. No immediate attention when needed	31·4 (30·7; 32·1)	30·7 (26·1; 35·2)	34·0 (29·8; 38·2)	24·9 (22·1; 27·6)	31·5 (30·0; 32·9)	20·2 (16·1; 24·2)	30·9 (29·3; 32·6)	30·8 (28·3; 33·3)	43·8 (38·3; 49·3)	60·7 (56·3; 65·0)	31·1 (29; 33·2)	23·3 (18·6; 28·0)	31·0 (29·6; 32·3)	26·6 (21·4; 31·8)

Women with prelabour caesarean section

	Overall n (%)	Croatia n (%)	France n (%)	Germany n (%)	Italy n (%)	Luxembourg n (%)	Norway n (%)	Portugal n (%)	Romania n (%)	Serbia n (%)	Slovenia n (%)	Spain n (%)	Sweden n (%)	Other countries n (%)
N	2964	60	47	132	840	59	231	387	256	152	254	38	445	63
1. Mode of birth														
1a. Elective CS	67·3 (65·6; 69)	63·3 (51·1; 75·5)	66·0 (52·4; 79·5)	80·3 (73·5; 87·1)	64·2 (60·9; 67·4)	74·6 (63·5; 85·7)	61·9 (55·6; 68·2)	68·2 (63·6; 72·9)	73·0 (67·6; 78·5)	72·4 (65·3; 79·5)	72·8 (67·4; 78·3)	55·3 (39·5; 71·1)	64·5 (60; 68·9)	63·5 (51·6; 75·4)
1b. ECS before labour	32·7 (31·0; 34·4)	36·7 (24·5; 48·9)	34·0 (20·5; 47·6)	19·7 (12·9; 26·5)	35·8 (32·6; 39·1)	25·4 (14·3; 36·5)	38·1 (31·8; 44·4)	31·8 (27·1; 36·4)	27·0 (21·5; 32·4)	27·6 (20·5; 34·7)	27·2 (21·7; 32·6)	44·7 (28·9; 60·5)	35·5 (31·1; 40)	36·5 (24·6; 48·4)
2. No pain relief after CS	13·2 (12·0; 14·4)	5·0 (0·0; 10·5)	38·3 (24·4; 52·2)	15·2 (9·0; 21·3)	13·3 (11; 15·6)	6·8 (0·4; 13·2)	13·0 (8·7; 17·3)	10·1 (7·1; 13·1)	10·2 (6·5; 13·9)	11·2 (6·2; 16·2)	10·2 (6·5; 14·0)	7·9 (0·0; 16·5)	20·2 (16·5; 24)	4·8 (0·0; 10·0)
3. No skin to skin	35·0 (33·3; 36·7)	45·0 (32·4; 57·6)	27·7 (14·9; 40·4)	9·1 (4·2; 14·0)	38·1 (34·8; 41·4)	1·7 (0·0; 5·0)	19·5 (14·4; 24·6)	30·0 (25·4; 34·5)	71·9 (66·4; 77·4)	59·2 (51·4; 67)	52·0 (45·8; 58·1)	23·7 (10·2; 37·2)	16·9 (13·4; 20·3)	20·6 (10·6; 30·6)
4. No early breastfeeding	35·7 (34; 37·5)	61·7 (49·4; 74)	40·4 (26·4; 54·5)	15·9 (9·7; 22·1)	37·1 (33·9; 40·4)	8·5 (1·4; 15·6)	31·2 (25·2; 37·1)	14·5 (11·0; 18·0)	73·8 (68·4; 79·2)	74·3 (67·4; 81·3)	45·7 (39·5; 51·8)	28·9 (14·5; 43·4)	21·1 (17·3; 24·9)	22·2 (12; 32·5)
5. Inadequate breastfeeding support	37·3 (35·6; 39·1)	41·7 (29·2; 54·1)	38·3 (24·4; 52·2)	37·1 (28·9; 45·4)	41·8 (38·5; 45·1)	18·6 (8·7; 28·6)	26·0 (20·3; 31·6)	25·6 (21·2; 29·9)	44·9 (38·8; 51)	48·7 (40·7; 56·6)	27·6 (22·1; 33·1)	34·2 (19·1; 49·3)	46·5 (41·9; 51·2)	22·2 (12; 32·5)
6. No rooming-in	36·1 (34·4; 37·8)	48·3 (35·7; 61·0)	23·4 (11·3; 35·5)	16·7 (10·3; 23)	39·4 (36·1; 42·7)	6·8 (0·4; 13·2)	39 (32·7; 45·2)	13·7 (10·3; 17·1)	54·7 (48·6; 60·8)	80·3 (73·9; 86·6)	63 (57·1; 68·9)	15·8 (4·2; 27·4)	19·3 (15·7; 23)	25·4 (14·6; 36·1)
7. Not allowed to stay with the baby as wished	14·3 (13·0; 15·6)	13·3 (4·7; 21·9)	10·6 (1·8; 19·5)	3·0 (0·1; 6·0)	14·3 (11·9; 16·7)	0·0 (0·0; 0·0)	10·8 (6·8; 14·8)	5·2 (3·0; 7·4)	25·4 (20·1; 30·7)	53·3 (45·4; 61·2)	13·8 (9·5; 18)	5·3 (0·0; 12·4)	10·6 (7·7; 13·4)	19·0 (9·4; 28·7)
8. No exclusive breastfeeding at discharge	47·0 (45·2; 48·8)	46·7 (34; 59·3)	46·8 (32·5; 61·1)	44·7 (36·2; 53·2)	50·2 (46·9; 53·6)	39·0 (26·5; 51·4)	41·6 (35·2; 47·9)	41·9 (36·9; 46·8)	60·2 (54·2; 66·2)	48·0 (40·1; 56·0)	44·9 (38·8; 51·0)	44·7 (28·9; 60·5)	45·4 (40·8; 50)	31·7 (20·3; 43·2)
9. No immediate attention when needed	35·6 (33·9; 37·3)	28·3 (16·9; 39·7)	40·4 (26·4; 54·5)	28·0 (20·4; 35·7)	34·2 (31; 37·4)	27·1 (15·8; 38·5)	39·8 (33·5; 46·1)	29·2 (24·7; 33·7)	41·0 (35; 47·0)	46·7 (38·8; 54·6)	31·1 (25·4; 36·8)	21·1 (8·1; 34)	43·8 (39·2; 48·4)	25·4 (14·6; 36·1)
10. No timely care by HCP at facility arrival	14·7 (13·4; 16·0)	5·0 (0·0; 10·5)	19·1 (7·9; 30·4)	21·2 (14·2; 28·2)	14·9 (12·5; 17·3)	6·8 (0·4; 13·2)	14·3 (9·8; 18·8)	14·5 (11·0; 18·0)	16·0 (11·5; 20·5)	34·9 (27·3; 42·4)	10·2 (6·5; 14)	15·8 (4·2; 27·4)	10·1 (7·3; 12·9)	9·5 (2·3; 16·8)

Notes

All the indicators in the domain of provision of care are directly based on WHO standards.

Indicators identified with letters (eg, 3a, 3b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births).

Abbreviations: CS = caesarean section; ECS = emergency caesarean section; HCP = health care provider; IVB= instrumental vaginal birth; SVB = spontaneous vaginal birth

Supplementary Table 7 Results on experience of care

Women who underwent labour

	Overall n (%)	Croatia n (%)	France n (%)	Germany n (%)	Italy n (%)	Luxembourg n (%)	Norway n (%)	Portugal n (%)	Romania n (%)	Serbia n (%)	Slovenia n (%)	Spain n (%)	Sweden n (%)	Other countries n (%)
N	18063	398	497	949	3973	382	2989	1298	315	478	1838	309	4355	282
1. No freedom of movements during labour	25·6 (25·0; 26·2)	66·8 (62·2; 71·5)	25·6 (21·7; 29·4)	15·4 (13·1; 17·7)	18·0 (16·8; 19·2)	14·9 (11·3; 18·5)	7·9 (6·9; 8·9)	46·0 (43·3; 48·7)	46·3 (40·8; 51·9)	68·2 (64·0; 72·4)	51·6 (49·3; 53·9)	30·4 (25·3; 35·6)	20·9 (19·7; 22·1)	18·8 (14·2; 23·4)
2a. No choice of birth position (in SVB)	42·8 (42·0; 43·6)	81·9 (77·9; 86·0)	47·7 (42·6; 52·8)	38·3 (34·7; 41·9)	32·4 (30·8; 34·1)	39·0 (33·1; 44·8)	32·9 (31·0; 34·8)	65·2 (61·7; 68·7)	75·6 (69·8; 81·4)	80·6 (76·8; 84·4)	61·6 (59·2; 64·0)	52·3 (45·7; 59·0)	35·6 (34·0; 37·2)	39·4 (33·0; 45·9)
2b. No consent requested (for IVB)	53·6 (51·4; 55·8)	81·8 (59·0; 104·6)	62·5 (52·8; 72·2)	59·5 (49·0; 70·0)	62·4 (57·3; 67·5)	42·2 (30·1; 54·3)	43·7 (38·9; 48·5)	63·2 (58·5; 68·0)	40·0 (0·0; 82·9)	69·2 (44·1; 94·3)	64·9 (54; 75·7)	78·6 (67·8; 89·3)	35·9 (30·9; 40·9)	53·8 (34·7; 73)
2c. No information on newborn (in ECS)	37·7 (35·6; 39·8)	38·6 (24·2; 53·0)	58·8 (42·3; 75·4)	22·2 (15·8; 28·6)	32·3 (28·2; 36·4)	19·6 (8·7; 30·5)	35·3 (29·6; 41·1)	25·3 (19·0; 31·5)	56·4 (46·8; 66·1)	59·5 (44·7; 74·4)	64·6 (57·2; 72·0)	24·3 (10·5; 38·1)	43·0 (38·1; 47·8)	26·3 (12·3; 40·3)
3. No clear/effective communication from HCP	30·3 (29·6; 31·0)	44·2 (39·3; 49·1)	32·6 (28·5; 36·7)	19·6 (17·1; 22·1)	32·9 (31·4; 34·4)	17·5 (13·7; 21·4)	30·5 (28·8; 32·1)	28·3 (25·8; 30·7)	44·8 (39·3; 50·3)	56·3 (51·8; 60·7)	30·8 (28·7; 32·9)	25·6 (20·7; 30·4)	27 (25·6; 28·3)	24·1 (19·1; 29·1)
4. No involvement in choices	34·7 (34·0; 35·3)	55·5 (50·6; 60·4)	34·6 (30·4; 38·8)	28·6 (25·7; 31·4)	39·1 (37·6; 40·7)	21·7 (17·6; 25·9)	26·2 (24·6; 27·8)	41·6 (38·9; 44·3)	50·5 (45·0; 56·0)	77·2 (73·4; 81·0)	30·6 (28·5; 32·7)	34·3 (29·0; 39·6)	31·3 (29·9; 32·6)	27·0 (21·8; 32·1)
5. Companionship not allowed	62·0 (61·3; 62·7)	80·2 (76·2; 84·1)	50·9 (46·5; 55·3)	57·7 (54·6; 60·9)	78·5 (77·2; 79·7)	20·7 (16·6; 24·7)	58·2 (56·4; 59·9)	66·7 (64·2; 69·3)	94·6 (92·1; 97·1)	99·0 (98; 99·9)	60·3 (58·1; 62·6)	12·6 (8·9; 16·3)	51·9 (50·5; 53·4)	34·0 (28·5; 39·6)
6. Not treated with dignity	23·9 (23·3; 24·5)	38·9 (34·2; 43·7)	23·1 (19·4; 26·8)	22·7 (20; 25·3)	24·8 (23·4; 26·1)	12·8 (9·5; 16·2)	21·9 (20·4; 23·4)	31·5 (29·0; 34)	38·4 (33·0; 43·8)	59·8 (55·4; 64·2)	21·2 (19·3; 23·0)	18·8 (14·4; 23·1)	18·9 (17·7; 20·0)	20·2 (15·5; 24·9)
7. No emotional support	27·4 (26·7; 28)	47·7 (42·8; 52·6)	27·4 (23·4; 31·3)	28·2 (25·4; 31·1)	27·4 (26·0; 28·8)	18·6 (14·7; 22·5)	22·6 (21·1; 24·1)	38·7 (36; 41·3)	44·8 (39·3; 50·3)	58·4 (53·9; 62·8)	29·8 (27·7; 31·9)	24·6 (19·8; 29·4)	20·6 (19·4; 21·8)	25·2 (20·1; 30·2)
8. No privacy	18·2 (17·6; 18·7)	36·7 (31·9; 41·4)	14·1 (11·0; 17·1)	19·9 (17·4; 22·5)	16·2 (15; 17·3)	8·9 (6·0; 11·8)	12·0 (10·8; 13·1)	22·5 (20·2; 24·8)	32·7 (27·5; 37·9)	65·9 (61·6; 70·1)	17·2 (15·5; 19)	21·0 (16·5; 25·6)	16·0 (14·9; 17·1)	19·1 (14·6; 23·7)
9. Abuses (physical /verbal /emotional)	12·5 (12·0; 13·0)	21·4 (17·3; 25·4)	18·5 (15·1; 21·9)	12 (9·9; 14·1)	15·3 (14·2; 16·4)	8·9 (6·0; 11·8)	8·2 (7·2; 9·1)	22·7 (20·4; 24·9)	21·9 (17·3; 26·5)	23·4 (19·6; 27·2)	11·1 (9·7; 12·5)	21·4 (16·8; 25·9)	7·0 (6·2; 7·7)	10·6 (7·0; 14·2)
10. Informal payment	2·4 (2·2; 2·6)	1·3 (0·2; 2·4)	6·8 (4·6; 9·1)	3·8 (2·6; 5·0)	1·6 (1·2; 1·9)	8·6 (5·8; 11·5)	0·9 (0·6; 1·2)	0·8 (0·3; 1·3)	19·7 (15·3; 24·1)	26·2 (22·2; 30·1)	0·7 (0·3; 1·0)	0·3 (0·0; 1·0)	0·1 (0·0; 0·2)	7·8 (4·7; 10·9)

Women with prelabour caesarean section

	Overall n (%)	Croatia n (%)	France n (%)	Germany n (%)	Italy n (%)	Luxembourg n (%)	Norway n (%)	Portugal n (%)	Romania n (%)	Serbia n (%)	Slovenia n (%)	Spain n (%)	Sweden n (%)	Other countries n (%)
N	2964	60	47	132	840	59	231	387	256	152	254	38	445	63
1. Consent requested for vaginal examination	28·9 (27·2; 30·5)	66·7 (54·7; 78·6)	8·5 (0·5; 16·5)	17·4 (11·0; 23·9)	38·3 (35·0; 41·6)	16·9 (7·4; 26·5)	6·9 (3·7; 10·2)	22·2 (18·1; 26·4)	22·7 (17·5; 27·8)	69·7 (62·4; 77·0)	42·5 (36·4; 48·6)	36·8 (21·5; 52·2)	11·7 (8·7; 14·7)	27·0 (16; 37·9)
2. No information on newborn	28·7 (27·1; 30·4)	23·3 (12·6; 34·0)	53·2 (38·9; 67·5)	14·4 (8·4; 20·4)	24·4 (21·5; 27·3)	16·9 (7·4; 26·5)	22·9 (17·5; 28·4)	14·2 (10·7; 17·7)	44·5 (38·4; 50·6)	49·3 (41·4; 57·3)	42·9 (36·8; 49·0)	21·1 (8·1; 34·0)	33·9 (29·5; 38·3)	22·2 (12·0; 32·5)
3. No clear/effective communication from HCP	35·0 (33·3; 36·7)	45·0 (32·4; 57·6)	44·7 (30·5; 58·9)	22·7 (15·6; 29·9)	37·0 (33·8; 40·3)	10·2 (2·5; 17·9)	36·4 (30·2; 42·6)	28·7 (24·2; 33·2)	40·6 (34·6; 46·6)	48·0 (40·1; 56)	29·5 (23·9; 35·1)	26·3 (12·3; 40·3)	38·2 (33·7; 42·7)	25·4 (14·6; 36·1)
4. No involvement in choices	43·0 (41·2; 44·8)	48·3 (35·7; 61·0)	48·9 (34·6; 63·2)	27·3 (19·7; 34·9)	48·8 (45·4; 52·2)	16·9 (7·4; 26·5)	33·8 (27·7; 39·9)	37·0 (32·1; 41·8)	43·8 (37·7; 49·8)	74·3 (67·4; 81·3)	37·0 (31·1; 42·9)	36·8 (21·5; 52·2)	41·6 (37; 46·2)	42·9 (30·6; 55·1)
5. Companionship not allowed	71·5 (69·8; 73·1)	93·3 (87; 99·6)	59·6 (45·5; 73·6)	63·6 (55·4; 71·8)	85·5 (83·1; 87·9)	27·1 (15·8; 38·5)	63·2 (57·0; 69·4)	52·2 (47·2; 57·2)	91·0 (87·5; 94·5)	98·0 (95·8; 100)	82·7 (78; 87·3)	21·1 (8·1; 34)	53·3 (48·6; 57·9)	49·2 (36·9; 61·6)
6. Not treated with dignity	30·5 (28·8; 32·2)	36·7 (24·5; 48·9)	34·0 (20·5; 47·6)	22·7 (15·6; 29·9)	31·7 (28·5; 34·8)	15·3 (6·1; 24·4)	31·2 (25·2; 37·1)	26·4 (22·0; 30·7)	35·2 (29·3; 41)	55·9 (48·0; 63·8)	26 (20·6; 31·4)	26·3 (12·3; 40·3)	27·6 (23·5; 31·8)	20·6 (10·6; 30·6)
7. No emotional support	31·4 (29·8; 33·1)	30·0 (18·4; 41·6)	44·7 (30·5; 58·9)	28·0 (20·4; 35·7)	29·6 (26·6; 32·7)	16·9 (7·4; 26·5)	22·1 (16·7; 27·4)	30·0 (25·4; 34·5)	33·2 (27·4; 39)	52·0 (44·0; 59·9)	40·2 (34·1; 46·2)	42·1 (26·4; 57·8)	28·5 (24·3; 32·7)	33·3 (21·7; 45·0)
8. No privacy	20·5 (19·0; 21·9)	26·7 (15·5; 37·9)	12·8 (3·2; 22·3)	18·2 (11·6; 24·8)	16·9 (14·4; 19·4)	18·6 (8·7; 28·6)	15·2 (10·5; 19·8)	15·0 (11·4; 18·5)	19·9 (15; 24·8)	68·4 (61·0; 75·8)	21·7 (16·6; 26·7)	21·1 (8·1; 34)	19·1 (15·4; 22·8)	19·0 (9·4; 28·7)
9. Abuses (physical /verbal/emotional)	14·1 (12·8; 15·3)	16·7 (7·2; 26·1)	14·9 (4·7; 25·1)	15·2 (9·0; 21·3)	16·4 (13·9; 18·9)	8·5 (1·4; 15·6)	7·8 (4·3; 11·2)	16·8 (13·1; 20·5)	14·5 (10·1; 18·8)	18·4 (12·3; 24·6)	12·2 (8·2; 16·2)	15·8 (4·2; 27·4)	9·7 (6·9; 12·4)	14·3 (5·6; 22·9)
10. Informal payment	5·2 (4·4; 6·0)	5·0 (0·0; 10·5)	10·6 (1·8; 19·5)	5·3 (1·5; 9·1)	1·5 (0·7; 2·4)	8·5 (1·4; 15·6)	0·9 (0·0; 2·1)	0·5 (0·0; 1·2)	27·3 (21·9; 32·8)	25·0 (18·1; 31·9)	0·4 (0·0; 1·2)	0·0 (0·0; 0·0)	0·0 (0·0; 0·0)	12·7 (4·5; 20·9)

Notes

All the indicators in the domain of experience of care are directly based on WHO standards.

Indicators identified with letters (eg, 2a, 2b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 2a was calculated on spontaneous vaginal births; 2b was calculated on instrumental vaginal births).

Abbreviations: ECS = emergency caesarean section; HCP = health care provider; IVB= instrumental vaginal birth; SVB = spontaneous vaginal birth

Supplementary Table 8 Results on availability of physical and human resources

Women who underwent labour

	Overall % (95% CI)	Croatia % (95% CI)	France % (95% CI)	Germany % (95% CI)	Italy % (95% CI)	Luxembourg % (95% CI)	Norway % (95% CI)	Portugal % (95% CI)	Romania % (95% CI)	Serbia % (95% CI)	Slovenia % (95% CI)	Spain % (95% CI)	Sweden % (95% CI)	Other countries % (95% CI)
N	18063	398	497	949	3973	382	2989	1298	315	478	1838	309	4355	282
1. No timely care by HCPs at facility arrival	13·1 (12·6; 13·6)	11·1 (8; 14·1)	13·3 (10·3; 16·3)	15·9 (13·6; 18·2)	12·5 (11·5; 13·5)	10·2 (7·2; 13·2)	14·2 (12·9; 15·4)	13·4 (11·6; 15·3)	19·7 (15·3; 24·1)	32·2 (28·0; 36·4)	11·8 (10·3; 13·3)	11·7 (8·1; 15·2)	10·5 (9·6; 11·5)	13·1 (9·2; 17·1)
2. No information on maternal danger signs	45·3 (44·6; 46)	58·5 (53·7; 63·4)	44·5 (40·1; 48·8)	36·8 (33·7; 39·8)	44·8 (43·3; 46·4)	29·3 (24·8; 33·9)	43·3 (41·5; 45·1)	28·7 (26·3; 31·2)	47·6 (42·1; 53·1)	75·1 (71·2; 79·0)	42·2 (40·0; 44·5)	36·2 (30·9; 41·6)	53·1 (51·6; 54·6)	37·9 (32·3; 43·6)
3. No information on newborn danger signs	55 (54·2; 55·7)	55·8 (50·9; 60·7)	51·1 (46·7; 55·5)	47·5 (44·3; 50·7)	50·7 (49·1; 52·2)	41·9 (36·9; 46·8)	54·8 (53·1; 56·6)	45·2 (42·5; 47·9)	54·6 (49·1; 60·1)	75·9 (72·1; 79·8)	49·4 (47·1; 51·7)	58·6 (53·1; 64·1)	65·5 (64·1; 66·9)	44 (38·2; 49·8)
4. Inadequate room comfort and equipment	8·3 (7·9; 8·7)	12·8 (9·5; 16·1)	8·2 (5·8; 10·7)	3·1 (2·0; 4·2)	9·9 (9·0; 10·9)	0·0 (0·0; 0·0)	9·2 (8·2; 10·3)	4·5 (3·3; 5·6)	9·8 (6·6; 13·1)	27·8 (23·8; 31·8)	7·5 (6·3; 8·7)	7·8 (4·8; 10·8)	7·2 (6·4; 7·9)	6·4 (3·5; 9·2)
5. Inadequate number of women per rooms	8·7 (8·3; 9·2)	9·5 (6·7; 12·4)	2·8 (1·4; 4·3)	4·8 (3·5; 6·2)	9·1 (8·2; 10·0)	4·5 (2·4; 6·5)	9·5 (8·4; 10·5)	6·4 (5·1; 7·7)	7·9 (5·0; 10·9)	18·4 (14·9; 21·9)	7·5 (6·3; 8·7)	11 (7·5; 14·5)	9·9 (9·0; 10·8)	6·7 (3·8; 9·7)
6. Inadequate room cleaning	6·7 (6·3; 7)	12·1 (8·9; 15·3)	3·8 (2·1; 5·5)	4·7 (3·4; 6·1)	7·3 (6·5; 8·1)	1 (0; 2·1)	8·9 (7·9; 10·0)	3·5 (2·5; 4·5)	8·9 (5·7; 12)	24·1 (20·2; 27·9)	2·2 (1·6; 2·9)	2·6 (0·8; 4·4)	6·4 (5·6; 7·1)	5 (2·4; 7·5)
7.Inadequate bathroom	13·4 (12·9; 13·9)	24·4 (20·2; 28·6)	4 (2·3; 5·8)	7·3 (5·6; 8·9)	14·5 (13·4; 15·6)	1·8 (0·5; 3·2)	11·9 (10·7; 13·0)	14·9 (12·9; 16·8)	16·5 (12·4; 20·6)	48·7 (44·3; 53·2)	14·2 (12·6; 15·8)	12 (8·4; 15·6)	11·3 (10·4; 12·3)	9·2 (5·8; 12·6)
8. Inadequate partner visiting hours	61·6 (60·9; 62·3)	91 (88·1; 93·8)	46·3 (41·9; 50·7)	49·9 (46·8; 53·1)	65·8 (64·4; 67·3)	23·0 (18·8; 27·3)	60·2 (58·4; 61·9)	66·6 (64·0; 69·1)	83·5 (79·4; 87·6)	89·3 (86·6; 92·1)	80·4 (78·5; 82·2)	6·1 (3·5; 8·8)	55·5 (54·1; 57·0)	33·7 (28·2; 39·2)
9. Inadequate HCP's number	21 (20·4; 21·6)	36·4 (31·7; 41·2)	20·3 (16·8; 23·9)	13·4 (11·2; 15·5)	17·8 (16·7; 19·0)	7·3 (4·7; 9·9)	29·5 (27·9; 31·1)	13 (11·2; 14·9)	19·4 (15·0; 23·7)	40·8 (36·4; 45·2)	10·6 (9·2; 12·0)	9·7 (6·4; 13·0)	25·6 (24·3; 26·9)	15·6 (11·4; 19·8)
10. Inadequate HCP professionalism	5·5 (5·2; 5·9)	9·8 (6·9; 12·7)	6·6 (4·5; 8·8)	4·4 (3·1; 5·7)	5·4 (4·7; 6·1)	1·3 (0·2; 2·4)	4·4 (3·7; 5·2)	5·5 (4·2; 6·7)	9·5 (6·3; 12·8)	19·2 (15·7; 22·8)	4·4 (3·4; 5·3)	6·8 (4·0; 9·6)	5·2 (4·6; 5·9)	3·5 (1·4; 5·7)

Women with prelabour caesarean section

	Overall % (95% CI)	Croatia % (95% CI)	France % (95% CI)	Germany % (95% CI)	Italy % (95% CI)	Luxembourg % (95% CI)	Norway % (95% CI)	Portugal % (95% CI)	Romania % (95% CI)	Serbia % (95% CI)	Slovenia % (95% CI)	Spain % (95% CI)	Sweden % (95% CI)	Other countries % (95% CI)
N	2964	60	47	132	840	59	231	387	256	152	254	38	445	63
1. No information on maternal danger signs	45·5 (43·8; 47·3)	53·3 (40·7; 66)	51·1 (36·8; 65·4)	34·1 (26·0; 42·2)	48·3 (45·0; 51·7)	28·8 (17·3; 40·4)	39·4 (33·1; 45·7)	28·4 (23·9; 32·9)	44·5 (38·4; 50·6)	69·1 (61·7; 76·4)	44·9 (38·8; 51·0)	36·8 (21·5; 52·2)	56·6 (52·0; 61·2)	41·3 (29·1; 53·4)
2. No information on newborn danger signs	52·4 (50·6; 54·2)	63·3 (51·1; 75·5)	57·4 (43·3; 71·6)	48·5 (40·0; 57·0)	51·8 (48·4; 55·2)	37·3 (24·9; 49·6)	49·4 (42·9; 55·8)	39·8 (34·9; 44·7)	47·7 (41·5; 53·8)	69·7 (62·4; 77·0)	51·6 (45·4; 57·7)	47·4 (31·5; 63·2)	66·7 (62·4; 71·1)	39·7 (27·6; 51·8)
3. Inadequate room comfort and equipment	10·8 (9·7; 11·9)	26·7 (15·5; 37·9)	8·5 (0·5; 16·5)	6·1 (2; 10·1)	12·5 (10·3; 14·7)	0 (0·0; 0·0)	8·7 (5·0; 12·3)	5·2 (3; 7·4)	10·2 (6·5; 13·9)	25·7 (18·7; 32·6)	5·9 (3·0; 8·8)	7·9 (; 0·7; 16·5)	13·7 (10·5; 16·9)	4·8 (0·0; 10)
4. Inadequate number of women per rooms	7 (6·0; 7·9)	15 (6·0; 24)	0 (0·0; 0·0)	3·8 (0·5; 7·0)	6·2 (4·6; 7·8)	5·1 (0·0; 10·7)	12·1 (7·9; 16·3)	5·9 (3·6; 8·3)	9 (5·5; 12·5)	12·5 (7·2; 17·8)	5·1 (2·4; 7·8)	13·2 (2·4; 23·9)	4·9 (2·9; 7·0)	6·3 (0·3; 12·4)
5. Inadequate room cleaning	8·3 (7·3; 9·3)	16·7 (7·2; 26·1)	2·1 (0·0; 6·3)	7·6 (3·1; 12·1)	7 (5·3; 8·8)	1·7 (0·0; 5·0)	10 (6·1; 13·8)	4·4 (2·4; 6·4)	11·3 (7·4; 15·2)	27·6 (20·5; 34·7)	3·1 (1·0; 5·3)	5·3 (; 1·8; 12·4)	8·8 (6·1; 11·4)	6·3 (0·3; 12·4)
6.Inadequate bathroom	14·4 (13·1; 15·7)	35 (22·9; 47·1)	2·1 (0·0; 6·3)	5·3 (1·5; 9·1)	14·5 (12·1; 16·9)	0 (0·0; 0·0)	14·7 (10·1; 19·3)	12·1 (8·9; 15·4)	19·5 (14·7; 24·4)	37·5 (29·8; 45·2)	9·4 (5·9; 13)	15·8 (4·2; 27·4)	11·5 (8·5; 14·4)	11·1 (3·4; 18·9)
7. Inadequate partner visiting hours	66·4 (64·7; 68·1)	88·3 (80·2; 96·5)	61·7 (47·8; 75·6)	50 (41·5; 58·5)	70·5 (67·4; 73·6)	22 (11·5; 32·6)	61·5 (55·2; 67·7)	55·8 (50·9; 60·8)	81·6 (76·9; 86·4)	92·1 (87·8; 96·4)	84·3 (79·8; 88·7)	13·2 (2·4; 23·9)	58·7 (54·1; 63·2)	46 (33·7; 58·3)
8. Inadequate HCP's number	21·3 (19·8; 22·8)	40 (27·6; 52·4)	21·3 (9·6; 33·0)	18·2 (11·6; 24·8)	20·6 (17·9; 23·3)	10·2 (2·5; 17·9)	29·9 (24·0; 35·8)	12·4 (9·1; 15·7)	18·8 (14·0; 23·5)	39·5 (31·7; 47·2)	11 (7·2; 14·9)	18·4 (6·1; 30·7)	27·4 (23·3; 31·6)	19 (9·4; 28·7)
9. Inadequate HCP professionalism	6·4 (5·6; 7·3)	8·3 (1·3; 15·3)	4·3 (0·0; 10)	4·5 (1·0; 8·1)	6·2 (4·6; 7·8)	1·7 (0·0; 5·0)	6·5 (3·3; 9·7)	4·1 (2·2; 6·1)	12·5 (8·4; 16·6)	12·5 (7·2; 17·8)	4·3 (1·8; 6·8)	5·3 (; 1·8; 12·4)	6·1 (3·8; 8·3)	4·8 (;0·0; 10)
10. Inadequate wards reorganization	40·9 (39·1; 42·6)	63·3 (51·1; 75·5)	29·8 (16·7; 42·9)	33·3 (25·3; 41·4)	45·7 (42·3; 49·1)	16·9 (7·4; 26·5)	36·8 (30·6; 43)	31·3 (26·6; 35·9)	35·5 (29·7; 41·4)	69·1 (61·7; 76·4)	27·6 (22·1; 33·1)	34·2 (19·1; 49·3)	47·9 (43·2; 52·5)	36·5 (24·6; 48·4)

Notes

All the indicators in the domain of resources are directly based on WHO standards

Abbreviations: HCP = health care provider

Supplementary Table 9 Results on reorganizational changes due to COVID-19

Women who underwent labour

	Overall % (95% CI)	Croatia % (95% CI)	France % (95% CI)	Germany % (95% CI)	Italy % (95% CI)	Luxembourg % (95% CI)	Norway % (95% CI)	Portugal % (95% CI)	Romania % (95% CI)	Serbia % (95% CI)	Slovenia % (95% CI)	Spain % (95% CI)	Sweden % (95% CI)	Other countries % (95% CI)
N	18063	398	497	949	3973	382	2989	1298	315	478	1838	309	4355	282
1. Difficulties in attending routine antenatal visits	41·8 (41·1; 42·6)	43·2 (38·3; 48·1)	42·9 (38·5; 47·2)	26·1 (23·3; 28·9)	44·7 (43·1; 46·2)	36·6 (31·8; 41·5)	46·1 (44·3; 47·9)	49·2 (46·5; 51·9)	63·5 (58·2; 68·8)	63·0 (58·6; 67·3)	45·8 (43·5; 48)	62·8 (57·4; 68·2)	30·8 (29·5; 32·2)	40·1 (34·4; 45·8)
2. Any barriers in accessing the facility	31·4 (30·7; 32·1)	37·7 (32·9; 42·4)	24·1 (20·4; 27·9)	31·3 (28·3; 34·2)	31·9 (30·4; 33·3)	29·8 (25·3; 34·4)	33·7 (32; 35·4)	32·6 (30; 35·1)	42·2 (36·8; 47·7)	50·0 (45·5; 54·5)	29·4 (27·4; 31·5)	31·1 (25·9; 36·2)	27·5 (26·2; 28·8)	30·1 (24·8; 35·5)
3. Inadequate info graphics	5·5 (5·2; 5·9)	9·8 (6·9; 12·7)	6·6 (4·5; 8·8)	4·4 (3·1; 5·7)	5·4 (4·7; 6·1)	1·3 (0·2; 2·4)	4·4 (3·7; 5·2)	5·5 (4·2; 6·7)	9·5 (6·3; 12·8)	19·2 (15·7; 22·8)	4·4 (3·4; 5·3)	6·8 (4·0; 9·6)	5·2 (4·6; 5·9)	3·5 (1·4; 5·7)
4. Inadequate wards reorganization	37·1 (36·4; 37·9)	58·3 (53·4; 63·1)	28·2 (24·2; 32·1)	30·2 (27·3; 33·2)	41·0 (39·5; 42·6)	16·5 (12·8; 20·2)	31·9 (30·2; 33·6)	37·4 (34·8; 40·1)	39·4 (34; 44·8)	70·5 (66·4; 74·6)	28·3 (26·3; 30·4)	35·6 (30·3; 40·9)	40 (38·6; 41·5)	29·4 (24·1; 34·8)
5. Inadequate room reorganization	37·9 (37·2; 38·6)	60·6 (55·8; 65·4)	17·1 (13·8; 20·4)	41·5 (38·4; 44·7)	47 (45·4; 48·5)	20·4 (16·4; 24·5)	27·8 (26·2; 29·4)	39·6 (36·9; 42·3)	38·7 (33·4; 44·1)	72·4 (68·4; 76·4)	42·7 (40·4; 45·0)	27·5 (22·5; 32·5)	32·6 (31·2; 34·0)	29·1 (23·8; 34·4)
6. Lacking one functioning accessible hand-washing station	13·6 (13·1; 14·1)	20·6 (16·6; 24·6)	10·5 (7·8; 13·2)	7·3 (5·6; 8·9)	34·7 (33·2; 36·2)	4·7 (2·6; 6·8)	5·8 (4·9; 6·6)	9·6 (8·0; 11·2)	17·5 (13·3; 21·7)	35·6 (31·3; 39·9)	3·4 (2·6; 4·3)	11·7 (8·1; 15·2)	4·6 (4·0; 5·3)	11·3 (7·6; 15)
7. HCP not always using PPEs	34·4 (33·7; 35·1)	42·2 (37·4; 47·1)	8·5 (6·0; 10·9)	21·1 (18·5; 23·7)	9·5 (8·6; 10·4)	5·2 (3·0; 7·5)	60·6 (58·8; 62·3)	11·3 (9·6; 13)	13·3 (9·6; 17·1)	34·5 (30·3; 38·8)	17·6 (15·8; 19·3)	12·0 (8·4; 15·6)	64·8 (63·3; 66·2)	23·4 (18·5; 28·3)
8. Insufficient HCP number	31·8 (31·1; 32·5)	50·5 (45·6; 55·4)	28·4 (24·4; 32·3)	24·9 (22·1; 27·6)	29·9 (28·5; 31·3)	20·7 (16·6; 24·7)	34·6 (32·9; 36·3)	27·5 (25·1; 29·9)	30·2 (25·1; 35·2)	53·1 (48·7; 57·6)	21·3 (19·5; 23·2)	17·8 (13·5; 22·1)	37·7 (36·3; 39·2)	22·3 (17·5; 27·2)
9. Communication inadequate to contain COVID-19 related stress	38·1 (37·4; 38·8)	59·5 (54·7; 64·4)	43·7 (39·3; 48)	32·6 (29·6; 35·5)	38·7 (37·2; 40·2)	24·9 (20·5; 29·2)	34·8 (33·1; 36·5)	37·2 (34·6; 39·8)	47·3 (41·8; 52·8)	55·9 (51·4; 60·3)	33·7 (31·5; 35·8)	29·8 (24·7; 34·9)	40·4 (39; 41·9)	28·7 (23·4; 34)
10. Reduction in QMNC due to COVID-19	49·9 (49·1; 50·6)	45·7 (40·8; 50·6)	37·2 (33·0; 41·5)	45·8 (42·7; 49·0)	44 (42·4; 45·5)	38·5 (33·6; 43·4)	66 (64·3; 67·7)	47·3 (44·6; 50·0)	58·1 (52·6; 63·5)	60·7 (56·3; 65·0)	48·2 (45·9; 50·4)	51·8 (46·2; 57·4)	48·3 (46·9; 49·8)	35·8 (30·2; 41·4)

Women with prelabour caesarean section

	Overall % (95% CI)	Croatia % (95% CI)	France % (95% CI)	Germany % (95% CI)	Italy % (95% CI)	Luxembourg % (95% CI)	Norway % (95% CI)	Portugal % (95% CI)	Romania % (95% CI)	Serbia % (95% CI)	Slovenia % (95% CI)	Spain % (95% CI)	Sweden % (95% CI)	Other countries % (95% CI)
N	2964	60	47	132	840	59	231	387	256	152	254	38	445	63
1. Difficulties in attending routine antenatal visits	43·7 (41·9; 45·5)	41·7 (29·2; 54·1)	42·6 (28·4; 56·7)	33·3 (25·3; 41·4)	44·2 (40·8; 47·5)	33·9 (21·8; 46·0)	45·5 (39·0; 51·9)	43·4 (38·5; 48·3)	51·6 (45·4; 57·7)	64·5 (56·9; 72·1)	41·3 (35·3; 47·4)	47·4 (31·5; 63·2)	36·2 (31·7; 40·6)	44·4 (32·2; 56·7)
2. Any barriers in accessing the facility	35·1 (33·3; 36·8)	33·3 (21·4; 45·3)	25·5 (13·1; 38·0)	43·2 (34·7; 51·6)	30·2 (27·1; 33·3)	33·9 (21·8; 46·0)	39 (32·7; 45·2)	32·8 (28·1; 37·5)	38·3 (32·3; 44·2)	53·3 (45·4; 61·2)	33·5 (27·7; 39·3)	26·3 (12·3; 40·3)	36·2 (31·7; 40·6)	38·1 (26·1; 50·1)
3. Inadequate info graphics	6·4 (5·6; 7·3)	8·3 (1·3; 15·3)	4·3 (0·0; 10)	4·5 (1·0; 8·1)	6·2 (4·6; 7·8)	1·7 (0·0; 5·0)	6·5 (3·3; 9·7)	4·1 (2·2; 6·1)	12·5 (8·4; 16·6)	12·5 (7·2; 17·8)	4·3 (1·8; 6·8)	5·3 (0·0; 12·4)	6·1 (3·8; 8·3)	4·8 (0·0; 10·0)
4. Inadequate wards reorganization	40·9 (39·1; 42·6)	63·3 (51·1; 75·5)	29·8 (16·7; 42·9)	33·3 (25·3; 41·4)	45·7 (42·3; 49·1)	16·9 (7·4; 26·5)	36·8 (30·6; 43)	31·3 (26·6; 35·9)	35·5 (29·7; 41·4)	69·1 (61·7; 76·4)	27·6 (22·1; 33·1)	34·2 (19·1; 49·3)	47·9 (43·2; 52·5)	36·5 (24·6; 48·4)
5. Inadequate room reorganization	39·8 (38·0; 41·6)	65·0 (52·9; 77·1)	19·1 (7·9; 30·4)	40·9 (32·5; 49·3)	49·2 (45·8; 52·5)	13·6 (4·8; 22·3)	30·3 (24·4; 36·2)	28·7 (24·2; 33·2)	37·5 (31·6; 43·4)	65·1 (57·6; 72·7)	42·5 (36·4; 48·6)	28·9 (14·5; 43·4)	31·5 (27·1; 35·8)	34·9 (23·1; 46·7)
6. Lacking one functioning accessible hand-washing station	19·1 (17·6; 20·5)	18·3 (8·5; 28·1)	6·4 (0·0; 13·4)	5·3 (1·5; 9·1)	39·8 (36·5; 43·1)	5·1 (0·0; 10·7)	6·1 (3·0; 9·1)	10·1 (7·1; 13·1)	17·2 (12·6; 21·8)	38·2 (30·4; 45·9)	4·7 (2·1; 7·3)	15·8 (4·2; 27·4)	5·4 (3·3; 7·5)	15·9 (6·8; 24·9)
7. HCP not always using PPEs	28·2 (26·6; 29·8)	36·7 (24·5; 48·9)	8·5 (0·5; 16·5)	36·4 (28·2; 44·6)	12·4 (10·2; 14·6)	1·7 (0·0; 5·0)	63·2 (57; 69·4)	10·9 (7·8; 14·0)	16·8 (12·2; 21·4)	32·9 (25·4; 40·4)	18·5 (13·7; 23·3)	10·5 (0·8; 20·3)	69·9 (65·6; 74·1)	20·6 (10·6; 30·6)
8. Insufficient HCP number	34·4 (32·7; 36·1)	45·0 (32·4; 57·6)	25·5 (13·1; 38)	34·1 (26; 42·2)	34·0 (30·8; 37·3)	16·9 (7·4; 26·5)	39·8 (33·5; 46·1)	28·4 (23·9; 32·9)	32·0 (26·3; 37·7)	43·4 (35·5; 51·3)	28·0 (22·4; 33·5)	13·2 (2·4; 23·9)	43·1 (38·5; 47·7)	33·3 (21·7; 45·0)
9. Communication inadequate to contain COVID-19 related stress	42·6 (40·8; 44·4)	58·3 (45·9; 70·8)	44·7 (30·5; 58·9)	39·4 (31·1; 47·7)	44·5 (41·2; 47·9)	25·4 (14·3; 36·5)	42·4 (36·1; 48·8)	32·8 (28·1; 37·5)	37·9 (31·9; 43·8)	55·9 (48; 63·8)	37·8 (31·8; 43·8)	23·7 (10·2; 37·2)	50·8 (46·1; 55·4)	44·4 (32·2; 56·7)
10. Reduction in QMNC due to COVID-19	50·2 (48·4; 52·0)	45 (32·4; 57·6)	44·7 (30·5; 58·9)	43·9 (35·5; 52·4)	47·4 (44; 50·8)	42·4 (29·8; 55·0)	68·4 (62·4; 74·4)	45·5 (40·5; 50·4)	50·0 (43·9; 56·1)	57·2 (49·4; 65·1)	50·4 (44·2; 56·5)	52·6 (36·8; 68·5)	53·5 (48·8; 58·1)	38·1 (26·1; 50·1)

Notes

Indicator 6 was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalised) supplied with water and soap or with disinfectant alcohol solution.

Abbreviations: HCP = health care provider; PPE = personal protective equipment; QMNC = quality of maternal and newborn care.

Supplementary Table 10 Comparison of the 40 key quality measures between women who underwent labour (N=18063) and women who did not (N=2964)

Provision of care	OR (95% CI)	p value	Experience of care	OR (95% CI)	p value	Availability of physical and human resources	OR (95% CI)	p value	Reorganizational changes due to COVID-19	OR (95% CI)	p value
1. No pain relief during labour	NA	NA	1. No freedom of movements during labour	NA	NA	1. No timely care by HCPs at facility arrival	1·03 (0·90; 1·18)	0·648	1. Difficulties in attending routine antenatal visits	0·98 (0·90; 10·7)	0·728
2. Mode of birth			2a. No choice of birth position (in SVB)	NA	NA	2. No information on maternal danger signs	1·01 (0·92; 1·11)	0·753	2. Any barriers in accessing the facility	1·08 (0·98; 1·19)	0·119
2a. IVB	NA	NA									
2b. ECS during labour	NA	NA	2b. No consent requested (for IVB)	NA	NA	3. No information on newborn danger signs	0·97 (0·88; 1·07)	0·554	3. Inadequate info graphics	1·02 (0·92; 1·12)	0·711
3a. Episiotomy (in SVB)	NA	NA	2c. No information on newborn (in ECS)	0·61 (0·53; 0·70)	**<0·001**	4. Inadequate room comfort and equipment	1·14 (0·98; 1·33)	0·088	4. Inadequate wards reorganization	1·07 (0·98; 1·18)	0·120
3b. Fundal pressure (in IVB)	NA	NA	3. No clear/effective communication from HCP	1·06 (0·96; 1·17)	0·270	5. Inadequate number of women per rooms	0·81 (0·67; 0·96)	**0·015**	5. Inadequate room reorganization	0·95 (0·86; 1·04)	0·253
3c. No pain relief after CS	0·91 (0·76; 1·10)	0·339	4. No involvement in choices	1·07 (0·98; 1·18)	0·141	6. Inadequate room cleaning	1·15 (0·97; 1·37)	0·114	6. Lacking one functioning accessible hand; washing station	1·01 (0·89; 1·15)	0·903
4. No skin to skin	3·39 (3·02; 3·81)	**<0·001**	5. Companionship not allowed	1·25 (1·13; 1·39)	**<0·001**	7.Inadequate bathroom	0·89 (0·78; 1·01)	0·080	7. HCP not always using PPEs	1·17 (1·04; 1·31)	**0·008**
5. No early breastfeeding	2·95 (2·63; 3·30)	**<0·001**	6. Not treated with dignity	1·11 (1·00; 1·23)	**0·044**	8. Inadequate partner visiting hours	1·11 (1·01; 1·23)	**0·035**	8. Insufficient HCP number	1·27 (1·02; 1·24)	**0·015**
6. Inadequate breastfeeding support	1·13 (1·02; 1·24)	**0·016**	7. No emotional support	0·88 (0·80; 0·98)	**0·017**	9. Inadequate HCP's number	1·05 (0·94; 1·18)	0·402	9. Communication inadequate to contain COVID; 19 related stress	1·12 (1·02; 1·23)	**0·014**
7. No rooming-in	1·68 (1·50; 1·89)	**<0·001**	8. No privacy	0·84 (0·75; 0·95)	**0·005**	10. Inadequate HCP professionalism	0·88 (0·73; 1·07)	0·211	10. Reduction in QMNC due to COVID; 19	1·01 (0·94; 1·09)	0·748
8. Not allowed to stay with the baby as wished	1·35 (1·15; 1·58)	**<0·001**									
9. No	1·76	**<0·001**	9. Abuses	0·86	**0·031**						

exclusive breastfeeding at discharge	(1·60; 1·94)		(physical /verbal /emotional)	(0·76; 0·98)	
10. No immediate attention when needed	1·11 (1·01; 1·22)	**0·034**	10. Informal payment	1·23 (0·91; 1·58)	0·091

Notes

OR are calculated taking women who underwent labour as reference and adjusting for all socio-demographic variables, type of professionals assisting the woman, newborn admission in neonatal intensive or semi-intensive care unit, mother admission in intensive care unit and multiple birth.

All the indicators in the domains of provision of care, experience of care, and resources are directly based on WHO standards.

Indicators identified with letters (eg, 3a, 3b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births).

Indicator 6 in the domains of reorganizational changes due to COVID-19 was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalised) supplied with water and soap or with disinfectant alcohol solution.

Abbreviations: CS = caesarean section; ECS = emergency caesarean section; HCP = health care provider; IVB = instrumental vaginal birth; PPE = personal protective equipment; QMNC = quality maternal and newborn care; SVB = spontaneous vaginal birth

Supplementary Table 11 QMNC Index by country

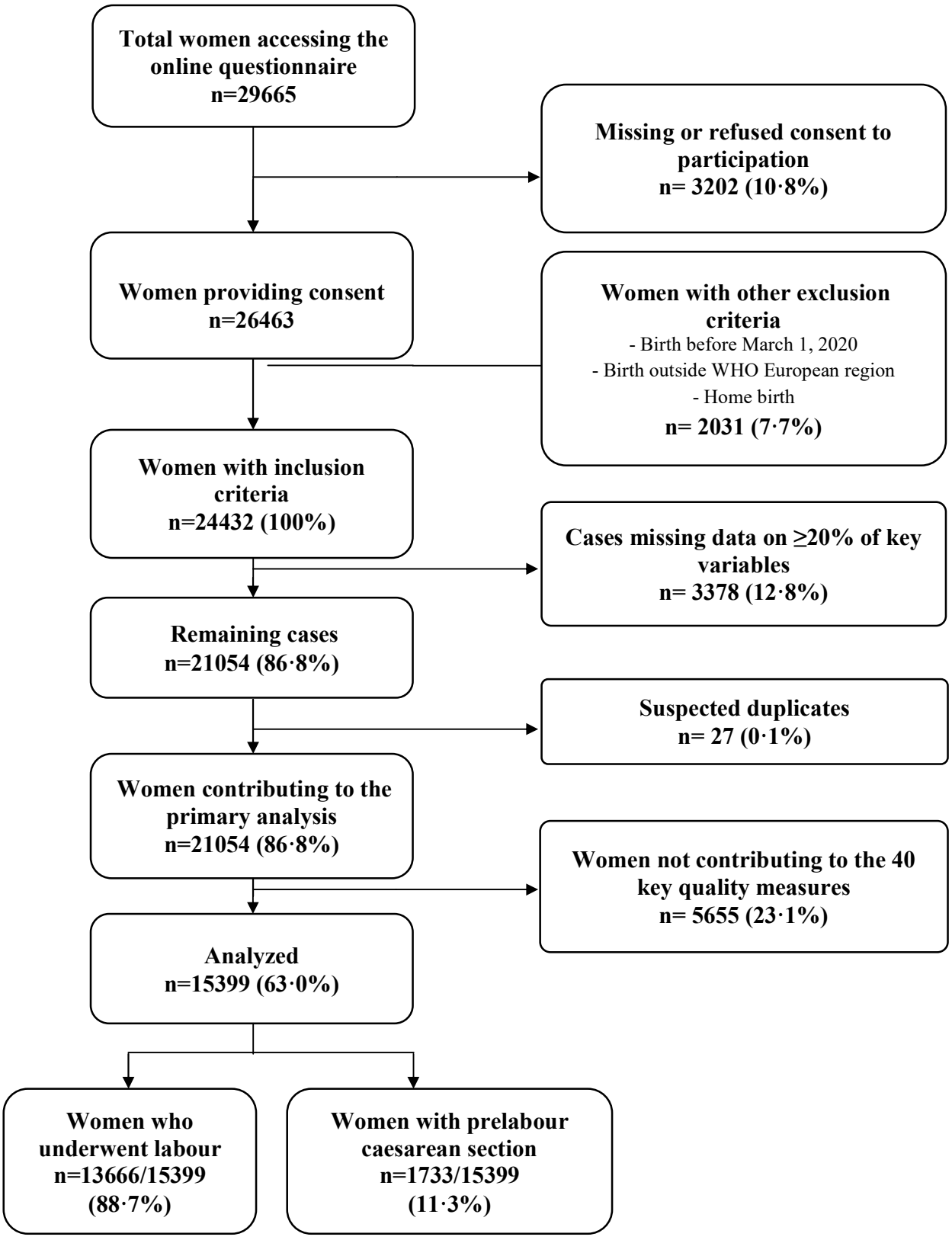
Country	n	QMNC Index Median (IQR; min-max)	p value*
Luxembourg	351	355 (335-375; 155-400)	**<0·001**
Spain	286	345 (305-370; 135-400)	**<0·001**
Germany	798	335 (295-360; 95-400)	**<0·001**
France	405	330 (290-360; 130-400)	**0·001**
Norway	1588	330 (285-360; 90-400)	**<0·001**
Sweden	3779	325 (285-355; 55-400	**0·003**
Portugal	1271	320 (275-355; 90-400)	0·181
Slovenia	1711	320 (280-350; 45-400)	0·240
Italy	3730	315 (260-350; 55-400)	**<0·001**
Romania	406	275 (220-315; 65-385)	**<0·001**
Croatia	346	270 (230-305; 105-380)	**<0·001**
Serbia	468	205 (160-262.5; 50-375)	**<0·001**
Total sample	**15139**	**320 (270-355; 45-400)**	

Notes: *Comparison between total median and country median;
Abbreviation: IQR = interquartile range; QMNC = quality maternal and newborn care

Supplementary Figure 2 QMNC Index by country

Note: the figure shows by country the median QMNC index values in each of the four domains (in the coloured bars), and the overall median value (in grey on the right of each bar) and interquartile ranges (error bars in grey) (N=21027).
Abbreviation: QMNC = quality maternal and newborn care

Supplementary Figure 3 Sensitivity analysis #1: flow diagram (N=15399)



Supplementary Table 12 Sensitivity analysis #1: characteristics of responders (N=15399)

	N=15399 n	%
Country		
Sweden	3779	24·5
Italy	3730	24·2
Slovenia	1711	11·1
Norway	1586	10·3
Portugal	1271	8·3
Germany	798	5·2
Serbia	468	3
France	405	2·6
Romania	406	2·6
Luxembourg	351	2·3
Croatia	346	2·2
Spain	286	1·9
Other[1]	262	1·7
Year of birth		
2020	14054	91·3
2021	908	5·9
Missing	437	2·8
Gave birth in the same country where you were born		
Yes	13948	90·6
No	1127	7·3
Missing	324	2·1
Age range		
18-24	687	4·5
25-30	5360	34·8
31-35	6074	39·4
36-39	2263	14·7
≥40	692	4·5
Missing	323	2·1
Educational level [2]		
None	6	0·1
Elementary school	29	0·2
Junior high school	841	5·5
High secondary	3782	24·6
University degree	6331	41·1
Postgraduate degree / Master /Doctorate or higher	4087	26·5
Missing	323	2·1
Parity		
1	9040	58·7

>1	6036	39·2
Missing	323	2·1
Mode of birth		
Vaginal spontaneous	11246	73·0
Instrumental vaginal birth	1323	8·6
Caesarean section	2830	18·3
Elective caesarean section	1157	7·5
Emergency caesarean section during labour	1097	7·1
Emergency caesarean section before going into labour	576	3·7
Type of facility		
Public	14025	91·1
Private	1050	6·8
Missing	324	2·1
Type of healthcare providers who directly assisted the birth [3]		
Midwife	13459	87·4
Nurse	5624	36·5
A student (i.e., before graduation)	2463	16·0
Obstetrics registrar / medical resident (under post-graduation training)	2421	15·7
Obstetrics and gynaecology doctor	7606	49·4
I don't know (healthcare providers did not introduce themselves)	1221	7·9
Other	1999	13·0

Notes: [1] Other countries (sample): Belgium (101); Austria (29); UK (25); Bosnia Herzegovina (19); Finland (19) Switzerland (19); Denmark; Greece; Ireland; Netherlands; Ukraine; Andorra; Montenegro; Russian Federation; Lithuania; Iceland; Poland; Turkey; Hungary; Albania; Cyprus; Latvia; Macedonia; Czech Republic (for each country less than 10 cases); [2] Wording on education levels agreed among partners during the Delphi and questionnaire translated and back translated according to ISPOR Task Force for Translation and Cultural Adaptation Principles of Good Practice[25]; [3] More than one possible answer.

Supplementary Table 13 Sensitivity analysis #1: results of the 40 key quality measures between women who underwent labour (N=1366) and women who did not (N=1733)

Women who underwent labour (N=1366)

Provision of care	Overall % (95% CI)	Experience of care	Overall % (95% CI)	Availability of physical and human resources	Overall % (95% CI)	Reorganizational changes due to COVID-19	Overall % (95% CI)
1. No pain relief during labour	23·7 (23·0; 24·4)	1. No freedom of movements during labour	28·8 (28·1; 29·6)	1. No timely care by HCPs at facility arrival	12·1 (11·5; 12·6)	1. Difficulties in attending routine antenatal visits	41·1 (40·2; 41·9)
2. Mode of birth 2a. IVB	9·7 (9·2; 10·2)	2a. No choice of birth position (in SVB)	42·1 (41·2; 43·1)	2. No information on maternal danger signs	44·7 (43·9; 45·6)	2. Any barriers in accessing the facility	31·1 (30·3; 31·9)
2b. CS	8·0 (7·6; 8·5)	2b. No consent requested (for IVB)	54·0 (51·4; 56·7)	3. No information on newborn danger signs	54·9 (54·1; 55·7)	3. Inadequate info graphics	5·1 (4·7; 5·5)
3a. Episiotomy (in SVB)	19·5 (18·8; 20·3)	2c. No information on newborn (in ECS)	33·8 (31·0; 36·6)	4. Inadequate room comfort and equipment	7·8 (7·4; 8·3)	4. Inadequate wards reorganization	36·8 (36·0; 37·6)
3b. Fundal pressure (in IVB)	42·9 (40·3; 45·6)	3. No clear/effective communication from HCP	28·9 (28·2; 29·7)	5. Inadequate number of women per rooms	8·6 (8·1; 9·1)	5. Inadequate room reorganization	37·8 (37·0; 38·7)
3c. No pain relief after CS	14·9 (12·8; 17·1)	4. No involvement in choices	33·4 (32·6; 34·2)	6. Inadequate room cleaning	6·1 (5·7; 6·5)	6. Lacking one functioning accessible hand-washing station	13·6 (13·0; 14·2)
4. No skin to skin	9·1 (8·6; 9·5)	5. Companionship not allowed	61·2 (60·4; 62)	7.Inadequate bathroom	12·8 (12·3; 13·4)	7. HCP not always using PPEs	32·6 (31·8; 33·4)
5. No early breastfeeding	13·6 (13·0; 14·2)	6. Not treated with dignity	22·1 (21·4; 22·8)	8. Inadequate partner visiting hours	61·2 (60·3; 62)	8. Insufficient HCP number	30·9 (30·1; 31·6)
6. Inadequate breastfeeding support	30·4 (29·7; 31·2)	7. No emotional support	25·9 (25·2; 26·6)	9. Inadequate HCP's number	19·9 (19·3; 20·6)	9. Communication inadequate to contain COVID-19 related stress	37·0 (36·2; 37·9)
7. No rooming-in	14·2 (13·7; 14·8)	8. No privacy	17·5 (16·9; 18·2)	10. Inadequate HCP professionalism	5·1 (4·7; 5·5)	10. Reduction in QMNC due to COVID-19	48·1 (47·2; 48·9)
8. Not allowed to stay with the baby as wished	5·0 (4·7; 5·4)	9. Abuses (physical /verbal /emotional)	11·7 (11·2; 12·3)				
9. No exclusive breastfeeding at discharge	24·8 (24·1; 25·5)	10. Informal payment	2·3 (2·1; 2·6)				
10. No immediate attention when needed	30·4 (29·6; 31·1)						

Women with prelabour caesarean section (N=1733)

Provision of care	Overall % (95% CI)	Experience of care	Overall % (95% CI)	Availability of physical and human resources	Overall % (95% CI)	Reorganizational changes due to COVID-19	Overall % (95% CI)
1. Mode of birth 1a. Elective CS	66·8 (64·5; 69·0)	1. Consent requested for vaginal examination	38·5 (36·2; 40·8)	1. No information on maternal danger signs	45·8 (43·5; 48·2)	1. Difficulties in attending routine antenatal visits	44·6 (42·3; 46·9)
1b. ECS before labour	33·2 (31·0; 35·5)	2. No information on newborn	26·7 (24·6; 28·8)	2. No information on newborn danger signs	53·6 (51·3; 56)	2. Any barriers in accessing the facility	34·3 (32; 36·5)
2. No pain relief after CS	12·6 (11·0; 14·1)	3. No clear/effective communication from HCP	35·2 (33·0; 37·4)	3. Inadequate room comfort and equipment	10·7 (9·2; 12·1)	3. Inadequate info graphics	7·3 (6·0; 8·5)
3. No skin to skin	44·9 (42·6; 47·2)	4. No involvement in choices	42·9 (40·6; 45·3)	4. Inadequate number of women per rooms	6·7 (5·5; 7·9)	4. Inadequate wards reorganization	39·9 (37·6; 42·2)
4. No early breastfeeding	47·5 (45·2; 49·9)	5. Companionship not allowed	74·9 (72·9; 76·9)	5. Inadequate room cleaning	8·7 (7·3; 10·0)	5. Inadequate room reorganization	40·6 (38·3; 42·9)
5. Inadequate breastfeeding support	37·9 (35·6; 40·1)	6. Not treated with dignity	31·3 (29·1; 33·5)	6.Inadequate bathroom	14·1 (12·4; 15·7)	6. Lacking one functioning accessible hand-washing station	21·5 (19·5; 23·4)
6. No rooming-in	30·6 (28·5; 32·8)	7. No emotional support	32·1 (29·9; 34·3)	7. Inadequate partner visiting hours	68·5 (66·3; 70·7)	7. HCP not always using PPEs	23·5 (21·5; 25·5)
7. Not allowed to stay with the baby as wished	11·0 (9·5; 12·4)	8. No privacy	20·8 (18·9; 22·7)	8. Inadequate HCP's number	21·5 (19·5; 23·4)	8. Insufficient HCP number	33·9 (31·7; 36·2)
8. No exclusive breastfeeding at discharge	45·4 (43·0; 47·7)	9. Abuses (physical /verbal/emotional)	14·6 (12·9; 16·3)	9. Inadequate HCP professionalism	7·3 (6·0; 8·5)	9. Communication inadequate to contain COVID-19 related stress	42 (39·6; 44·3)
9. No immediate attention when needed	34·9 (32·7; 37·2)	10. Informal payment	6·7 (5·5; 7·9)	10. Inadequate wards reorganization	39·9 (37·6; 42·2)	10. Reduction in QMNC due to COVID-19	49·9 (47·5; 52·2)
10. No timely care by HCP at facility arrival	15·8 (14·1; 17·5)						

Notes

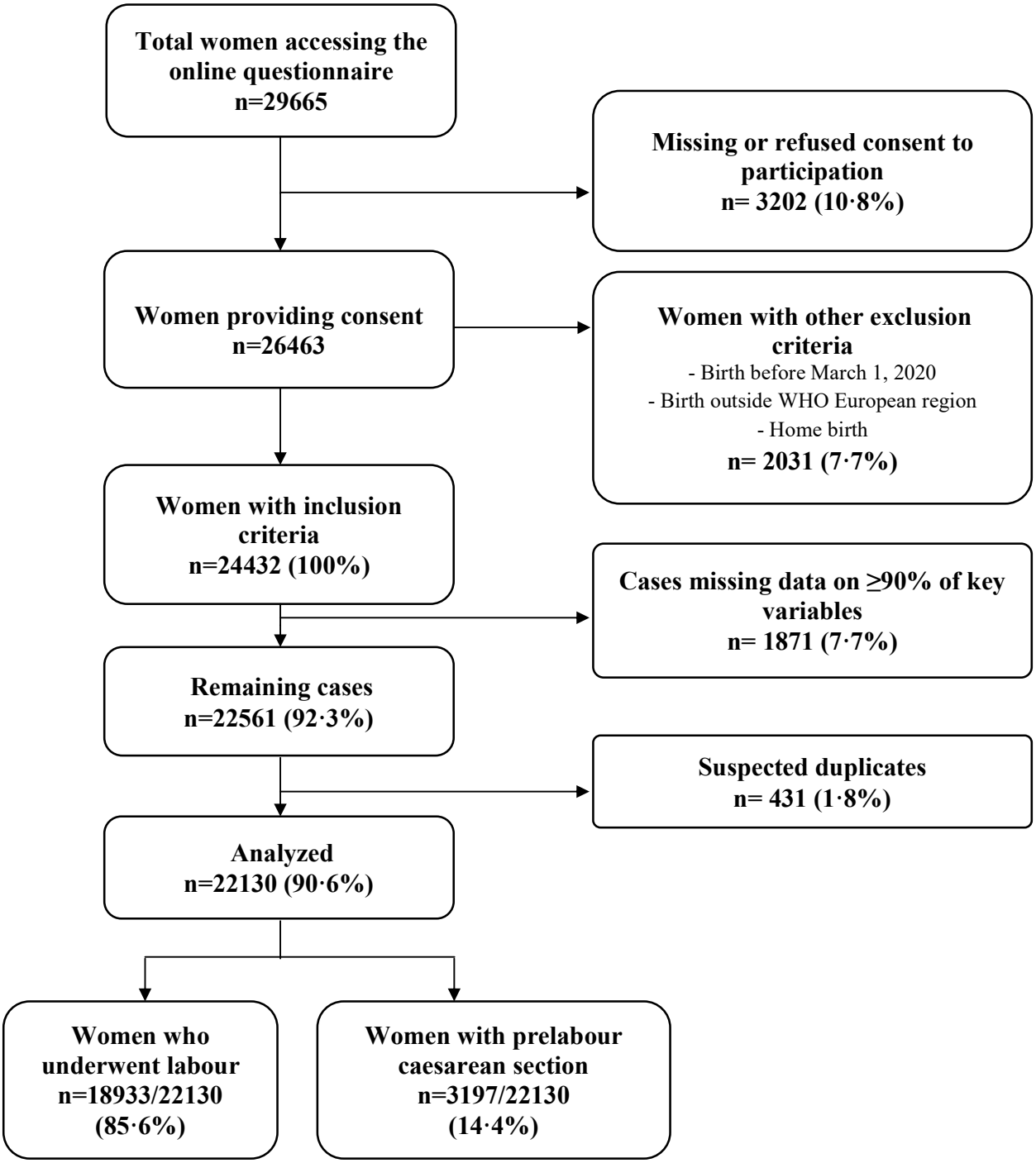
All the indicators in the domains of provision of care, experience of care, and resources are directly based on WHO standards.

Indicators identified with letters (eg, 3a, 3b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births).

Indicator 6 in the domains of reorganizational changes due to COVID-19 was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalised) supplied with water and soap or with disinfectant alcohol solution.

Abbreviations: CS = caesarean section; ECS = emergency caesarean section; HCP = health care provider; IVB = instrumental vaginal birth; PPE = personal protective equipment; QMNC = quality maternal and newborn care; SVB = spontaneous vaginal birth

Supplementary Figure 4. Sensitivity analysis #2: flow diagram (N=22130)



Supplementary Table 14 Sensitivity analysis #2: characteristics of responders (N=22130)

	N=22130 n	%
Country		
Italy	5119	23·1
Sweden	4918	22·2
Norway	3367	15·2
Slovenia	2217	10·0
Portugal	1777	8·0
Germany	1147	5·2
Serbia	677	3·1
Romania	632	2·9
France	578	2·6
Croatia	486	2·2
Luxembourg	467	2·1
Spain	371	1·7
Other [1]	374	1·7
Year of birth		
2020	11458	51·8
2021	8752	39·5
Missing	1920	8·7
Gave birth in the same country where you were born		
Yes	19021	86·0
No	1523	6·9
Missing	1586	7·2
Age range		
18-24	949	4·3
25-30	7323	33·1
31-35	8213	37·1
36-39	3070	13·9
≥40	992	4·5
Missing	1583	7·2
Educational level [2]		
None	6	0·1
Elementary school	46	0·2
Junior high school	1100	5·0
High secondary	5152	23·3
University degree	8725	39·4
Postgraduate degree / Master /Doctorate or higher	5515	24·9
Missing	1586	7·2
Parity		
1	12554	56·7

>1	7992	36·1
Missing	1584	7·2
Mode of birth		
Vaginal spontaneous	14110	67·1
Instrumental vaginal birth	1928	9·2
Caesarean section	4989	23·7
Elective caesarean section	2155	9·7
Emergency caesarean section during labour	2155	9·7
Emergency caesarean section before going into labour	1042	4·7
Type of facility		
Public	19160	86·6
Private	1387	6·3
Missing	1583	7·2
Type of healthcare providers who directly assisted the birth [3]		
Midwife	18153	82·0
Nurse	8068	36·5
A student (i.e. before graduation)	3450	15·6
Obstetrics registrar / medical resident (under post-graduation training)	3780	17·1
Obstetrics and gynaecology doctor	10876	49·1
I don't know (healthcare providers did not introduce themselves)	1802	8·1
Other	3029	13·7

Notes: [1] Other countries (sample): Belgium (129); Austria (42); UK (38); Bosnia Herzegovina (33); Finland (32); Switzerland (23); Denmark (17); Greece (10); Ireland; Netherlands; Ukraine; Andorra; Montenegro; Russian Federation; Lithuania; Iceland; Poland; Turkey; Hungary; Albania; Cyprus; Latvia; Macedonia; Czech Republic (for each country less than 10 cases); [2] Wording on education levels agreed among partners during the Delphi and questionnaire translated and back translated according to ISPOR Task Force for Translation and Cultural Adaptation Principles of Good Practice; [3] More than one possible answer.

Supplementary Table 15 Sensitivity analysis #2: results of the 40 key quality measures between women who underwent labour (N=18933) and women who did not (N=3197)

Women who underwent labour (N=18933)

Provision of care	Overall % (95% CI)	Experience of care	Overall % (95% CI)	Availability of physical and human resources	Overall % (95% CI)	Reorganizational changes due to COVID-19	Overall % (95% CI)
1. No pain relief during labour	21·0 (20·4; 21·5)	1. No freedom of movements during labour	25·7 (25·1; 26·4)	1. No timely care by HCPs at facility arrival	13·2 (12·7; 13·7)	1. Difficulties in attending routine antenatal visits	39·9 (39·2; 40·6)
2.Mode of birth 2a. IVB	10·8 (10·3; 11·2)	2a. No choice of birth position (in SVB)	42·8 (42·0; 43·6)	2. No information on maternal danger signs	45·3 (44·6; 46·0)	2. Any barriers in accessing the facility	30·0 (29·3; 30·6)
2b. CS	11·4 (10·9; 11·8)	2b. No consent requested (for IVB)	53·5 (51·3; 55·6)	3. No information on newborn danger signs	54·9 (54·2; 55·6)	3. Inadequate info graphics	5·4 (5·1; 5·7)
3a. Episiotomy (in SVB)	20·4 (19·8; 21·1)	2c. No information on newborn (in ECS)	37·5 (35·5; 39·5)	4. Inadequate room comfort and equipment	8·1 (7·7; 8·4)	4. Inadequate wards reorganization	35·5 (34·8; 36·1)
3b. Fundal pressure (in IVB)	41·5 (39·4; 43·7)	3. No clear/effective communication from HCP	29·9 (29·3; 30·6)	5. Inadequate number of women per rooms	8·5 (8·1; 8·9)	5. Inadequate room reorganization	36·2 (35·5; 36·9)
3c. No pain relief after CS	15·1 (13·6; 16·6)	4. No involvement in choices	34·1 (33·5; 34·8)	6. Inadequate room cleaning	6·5 (6·1; 6·8)	6. Lacking one functioning accessible hand-washing station	13·0 (12·5; 13·4)
4. No skin to skin	9·3 (8·8; 9·7)	5. Companionship not allowed	60·9 (60·2; 61·6)	7.Inadequate bathroom	13 (12·5; 13·5)	7. HCP not always using PPEs	32·9 (32·2; 33·5)
5. No early breastfeeding	13·2 (12·7; 13·7)	6. Not treated with dignity	23·5 (22·9; 24·1)	8. Inadequate partner visiting hours	59·7 (59·0; 60·4)	8. Insufficient HCP number	30·3 (29·7; 31·0)
6. Inadequate breastfeeding support	31·3 (30·7; 32·0)	7. No emotional support	27·0 (26·3; 27·6)	9. Inadequate HCP's number	20·4 (19·8; 20·9)	9. Communication inadequate to contain COVID-19 related stress	36·4 (35·7; 37·1)
7. No rooming-in	19·8 (19·2; 20·3)	8. No privacy	17·9 (17·4; 18·5)	10. Inadequate HCP professionalism	5·4 (5·1; 5·7)	10. Reduction in QMNC due to COVID-19	47·6 (46·9; 48·3)
8. Not allowed to stay with the baby as wished	7·2 (6·8; 7·6)	9. Abuses (physical /verbal /emotional)	12·3 (11·8; 12·8)				
9. No exclusive breastfeeding at discharge	28·1 (27·5; 28·7)	10. Informal payment	2·4 (2·2; 2·7)				
10. No immediate attention when needed	30·9 (30·2; 31·5)						

Women with prelabour caesarean section (N=3197)

Provision of care	Overall % (95% CI)	Experience of care	Overall % (95% CI)	Availability of physical and human resources	Overall % (95% CI)	Reorganizational changes due to COVID-19	Overall % (95% CI)
1. Mode of birth 1a. Elective CS	67·4 (65·8; 69·0)	1. Consent requested for vaginal examination	29·1 (27·5; 30·6)	1. No information on maternal danger signs	45·4 (43·7; 47·1)	1. Difficulties in attending routine antenatal visits	40·6 (38·9; 42·3)
1b. ECS before labour	32·6 (31; 34·2)	2. No information on newborn	29·3 (27·7; 30·9)	2. No information on newborn danger signs	52·5 (50·8; 54·2)	2. Any barriers in accessing the facility	32·5 (30·9; 34·2)
2. No pain relief after CS	13·2 (12·1; 14·4)	3. No clear/effective communication from HCP	34·5 (32·9; 36·2)	3. Inadequate room comfort and equipment	10·2 (9·1; 11·2)	3. Inadequate info graphics	6·1 (5·3; 7·0)
3. No skin to skin	35·0 (33·3; 36·6)	4. No involvement in choices	42·1 (40·4; 43·8)	4. Inadequate number of women per rooms	6·7 (5·8; 7·6)	4. Inadequate wards reorganization	37·9 (36·2; 39·6)
4. No early breastfeeding	36·2 (34·5; 37·9)	5. Companionship not allowed	69·8 (68·2; 71·4)	5. Inadequate room cleaning	7·9 (6·9; 8·8)	5. Inadequate room reorganization	36·9 (35·2; 38·6)
5. Inadequate breastfeeding support	37·7 (36·0; 39·3)	6. Not treated with dignity	29·7 (28·2; 31·3)	6.Inadequate bathroom	13·6 (12·4; 14·8)	6. Lacking one functioning accessible hand-washing station	17·7 (16·4; 19·0)
6. No rooming-in	36·6 (35·0; 38·3)	7. No emotional support	30·7 (29·1; 32·3)	7. Inadequate partner visiting hours	63·8 (62·1; 65·4)	7. HCP not always using PPEs	26·1 (24·6; 27·6)
7. Not allowed to stay with the baby as wished	14·4 (13·1; 15·6)	8. No privacy	20 (18·6; 21·4)	8. Inadequate HCP's number	20·4 (19; 21·8)	8. Insufficient HCP number	31·9 (30·3; 33·5)
8. No exclusive breastfeeding at discharge	47·5 (45·8; 49·3)	9. Abuses (physical /verbal/emotional)	13·7 (12·5; 14·9)	9. Inadequate HCP professionalism	6·1 (5·3; 7·0)	9. Communication inadequate to contain COVID-19 related stress	39·5 (37·8; 41·2)
9. No immediate attention when needed	34·9 (33·3; 36·6)	10. Informal payment	5·2 (4·4; 5·9)	10. Inadequate wards reorganization	37·9 (36·2; 39·6)	10. Reduction in QMNC due to COVID-19	46·5 (44·8; 48·3)
10. No timely care by HCP at facility arrival	14·7 (13·5; 15·9)						

Notes

All the indicators in the domains of provision of care, experience of care, and resources are directly based on WHO standards.

Indicators identified with letters (eg, 3a, 3b) were tailored to take into account different mode of birth (ie, spontaneous vaginal, instrumental vaginal, and caesarean section). These were calculated on subsamples (eg, 3a was calculated on spontaneous vaginal births; 3b was calculated on instrumental vaginal births).

Indicator 6 in the domains of reorganizational changes due to COVID-19 was defined as: at least one functioning and accessible hand-washing station (near or inside the room where the mother was hospitalised) supplied with water and soap or with disinfectant alcohol solution.

Abbreviations: CS = caesarean section; ECS = emergency caesarean section; HCP = health care provider; IVB = instrumental vaginal birth; PPE = personal protective equipment; QMNC = quality maternal and newborn care; SVB = spontaneous vaginal birth

Supplementary Table 16 Multivariable quantile regression estimates (n=14954)

	0·25th centile Coefficient (95%CI)	p value	0·50th centile (median) Coefficient (95%CI)	p value	0·75th centile Coefficient (95%CI)	p value
Parity						
1	Ref		Ref		Ref	
>1	20·0 (17·3; 22·7)	<0·001	13·2 (11·0; 15·4)	<0·001	10·0 (8·5; 11·5)	<0·001
Mother and newborn's country of birth						
Same country	Ref		Ref		Ref	
Different country	-1·7 (-7·9; 4·6)	0·601	2·7 (-0·9; 5·5)	0·057	0·0 (-2·4; 2·4)	1·0
Type of facility						
Public	Ref		Ref		Ref	
Private	28·3 (23·6; 33·0)	<0·001	28·6 (24·5; 32·7)	<0·001	20·0 (18·0; 22·0)	<0·001
Age range						
18-24	-11·7 (-17·0; -6·4)	<0·001	-10·9 (-17·0; -4·8)	<0·001	-5·0 (-9·5; -0·5)	0·030
25-30	0·0 (-3·1; 3·1)	1·0	-0·5 (-3·0; 2·1)	0·727	0·0 (-1·6; 1·6)	1·0
31-35	Ref		Ref		Ref	
36-40	3·3 (-0·2; 6·9)	0·065	0·5 (-2·2; 3·1)	0·733	0·0 (-2·0; 2·0)	1·0
>40	5·0 (-0·1; 9·9)	0·055	1·8 (-2·7; 6·3)	0·426	5·0 (-0·6; 10·6)	0·081
Educational level						
None or elementary	-8·3 (-45·9; 29·2)	0·663	1·8 (-44·0; 47·6)	0·938	-5·0 (-14·1; 4·1)	0·284
Junior high school	5·0 (-0·5; 10·5)	0·075	7·3 (3·7;10·8)	<0·001	5·0 (2·2; 7·8)	0·001
High school	0·0 (-3·3; 3·3)	1·0	1·8 (-0·7; 4·3)	0·150	0·0 (-1·5; 1·5)	1·0
University or higher	Ref		Ref		Ref	
Year of birth						
2020	Ref		Ref		Ref	
2021	21·7 (18·6; 24·8)	<0·001	16·8 (14·1; 19·5)	<0·001	10·0 (7·2; 12·8)	<0·001
Mode of birth						
Spontaneous VB	Ref		Ref		Ref	
Instrumental VB	-23·3 (-28·3; -18·4)	<0·001	-20·5 (-24·9; -16·0)	<0·001	-15·0 (-17·6; -12·4)	<0·001
CS	-28·3 (-32·6; -24·1)	<0·001	-21·8 (-25·3; -18·3)	<0·001	-15·0 (-17·4; -12·6)	<0·001
Midwife in the team who assisted the birth						
No	Ref		Ref		Ref	
Yes	31·7 (25·7; 37·7)	<0·001	24·5 (19·9; 29·2)	<0·001	15·0 (11·0; 19·0)	<0·001
OB-GYN doctor in the team who assisted the birth						
No	Ref		Ref		Ref	
Yes	10·0 (7·1; 12·9)	<0·001	6·4 (3·9; 8·8)	<0·001	0·0 (-1.7; 1·7)	1·0
Country						
Croatia	-35·0 (-45·8; -24·2)	<0·001	-43·2 (-49·6; -36·8)	<0·001	-40·0 (-48·6; -31·4)	<0·001
France	13·3 (5·0; 21·6)	0·002	9·1 (3·6; 14·6)	0·001	5·0 (-1·5; 11·5)	0·131
Germany	25·0 (18·9; 31·1)	<0·001	13·2 (8·9; 17·5)	<0·001	5·0 (2·6; 7·4)	<0·001
Italy	Ref		Ref		Ref	
Luxembourg	55·0 (47·2; 62·8)	<0·001	35·5 (31·5; 39·4)	<0·001	20·0 (17·3; 22·7)	<0·001
Norway	20·0 (14·9; 25·1)	<0·001	11·8 (7·1; 16·5)	<0·001	5·0 (1·7; 8·3)	0·003
Portugal	26·7 (21·3; 32·0)	<0·001	19·1 (14.4; 23·8)	<0·001	10·0 (7·3; 12·7)	<0·001
Romania	-28·3 (-37·0; -19·7)	<0·001	-29·5 (-40·3; -18·8)	<0·001	-25·0 (-31·2; -18·8)	<0·001
Serbia	-100 (-110·6; -89·4)	<0·001	-105 (-113·7; -96·3)	<0·001	-90·0 (-101·3; -78·7)	<0·001
Slovenia	10·0 (4·7; 15·3)	<0·001	2·3 (-2·2; 6·7)	0·318	-5·0 (-8·0; -2·0)	0·001
Spain	36·7 (31·3; 42·0)	<0·001	23·2 (16·9; 29·4)	<0·001	15·0 (7·6; 22·4)	<0·001
Sweden	15·0 (10·6; 19·4)	<0·001	7·3 (3·4; 11·1)	<0·001	0·0 (-2.3; 2·3)	1·0
Other countries	30·0 (21·5; 38·5)	<0·001	26·8 (19·0; 34·7)	<0·001	20.0 (16·9; 23·1)	<0·001
Intercept	228·3 (221·0; 235·7)	<0·001	285·5 (279·6; 291·4)	<0·001	335·0 (330·4; 229·6)	<0·001

Notes: 95% CI and p value are calculated using robust estimation of standard errors.

Abbreviations: CI = confidence interval; CS = caesarean section; OB-GYN = obstetrics and gynaecology; VB = vaginal birth.