

Use of specialist health services until two years of age in a European cohort of very preterm births

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Abstract

Aim: Children born very preterm require additional specialist care because of the health and neurodevelopmental risks associated with prematurity, but information on their health service use is sparse. We sought to describe medical specialist service use by very preterm children in Europe.

Method: We analysed data from the multi-regional, population-based EPICE cohort of births before 32 weeks of gestation in 11 European countries. Perinatal data were abstracted from medical records and parents completed a questionnaire at two years of corrected age (4322 children). We compared parent-reported use of specialist services by country, perinatal risk (based on gestational age, small for gestational age and neonatal morbidities), maternal education and migration status.

Results: Seventy-six percent of the children had consulted at least one specialist, ranging across countries from 53.7% to 100%. Ophthalmologist (53.4%) and physiotherapists (48.0%) were most frequently consulted, but individual specialists varied greatly by country. Perinatal risk was associated with specialist use, but the gradient differed across countries. Children with more educated mothers had higher proportions of specialist use in three countries.

Interpretation: Large variations in use of specialists across Europe were not explained by perinatal risk and raise questions about the strengths and limits of existing models of care.

Short title: Specialist consultations in very preterm children

What this paper adds

1. Specialist service use for children born very preterm varied greatly across Europe.
2. This variation was observed for types and number of different specialists consulted.
3. Perinatal risk was associated with specialist care, but did not explain country-level differences.
4. In some countries, mothers' educational level affected use of specialist services.

Very preterm children born before 32 weeks of gestation face higher risks of motor impairment, including cerebral palsy, vision and hearing loss, language and developmental delay and behavioural and cognitive difficulties compared to children born at later gestational ages (1-5). These risks rise with declining gestational age at birth (1, 2). From 21 to 35% of children born extremely preterm (22–27 weeks) in cohort studies worldwide have been shown to have moderate to severe neurological disability in childhood (2). In addition to gestational age (GA), other perinatal factors affect the probability of health difficulties later in life; most importantly, the presence of severe neonatal morbidities at discharge from the neonatal unit (2). Studies have found that up to 40% of extremely preterm infants and 7 to 12% of very preterm infants born between 28 and 31 weeks have a severe morbidity at discharge (6, 7). However, many children without severe morbidities also experience neurodevelopmental problems (8). Social factors may affect long term prognosis, and children from socially disadvantaged families have more adverse outcomes in, for example, language development (9), cognition (8, 10) and cerebral palsy (11).

Equitable and timely access to high-quality health services is needed to ensure appropriate care for emerging health problems in this population. Studies show that health service use is higher in very preterm compared to term born children (2) and in children with neurodevelopmental disabilities compared to those without (12). Use of occupational and physical therapies is higher in very preterm born children at 18 months corrected age (13) and up to the age of 10 to 12 years (14). The type and number of services used depend primarily on the gestational age at birth (1, 15) and the severity of disabilities (1). In the French EPIPAGE 1 cohort, one third of very preterm children were using specialised care, including occupational, speech and physiotherapy, and psychologist or psychiatrist consultations at 5 years of age (1). Other studies suggest that families' socioeconomic characteristics affect children's use of health care services. Unfavourable social circumstances have been associated with increased out-patient

service use in very preterm children in Canada (15). In the US, low maternal education, poverty and ethnic group have been associated with less access to early intervention services for high-risk infants (16). Socioeconomic characteristics have also been associated with the type of service providers consulted (17).

While existing recommendations specify that paediatric specialist consultations, as well as sensory, developmental and behavioral screening are needed for preterm infants (18, 19), clear evidence-based guidelines governing post-discharge care do not exist. The importance of establishing more solid evidence-based and common guidelines has been highlighted by parent organization and professional societies (20, 21), but more information is first needed about current practices. While existing studies on health service use among very preterm infants provide an overview of the specialist services used, they are limited in their geographical coverage. Health service use may reflect both prevention and follow-up policies as well as how the health care system is organised, and are therefore highly context specific. In this study, the objective was to compare the use of specialist services by very preterm children in 11 European countries with a similar level of socioeconomic development and universal health insurance systems. The focus was on care received after discharge from hospital until two years of corrected age and on investigating differences by children's perinatal risk and mothers' social characteristics across regions from 11 European countries.

Method

Data source

The data were collected as part of the Effective Perinatal Intensive Care in Europe (EPICE) project; a population-based cohort of very preterm births in 19 regions in 11 European countries: Belgium (Flanders); Denmark (Eastern Region); Estonia (entire country); France (Burgundy, Ile-de-France and the Northern region); Germany (Hesse and Saarland); Italy

(Emilia-Romagna, Lazio and Marche); the Netherlands (Central and Eastern region), Poland (Wielkopolska); Portugal (Lisbon and Northern region); Sweden (greater Stockholm) and the United Kingdom (East Midlands, Northern, and Yorkshire & Humber regions). Regions were selected based on geographic location, organisational diversity, on-site infrastructure and expertise for implementing the protocol. All still and live births between 22+0 weeks and 31+6 weeks of gestation were included from both public and private maternity hospitals over a period of 12 months between April 2011 and September 2012. In France the inclusions were done over 6 months.

Data were abstracted from obstetric and neonatal records until the initial discharge from hospital, using a standard, pretested questionnaire. Families who provided written informed consent for follow-up were re-contacted when the children were two years of corrected age to answer a parent-administered questionnaire.

Each participating region obtained approval from their local ethics board and/or hospital committee according to national legislations, prior to the start of data collection. The study was also approved by the French Advisory Committee on Use of Health Data in Medical Research (CCTIRS) and the French National Commission for Data Protection and Liberties (CNIL).

Study population

The EPICE cohort included 10 329 stillbirths, terminations of pregnancies (TOP) and live births (Supplementary Figure 1). Out of 7 900 live births, 6 792 infants (86.0%) survived to discharge from the neonatal unit. Families whose child died before two years of corrected age (N=31) were not contacted for follow-up. Of the 6 761 children alive at two years, 2 336 (34.6%) did not participate in the study. The Northern Region in the UK (380 children alive at two years) was excluded from the analyses due to concern about bias linked to a low response rate (27.1%).

After excluding UK North, the loss to follow-up varied between 0.7–53.0% across the countries ($p < 0.001$). The final study sample included 4 322 children (67.7% of those eligible).

Data on use of medical specialists

Data on specialist service use were collected through the parent-report questionnaire at two years of corrected age. The parents were asked whether their child had seen any of the health care providers listed in the questionnaire or other health care professionals, given by free text answer. The questions were developed in English, then translated into appropriate languages and adapted to local health care systems; the services thus differed slightly across countries (Supplementary Table 1). This analysis focused on medical specialist services not routinely provided by a general practitioner or paediatrician. Free-text responses were abstracted and analysed when corresponding to the services listed. Services of the same type, such as psychologist and psychiatrist, were analysed together. A variable “any specialist” was defined as having consulted, at least once since first discharge from the neonatal unit, any of the specialists listed for all countries. Since paediatricians may be the primary care provider for all, including very preterm children, information on paediatricians was included to assess if these consultations were more frequent where specialist use was lower.

Data on perinatal risk factors and socioeconomic status

Perinatal and child characteristics included GA in weeks, sex, small for gestational age (SGA; birth weight $< 10^{\text{th}}$ percentile for GA and sex, using references developed for the cohort (22)), any congenital anomaly, bronchopulmonary dysplasia (BPD, based on need for supplemental oxygen or ventilation at 36 weeks postmenstrual age), retinopathy of prematurity (ROP, stages III–V, diagnosed before discharge), intraventricular haemorrhage (grades III–IV) or cystic

periventricular leukomalacia (IVH/cPVL), and necrotising enterocolitis needing surgery (NEC).

The mothers' highest achieved educational level was collected in the two-year questionnaire using the International Standard Classification of Education (ISCED) 2011 definition and categorized as (I) high school (upper secondary) or below and (II) more than high school (post-secondary or more). Whether the mother was foreign-born was also self-reported. The mother's age at delivery was obtained from medical records.

Analysis strategy

First, responders were compared with non-responders regarding child characteristics, perinatal risk and mother's sociodemographic factors. The use of specialist services was then described across the countries and by perinatal risk. Three risk groups were defined, based on perinatal characteristics associated with the risk of developing neurodevelopmental or health problems in childhood (2, 8): a high-risk group born before 28 weeks and/or with a severe neonatal morbidity (BPD, ROP, IVH/cPVL or NEC) and/or a severe congenital anomaly; a low risk group born at 30–31 weeks, without SGA, congenital anomalies or severe neonatal morbidity, and a moderate risk group including all other children, not classified as high or low risk. Proportions were compared using Chi-square and Fisher's exact tests and the mean number of specialists across these risk groups was compared using the Kruskal-Wallis test.

To assess the effect of social factors, specialist use was compared by maternal education (high school or less vs. more than high school) and migration status (foreign vs. native-born). Direct standardization was used to account for the distribution of perinatal risk within each country. Binomial regression models were used to obtain p-values for the risk differences in any specialist service use across the educational groups and between foreign and native-born

mothers, adjusting for perinatal risk. Mean numbers of specialists were adjusted for perinatal risk and predicted with margins holding risk constant at the mean across social groups. P-values were obtained by negative binomial regressions and the Wald test, adjusted for perinatal risk. STATA 14.0 (23) was used for all analyses.

Results

The population at two years corrected age consisted of 2 026 girls and 2 296 boys, with a mean GA of 28.9 weeks (SD: 2.0) (Table 1) and a mean birth weight of 1251 g (SD: 369 g). BPD was present in 12.6% of the children, severe and non-severe congenital anomaly in 1.1% and 7.3% respectively, ROP in 3.8%, IVH/cPVL in 6.1 % and NEC in 1.6%. Based on GA and perinatal factors, 26.9% were classified into the low risk group, 38.8% into the moderate and 34.3% into the high risk group. Mothers had a mean age of 31.3 years and a majority had more than high school education (53.6%). Among non-responders at two years, mothers were more likely to be young (≤ 24 years) and foreign-born ($p < 0.001$) with singleton pregnancies ($p = 0.001$) (Supplementary Table 2).

Table 2 presents parent-reported specialist use by country. Overall, the highest reported use was for ophthalmologists and physiotherapists or motor development therapists. However, there was wide variation across countries: the use of ophthalmologists ranged from 23.9% in the region in Denmark to 99.3% in Estonia (overall 53.4%), and physiotherapists ranged from 29.5% in the UK regions to 96.4% in Estonia (overall 48.0%). Respiratory and asthma specialists were the third most used service (23.6% overall) but with a higher use of respiratory physiotherapy in French regions (63.5%). Psychologist/psychiatrist visits were more frequent in Estonia (42.0%) and in the Polish region (42.1%). Consultations with dieticians were reported more often in the UK (25.8%) and Swedish (27.9%) regions. Hearing specialists (including ENT, audiology and hearing screening) were reported as freetext answers in all

countries except Estonia, where hearing examinations were listed and frequently reported (83.3%). However, the item in Estonia referred to the examination and not to the specialist and therefore may have been provided in other settings. Use of any of the specialists listed in all countries varied from 53.7% (Italian regions) to 100% (Estonia). Consultations with paediatricians showed variability by country, but were not systematically higher when specialist service use was low.

Perinatal risk was associated with specialist use (Table 3). In the lowest risk group, 64.3% had seen a specialist compared to 85.7% of the high risk children ($p < 0.001$). This pattern was found in all countries except for Estonia, where all children had seen at least one specialist, and in Denmark, the Netherlands and Poland where the results were not statistically significant between risk groups. The mean number of different specialists increased with risk group; on average 1.1 specialists were reported for low risk, 1.4 for moderate risk and 1.9 for high risk children ($p < 0.001$). This increase was seen in all countries except in the Netherlands and Denmark. Poland and Sweden had the highest mean number in the high risk group (2.9) and Estonia had the highest mean for both lower risk groups (2.2 and 2.8 respectively).

Overall, the proportion of children having consulted at least one specialist was slightly higher for mothers with more than high school education (77.6% vs. 74.2%; $p = 0.004$) after standardising for risk group (Table 4). Significant differences by maternal educational level were found in Belgium, Germany and Portugal. No statistically significant differences were found for the mean number of specialists between educational groups and between foreign and native-born mothers, after adjusting for risk.

Discussion

This study provides a previously unavailable overview of specialist service use among very preterm children in their first two years of life in 11 European countries. A large variability existed in the reported use of services across the countries, with use of any specialist varying from 54% to 100%. Higher perinatal risk was associated with increased specialist consultations and number of specialists seen in most countries. Maternal education was associated with specialist use in regions from three countries. These results reveal highly diverse approaches to the use of specialists in care of very preterm children across Europe and the challenges of benchmarking care across countries, even when they share similar standards of living and access to care.

Our findings corroborate previous studies showing a high use of specialist services by preterm children as well as the association with perinatal risk factors (1, 15, 24). However, perinatal risk did not explain differences by country, as these persisted after risk adjustment. This variation may be explained by differences in policies for the follow-up of very preterm infants. For instance, Estonia, where almost all children had seen a specialist, has established national follow-up policies and a comprehensive programme including specialist care for all children born before 32 weeks. In the UK, Denmark and Italy, where national protocols have not yet been established for follow-up of very preterm children, specialist service use was lower, even when perinatal risk was high, possibly reflecting a focus on treatment more than prevention. Studying the content of established follow-up programmes and their ability to refer children to specialists could give a better picture of the role of specialists in screening, prevention and treatment. Variation across countries may also reflect differences in how paediatric primary care is organised more generally, and the accessibility of paediatric services. Both paediatrician, general practitioner-based and combined systems exist across Europe, with varying provision of paediatric services (25). However, there was no clear pattern across the countries with respect to using paediatric versus specialist services.

The two most commonly used services were ophthalmologist and physiotherapist, as reported previously (13). Some services were more country specific, such as respiratory physiotherapy in France, speech therapy in Estonia, dietician in Sweden and the UK, and neurologist and psychologist/psychiatrist in Estonia and Poland. In France, respiratory physiotherapy is commonly used in the general paediatric population (26). Speech/language therapy, which is used for feeding difficulties in this age group, were also mentioned by parents although they were not included in the pre-established list, suggesting they should be included in future studies.

Despite the availability of universal health care coverage in all countries, children of more educated mothers were more likely to see a specialist in three of the 11 countries, which has similarly been reported for out-patient services in very preterm children (15). The absence of these differences in the remaining countries might be explained by the organisation of care, such as having systematic follow-up in place, or referral or targeting practices focussing on socially disadvantaged families, and constitute areas for further investigation. Ensuring access to specialised health services for socially disadvantaged families is essential as these families are more likely to have a very preterm child (27) and there is evidence that they may benefit more from some services (28). Referring high-risk children to early interventions has been particularly successful in children from families of low socioeconomic status in the US (29). Conversely, being foreign-born or not speaking the language may act as a barrier to contact with service providers (29). Reassuringly, differences were not found between foreign and native-born women in this study. Other socioeconomic or demographic measures might explain the differences across the countries, such as mother's income level (17) or distance to services (30), but these data were not available.

The strengths of this study include its population-based design, geographic spread and standardised protocol across 11 European countries. However, with limited detail collected about the care received, including the frequency of consultations and whether they were for prevention or treatment, we could not consider the appropriateness of the care, nor whether some specialist care was provided as part of other health services. For instance, vision or motor development tests are sometimes part of routine practices in follow-up networks or maternal and child health centres. Neither could we distinguish private from public providers nor assess if services had out-of-pocket costs. Another limitation was loss to follow-up, which varied across regions. Comparison of non-responders with responders showed that younger and foreign-born mothers were underrepresented. Mothers who understand the local language may not only be more likely to answer the questionnaire, but also better integrated into the health care system, potentially resulting in an underestimation of the impact of migration status on the use of services in countries with higher loss to follow-up. However, the non-responders were otherwise comparable and, particularly, medical risk factors did not differ. Finally, recall bias might have affected the accuracy of the answers. Nonetheless, it is unlikely that the recall bias was differential across regions as the protocol and questionnaires were standardised.

In conclusion, these data show high heterogeneity in medical specialist use among very preterm children across European regions using a standardised parent-report instrument in ten languages. This heterogeneity cautions about generalizing research results on health care use from one country to others, and calls attention to the diverse models of care within Europe. Further studies on specialist service use in relation to health outcomes, use of emergency and in-patient services, parental experiences of care and health care costs should investigate the advantages and drawbacks of these models in order to inform guidelines that are applicable across diverse health systems.

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Table 1: Sample characteristics

| | N | n | % |
|--|----------|----------------------------|----------|
| Gestational age in completed weeks | 4322 | <i>Mean: 28.9, SD: 2.0</i> | |
| <26 | | 324 | 7.5 |
| 26-27 | | 759 | 17.6 |
| 28-29 | | 1152 | 26.7 |
| 30-31 | | 2087 | 48.3 |
| Birth weight, grams | 4322 | <i>Mean: 1251, SD: 369</i> | |
| Multiple birth | | | |
| Singleton | 4322 | 2890 | 66.9 |
| Twins | | 1259 | 29.1 |
| Triplets or more | | 173 | 4.0 |
| Sex of child: Female | 4322 | 2026 | 46.9 |
| Small for gestational age | 4322 | | |
| Yes ($\leq 10^{\text{th}}$ percentile) | | 1413 | 32.8 |
| No ($> 10^{\text{th}}$ percentile) | | 2909 | 67.3 |
| Congenital anomaly | 4321 | | |
| Severe | | 49 | 1.1 |
| Non-severe | | 317 | 7.3 |
| None | | 3955 | 91.5 |
| Bronchopulmonary dysplasia at 36 weeks of postmenstrual age | 4225 | 533 | 12.6 |
| Retinopathy of prematurity stages III-V | 4272 | 161 | 3.8 |
| Intraventricular haemorrhage grade III or IV or cystic periventricular leukomalacia | 4278 | 260 | 6.1 |
| Necrotising enterocolitis needing surgery | 4322 | 67 | 1.6 |
| Perinatal risk* | 4215 | | |
| Lower | | 1132 | 26.9 |
| Moderate | | 1636 | 38.8 |
| Higher | | 1447 | 34.3 |
| Mother's age at delivery | 4322 | <i>Mean: 31.3, SD: 5.8</i> | |
| ≤ 24 | | 537 | 12.4 |
| 25-34 | | 2515 | 58.2 |
| ≥ 35 | | 1260 | 29.4 |
| Foreign-born mother | 4308 | 956 | 22.2 |
| Mother's educational level | 4168 | | |
| High school or less | | 1936 | 46.5 |
| More than high school | | 2232 | 53.6 |

*Lower: Over 29 WG, without SGA, severe neonatal morbidities and congenital anomaly

Moderate: Not classified as higher or lower risk

Higher: Below 28 WG or at least one neonatal morbidity or severe congenital anomaly

Table 2: Use of specialist services by country, sorted by total use of services.

| | | | Specialised services | | | | | | | | | |
|------------------|-----------------|---|-----------------------|--|---|--|---------------------------|--|-------------|------------------|------------------|-------|
| | | | Forced choice answers | | | | | Free text responses | | | | |
| | | Any of the specialised forced choice services | Ophthalmologist | Physiotherapist or motor development therapist | Respiratory, lung or asthma specialist or pulmonologist | Developmental psychologist or psychiatrist | Dietician or nutritionist | Hearing examination/ ENT/audiology/ hearing specialist | Neurologist | Osteopath | Speech therapist | |
| N | Paediatrician % | % | % | % | % | % | % | % | % | % | % | |
| Belgium | 308 | 90.0 | 62.8 | 33.1 | 41.0 | 13.7 | 8.5 | 1.7 | 2.3 | 0.3 | 2.3 | 1.6 |
| Denmark | 180 | 34.3 | 62.6 | 23.9 | 45.8 | 7.5 | 7.5 | 10.3 | 0.6 | 3.5* | 2.2 | 0.0 |
| Estonia | 138 | 38.4 ^a | 100.0 | 99.3 | 96.4 | 16.1 | 42.0 | 3.6 | 83.3* | 70.3* | 2.2 | 29.7* |
| France | 986 | 96.1 | 92.9 | 61.9 | 46.3 | 63.5 | 17.6 | 0.2 | 32.0 | 2.2* | 26.9* | 6.3 |
| Germany | 435 | 87.4 | 88.7 | 78.5 | 63.8 | 2.9 | 6.0 | 7.9 | 3.9 | 8.5* | 4.6 | 1.6 |
| Italy | 731 | 86.4 | 53.7 | 36.8 | 30.2 | 7.8 | 10.0 | 3.1 | 5.9 | 26.1* | 2.2 | 1.2 |
| Netherlands | 229 | 88.9 | 84.2 | 37.2 | 79.0 | 6.7 | 6.6 | 10.6 | 3.1 | 0.9 | 1.3 | 10.0 |
| Poland | 199 | 90.9 | 94.9 | 90.8 | 82.2 | 28.4 | 42.1 | 3.6 | 6.5 | 69.0* | 0.0 | 10.6 |
| Portugal | 408 | 84.2 | 79.7 | 67.7 | 44.4 | 17.6 | 18.9 | 9.6 | 12.5 | 14.5* | 0.0 | 1.2 |
| Sweden | 165 | 74.5 | 74.1 | 47.8 | 54.0 | 39.7 | 4.5 | 27.9 | 7.3 | 3.6 ^b | 0.0 | 1.8 |
| UK | 543 | 56.2 | 58.7 | 33.6 | 29.5 | 11.4 | 3.3 | 25.8 | 4.1 | 5.62* | 0.0 | 6.5 |
| Total | 4322 | 81.0 | 75.9 | 53.4 | 48.0 | 23.6 | 13.3 | 7.9 | 14.0 | 13.7 | 7.4 | 4.9 |
| N missing values | | 160 | 144 | 99 | 166 | 244 | 174 | 134 | -- | -- | -- | -- |

Most commonly used service in each country in bold.

^a Paediatrician outside follow-up clinic. In Estonia, all children have a paediatrician consultation at a follow-up centre as part of follow-up.

^b Question asked in 35 of 165 cases (18,4%) in Sweden.

*Forced choice answers

Table 3: Use of any specialist services (proportion and mean number of services used) by country and level of medical risk

| | Use of any specialist by risk level | | | | | | | | | | | |
|-------------|-------------------------------------|-------|-------|--------|----------|-------|--------|--------|-------|--------|--------------------|--------|
| | Total | Lower | | | Moderate | | | Higher | | | p^a | p^b |
| | | N | % | Mean n | N | % | Mean n | N | % | Mean n | | |
| Belgium | 308 | 98 | 48.9 | 0.7 | 101 | 60.8 | 0.9 | 85 | 81.5 | 1.5 | <0.001 | <0.001 |
| Denmark | 180 | 33 | 50.0 | 0.7 | 64 | 59.4 | 0.9 | 69 | 72.5 | 1.1 | 0.069 | 0.053 |
| Estonia | 138 | 36 | 100.0 | 2.2 | 52 | 100.0 | 2.8 | 50 | 100.0 | 2.6 | -- | 0.003 |
| France | 986 | 234 | 87.3 | 1.5 | 400 | 92.7 | 1.8 | 306 | 97.3 | 2.3 | <0.001 | <0.001 |
| Germany | 435 | 104 | 81.7 | 1.3 | 182 | 89.8 | 1.5 | 149 | 92.4 | 1.8 | 0.028 | <0.001 |
| Italy | 731 | 215 | 42.3 | 0.6 | 284 | 51.9 | 0.8 | 225 | 66.1 | 1.3 | <0.001 | <0.001 |
| Netherlands | 229 | 53 | 81.1 | 1.4 | 86 | 82.6 | 1.3 | 89 | 88.6 | 1.5 | 0.394 | 0.194 |
| Poland | 199 | 53 | 96.1 | 2.1 | 62 | 91.8 | 2.3 | 83 | 96.4 | 2.9 | 0.460 ^c | <0.001 |
| Portugal | 408 | 98 | 64.8 | 1.1 | 173 | 80.4 | 1.4 | 137 | 89.2 | 2.0 | <0.001 | <0.001 |
| Sweden | 165 | 44 | 37.2 | 0.7 | 63 | 75.4 | 1.4 | 54 | 100.0 | 2.9 | <0.001 | <0.001 |
| UK | 543 | 164 | 44.9 | 0.6 | 169 | 51.2 | 0.8 | 200 | 76.8 | 1.6 | <0.001 | <0.001 |
| Total | 4322 | 1132 | 64.3 | 1.1 | 1636 | 75.1 | 1.4 | 1447 | 85.7 | 1.9 | <0.001 | <0.001 |

^aChi-square test for p -value for difference in proportions

^bKruskal-Wallis test for p -value for mean number of services

^cFisher's exact test

Table 4: Use of any specialist services (proportion and mean number of specialists seen) by country and maternal education level, adjusted by medical risk

| Use of any specialist by educational level and migrant status, adjusted for risk | | | | | | | | | | | | | | | | | |
|--|-------|---------------------|----------------|---------------------|-----------------------|----------------|---------------------|-----------------------|-----------------------|--------------|----------------|---------------------|--------|----------------|---------------------|-----------------------|-----------------------|
| | Total | High school or less | | | More than high school | | | | | Foreign-born | | | Native | | | | |
| | | N | % ^a | Mean n ^b | N | % ^a | Mean n ^b | <i>p</i> ^c | <i>p</i> ^d | N | % ^a | Mean n ^b | N | % ^a | Mean n ^b | <i>p</i> ^c | <i>p</i> ^d |
| Belgium | 308 | 128 | 57.1 | 0.8 | 174 | 67.8 | 1.0 | 0.020 | 0.358 | 58 | 67.2 | 0.9 | 250 | 62.2 | 0.9 | 0.809 | 0.743 |
| Denmark | 180 | 27 | 65.2 | 1.1 | 150 | 63.4 | 0.9 | 0.966 | 0.550 | 18 | 43.1 | 1.0 | 162 | 63.9 | 0.9 | 0.492 | 0.805 |
| Estonia | 138 | 46 | 100.0 | 2.7 | 89 | 100.0 | 2.5 | -- | 0.731 | 9 | 100.0 | 2.6 | 129 | 100.0 | 2.6 | -- | 0.953 |
| France | 986 | 428 | 91.9 | 1.9 | 481 | 94.0 | 1.9 | 0.299 | 0.716 | 335 | 90.3 | 1.8 | 646 | 94.1 | 1.9 | 0.050 | 0.707 |
| Germany | 435 | 221 | 88.1 | 1.5 | 200 | 93.0 | 1.7 | 0.002 | 0.547 | 122 | 82.1 | 1.3 | 311 | 91.0 | 1.7 | 0.091 | 0.141 |
| Italy | 731 | 459 | 54.6 | 0.8 | 266 | 51.0 | 0.8 | 0.351 | 0.546 | 188 | 53.2 | 0.8 | 543 | 53.5 | 0.8 | 0.994 | 0.944 |
| Netherlands | 229 | 39 | 87.5 | 1.6 | 187 | 84.0 | 1.4 | 0.867 | 0.489 | 27 | 76.2 | 1.2 | 202 | 85.4 | 1.4 | 0.357 | 0.543 |
| Poland | 199 | 114 | 93.8 | 2.4 | 83 | 97.6 | 2.6 | 0.057 | 0.522 | 1 | -- | 2.2 | 198 | -- | 2.5 | -- | 0.919 |
| Portugal | 408 | 228 | 74.7 | 1.4 | 175 | 86.2 | 1.7 | 0.004 | 0.124 | 76 | 84.1 | 1.6 | 332 | 78.8 | 1.5 | 0.806 | 0.610 |
| Sweden | 165 | 71 | 70.6 | 1.4 | 93 | 75.3 | 1.5 | 0.363 | 0.812 | 48 | 66.4 | 1.3 | 117 | 75.5 | 1.5 | 0.211 | 0.565 |
| UK | 543 | 175 | 56.7 | 0.9 | 334 | 59.9 | 1.0 | 0.495 | 0.649 | 74 | 51.0 | 0.9 | 462 | 59.8 | 1.0 | 0.180 | 0.613 |
| Total | 4322 | 1936 | 74.2 | 1.4 | 2232 | 77.6 | 1.5 | 0.004 | 0.365 | 956 | 75.1 | 1.4 | 3352 | 76.2 | 1.4 | 0.410 | 0.420 |

^aProportions adjusted by level of medical risk by direct standardization

^bPredicted margins with risk constant at mean

^cP-value for risk difference adjusted for perinatal risk using binomial regression

^dP-value for difference in mean number of specialists seen adjusted by risk using Wald Test (negative binomial regression)