Obstetrics Healthcare Atlas

The use of obstetrics healthcare services in Norway during the period 2015–2017

April 2019

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Foreword, Northern Norway RHA

Norwegian antenatal and maternity care is of high international quality. Considerable efforts have gone into developing a comprehensive maternity care since the submission of Report No 12 to the Storting (2008–2009) - *En gledelig begivenhet* ('A happy event' - in Norwegian only) and the publication of the Norwegian Directorate of Health's guide *Et trygt fødetilbud* ('Safe maternity services' - in Norwegian only). The guide and the subsequent regional discipline plans have provided a basis for developing even better described and more predictable maternity care. The quality requirements have been clarified and the requirements that apply to maternity units have been specified. Cooperation between specialist communities across institutional boundaries have helped to develop more uniform and medically documented practices.

It is therefore pleasing, and perhaps also expected, that SKDE's eighth healthcare atlas shows that overall, mothers and babies receive good and equitable health services throughout pregnancy and childbirth. This is primarily important to the women and the babies born, as it allows them to feel safe before the most important event in life. The considerable joint efforts of the specialist communities in recent years have helped us to develop a service that largely gives women and their newborn babies an equitable starting point. At the same time, these findings should motivate us to continue our improvement work and reduce variations in practice in areas where unwarranted variation is documented.

Healthcare atlases show the big picture rather than going into detail on every topic. That is also the case here. Complications such as severe perineal tears and postpartum haemorrhage have serious consequences for the people involved. Although this atlas shows that such complications are so rare that it is impossible to confirm or disprove the existence of geographical variation, there is nevertheless reason to consider one's practice if a hospital referral area seems to have a relatively high and stable level. There are other serious issues that concern small groups that cannot be investigated within the framework of a healthcare atlas. Whether these groups are given sufficient priority and receive good and equitable health services must be investigated in other ways.

The healthcare atlas shows high and unwarranted variation in postnatal care. After the mother and baby have been discharged from the maternity unit, the specialist and municipal health services share responsibility for the postnatal follow-up. The role of each party shall be formally set out in local cooperation agreements between each health trust and the surrounding municipalities. Although good services have been developed in many areas, there is too much variation both in the use of municipal services and specialist health services. This could suggest inadequate clarification of responsibilities between the specialist health service and the municipal level. Perhaps it is necessary for the health trusts and municipalities to join forces and take a critical look at the organisation and prioritisation of postnatal care.

Lars Vorland
Managing Director
Northern Norway RHA

Foreword, the Medical Birth Registry of Norway

The Medical Birth Registry of Norway (MBRN) was established in 1967 as the world's first national birth registry. The registry was established in the wake of the thalidomide disaster, where more than 10,000 children worldwide were born with limb deformities after their mothers had taken the drug Thalidomide during the first trimester of pregnancy. The purpose of the registry was to register and prevent foetal damage. Since then, the registry has made it possible to conduct research on congenital abnormalities and health problems related to pregnancy and childbirth. The results of research based on the birth registry have been vital to the great efforts made to improve antenatal and maternity care.

The MBRN contains information about all births and pregnancies that ended after week 12. The notifications of birth form the main source of information, and this notification is now integrated into the patient record systems used by Norwegian maternity units. Data from the MBRN are disclosed for research purposes, and a selection of data is presented in our statistics databank. The MBRN also submits data to the Norwegian Directorate of Health for national quality indicators for maternity care.

A great deal of work goes into the MBRN, including the reporting from maternity units and quality assurance at the Norwegian Institute of Public Health. We are very pleased to be able to use data from the MBRN in such an overall report on the health services provided during pregnancy and childbirth.

Bergen, 29 March 2019

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Summary

Main findings

- On average, pregnant women had seven or eight appointments with a midwife or their regular GP/the emergency primary healthcare service and five appointments with the specialist health service.
  There was little geographical variation in the number of antenatal appointments.
- Unwarranted variation was identified in the use of caesarean section, forceps delivery and vacuum extraction, episiotomy and epidural anaesthesia.
- No systematic geographical variation was identified in the number of complications in connection with childbirth, and there were very few such events.
- There was high and unwarranted geographical variation in the use of the specialist health service during the postnatal period, both for postpartum women and newborns.
- Taken together, the results may seem to indicate that follow-up of mother and baby during the postnatal period is not as highly prioritised or as well organised as their follow-up during pregnancy and childbirth.

The results show that pregnant women in Norway receive close and good follow-up during pregnancy and childbirth. The vast majority have one or more antenatal appointments with the specialist health service in addition to the ultrasound examination in week 17–19 of pregnancy. There is reason for the specialist community to question whether the high number of such appointments reflects an actual need or whether it might be a sign of overuse of services.

The results indicate that the threshold practised for interventions such as caesarean section, forceps delivery or vacuum extraction (suction) is more or less uniform, but that there are differences in practice when it comes to choosing between the three procedures. This results in unwarranted geographical variation in the use of caesarean section, forceps delivery or vacuum extraction.

The use of episiotomy (cutting) during childbirth is very common, and there is considerable geographical variation. The results give reason to question whether the use reflects an actual need or whether it is a sign of overtreatment.

Despite sometimes great unwarranted variation in the use of caesarean section, forceps and vacuum-assisted delivery, episiotomy and epidural anaesthesia, it has not been possible to identify any geographical variation in the occurrence of serious complications for mothers or babies.

The extent to which mothers and babies receive postnatal follow-up from the specialist health

service varies a lot between the health trusts' hospital referral areas. The observed variation is deemed to be unwarranted. When these results are seen in conjunction with the varying follow-up provided by the municipal midwife service, there is reason to question whether postpartum women have equitable access to good health services regardless of where they live.

The table below shows all patient samples in this atlas for which variation is deemed to be unwarranted.

Patient sample, ratio[a], hospital referral area with the highest and lowest rate (per 1.000).

Primiparous women	FT[a]	FT2[a]	Highest	Rate high	Lowest	Rate low
Epidural, vaginal delivery	1.9	1.8	Diakonhjemmet	636.6	UNN	339.2
Episiotomy, vaginal delivery	1.9	1.9	Telemark	431.6	Førde	224.5
Operative vaginal delivery	2.2	1.9	Stavanger	300.3	Vestfold	134.1
Caesarean section, emergency	1.9	1.6	Nord-Trøndelag	201.7	Diakonhjemmet	106.2
Caesarean section, planned	2.3	1.9	Finnmark	51.0	Bergen	21.8
Multiparous women						
Epidural, vaginal delivery	2.8	2.1	Diakonhjemmet	368.1	UNN	129.7
Episiotomy, vaginal delivery	2.7	2.2	Møre og Romsdal	122.6	St. Olavs	46.3
Operative vaginal delivery	2.2	1.8	Stavanger	68.0	Vestfold	30.4
Caesarean section, emergency	2.3	1.9	Nord-Trøndelag	116.9	Diakonhjemmet	51.8
Caesarean section, planned	2.2	1.7	Nord-Trøndelag	108.7	Bergen	49.1
Postnatal period						
Outpatient services, mother	7.4	4.6	Bergen	632.6	Stavanger	85.4
Outpatient services, newborns	6.4	3.1	Vestfold	768.3	Finnmark	119.7
Home visit by midwife	5.1	3.5	Førde	611.9	Stavanger	120.6

[a] FT=highest rate/lowest rate, FT2=second highest rate/second lowest rate

Chapter 1

Introduction

The Obstetric Healthcare Atlas is the second of two healthcare atlases in the area of gynaecology and obstetrics produced by the Centre for Clinical Documentation and Evaluation (SKDE) at the initiative of the Norwegian Society of Gynecology and Obstetrics. The first one was the Gynaecology Healthcare Atlas, which was published on 8 January 2019. For SKDE, there is no better background for a healthcare atlas than such a request from the relevant specialist community. This ensures the support of the specialist community during the work on the atlas, and contributes to it being read and used. In our work on the Obstetric Healthcare Atlas, we have again benefitted greatly from close contact with the specialist community and the Medical Birth Registry of Norway throughout the process.

The Gynaecology Healthcare Atlas was characterised by high, and sometimes very high, geographical variation. Overall, the Obstetric Healthcare Atlas has identified less variation, but we have found several cases of high and unwarranted variation in this field as well. As for the Gynaecology Healthcare Atlas, it is worth noting that an association-based discipline guide with clear guidelines and long-standing traditions does not necessarily result in low variation.

Practice recommendations have changed over the past decades in this as in other fields, and change processes take time. This could explain some of the variation observed. In other cases, the variation can be due to differences in medical tradition and assessments.

The way in which obstetric healthcare is organised has also changed over the past decade. The length of hospital stays has decreased since the Coordination Reform was implemented, and responsibility for following up postpartum women has been transferred from the specialist health service to the primary healthcare service.

It is possible that the reason for some of the variation found in the use of specialist health services during the postnatal period is that the situation has not settled yet after this process brought changes in the division of responsibility between hospitals and municipalities. It is possible that further clarification of the division of responsibility between the specialist health service and the primary healthcare service is necessary.

Chapter 2

Method

2.1 Data

The Medical Birth Registry of Norway (MBRN)

The Medical Birth Registry of Norway (MBRN) is a national health register containing information about all births in Norway. The objective of the registry is to help to clarify the causes and consequences of health problems related to pregnancy and birth, as well as to monitor the occurrence of congenital abnormalities. The MBRN was established on 1 January 1967. The registry is a source of knowledge and information about women's health in connection with pregnancy and childbirth and during the postnatal period, as well as about children's health from birth until 1 year of age.

The collection and processing of health data are regulated by the Personal Health Data Filing System Act and the Medical Birth Registry Regulations. All births and pregnancies that end after week 12 must be reported to the MBRN, including stillbirths and miscarriages. Maternity units and health personnel that assist in connection with births outside healthcare institutions are obliged to report information to the MBRN by filling in a birth notification form.

The notification form has developed through the MBRN's history, from various paper versions to the gradual introduction of different electronic versions. Today, the information to be entered in the birth notification is retrieved from two specific patient record systems (Partus and Natus) used at maternity units and sent electronically on discharge from the unit.

The notification form contains information about the identity of the baby and its parents, and about the mother's health before and during pregnancy and any complications in connection with the pregnancy and/or birth. Examples of such information include the mother's illness during pregnancy, interventions or other action taken during the birth, complications during the birth, postpartum complications in the mother, whether it was a live birth or stillbirth, any congenital diseases or abnormalities in the child. Some information, such as the mother's height and weight, smoking habits and use of medication, is transferred from the antenatal care record card (*'Helsekort for gravide'*) or is obtained from the mother. The woman can refuse to have information about smoking habits registered in the MBRN.

A guide to completing the notification to the Medical Birth Registry of Norway has been produced and is available on the website of the Norwegian Institution of Public Health. The purpose of the guide is to contribute to quality assurance of the electronic reporting of births by specifying the

content of the notification form, defining the fields and explaining how to fill in values. Some fields are mandatory, others are not. The degree of reporting will therefore vary for different information.

The analyses of factors relating to childbirth, such as induction, pain relief, delivery method, bleeding and the condition of the newborn, are based on data from the MBRN. Aggregate data sets for the topics in questions have been disclosed to SKDE. For more information about what the MBRN contains and definitions of variables, see www.fhi.no/hn/helseregistre-og-registre/mfr/.

The Norwegian Patient Registry (NPR)

The description of the specialist health service's activities relating to pregnancy and the postnatal period is based on data from the Norwegian Patient Registry (NPR). NPR contains information about publicly funded specialist health service activities only. NPR has disclosed indirectly identifiable personal health data for the years 2013–2017 to SKDE pursuant to the provisions of the Personal Health Data Filing System Act Section 20 under a licence from the Norwegian Data Protection Authority dated 6 April 2016. Since 20 July 2018, the basis for the processing of data has been the General Data Protection Regulation Article 6(1) letter (e) and Article 9(2) letter (j). SKDE has sole responsibility for the interpretation and presentation of the disclosed data. NPR has no responsibility for analyses or interpretations based on the data.

Control and payment of reimbursements to health service providers (KUHR)

The description of the activities of regular GPs (RGPs), the emergency primary healthcare service and municipal midwives is based on data from the settlement system for control and payment of reimbursements to health service providers (KUHR). Aggregate data sets for the mother's pregnancy-related RGP, emergency primary healthcare service or midwife contacts and her postnatal RGP or emergency primary healthcare service contacts have been disclosed to SKDE.

Statistics Norway

Figures for 'Home visits by midwife within three days after the woman and child's return from the maternity/maternity ward' and 'Born during the year', as well as 'First-time home visits to newborns' for municipalities are obtained from Statistics Norway's StatBank.

2.2 Hospital referral areas

The regional health authorities have a responsibility to provide satisfactory specialist health services to the population in their catchment area (cf. the Specialist Health Service Act Section 2-1a and Section 2-2 and the Health Authorities and Health Trusts Act Section 1). In practice, it is the individual health trusts and private providers under a contract with a regional health authority that provide and perform the public health services. Each health trust has a hospital referral area that includes specific municipalities or city districts. Different medical disciplines can have different hospital referral areas, and for some services, functions are divided between

different health trusts and/or private providers. The Obstetrics Healthcare Atlas uses the general hospital referral areas for specialist health services for medical emergency care.

Table 2.1 shows the health trusts or hospitals for which hospital referral areas have been defined and the short versions of the names used in this healthcare atlas. Table C.1 in Appendix C contains a complete list of the municipalities and city districts that belong to the different hospital referral areas. With some exceptions,[1] the hospital referral areas are defined in the same way as in the analyses in SAMDATA spesialisthelsetjenesten (Rønningen et al. 2016).

Table 2.1: Hospital referral areas and short names used in the text and figures

Hospital referral area for	Short name
Northern Norway Regional Health Authority	
Finnmark Hospital Trust	Finnmark
University Hospital of Northern Norway Trust	UNN
Nordland Hospital Trust	Nordland
Helgeland Hospital Trust	Helgeland
Central Norway Regional Health Authority	
Helse Nord-Trøndelag health trust	Nord-Trøndelag
St. Olavs Hospital Trust	St. Olavs
Helse Møre og Romsdal health trust	Møre og Romsdal
Western Norway Regional Health Authority	
Helse Førde health trust	Førde
Helse Bergen health trust	Bergen
Helse Fonna health trust	Fonna
Helse Stavanger health trust	Stavanger
South-Eastern Norway Regional Health Authority	
Østfold Hospital Trust	Østfold
Akershus University Hospital Trust	Akershus
Oslo University Hospital Trust	OUS
Lovisenberg Diaconal Hospital	Lovisenberg
Diakonhjemmet Hospital	Diakonhjemmet
Innlandet Hospital Trust	Innlandet
Vestre Viken Hospital Trust	Vestre Viken
Vestfold Hospital Trust	Vestfold
Telemark Hospital Trust	Telemark
Sørlandet Hospital Trust	Sørlandet

Publicly funded non-commercial private hospitals, such as Lovisenberg Diaconal Hospital, Diakonhjemmet Hospital and Haraldsplass Diaconal Hospital, are considered public hospitals. These hospitals have long-term agreements with the regional health authorities to fulfil certain local hospital functions, and they have their own referral areas. In this healthcare atlas, we have defined separate hospital referral areas for Lovisenberg Diaconal Hospital and Diakonhjemmet Hospital, while Haraldsplass Diaconal Hospital's referral area is included in the Bergen area.

[1] In this atlas, contacts for which the city district in Oslo is unknown have been assigned to OUS hospital referral area.

2.3 Age-adjusted rates

Since we want to compare the use of health services in geographical areas with different age compositions, we use age-adjusted rates. The rates are calculated per 1,000 pregnant women, births, postpartum women or newborns. Annual rates and an average rate for the period 2015–2017 are calculated per hospital referral area.

The unadjusted rate for an event in a hospital referral area is calculated as follows:

$$\frac{\text{Number of events in the hospital referral area}}{\text{Number at risk of the event in the hospital referral area}}$$

Due to the low number of events in some samples, indirect standardisation is used in this healthcare atlas to adjust the rates for age. The expected number of events for each age group[2] is calculated for each hospital referral area by multiplying the national age-specific rates by the number of persons in each age group. The expected number of events from each age group is then added up. The difference between the observed number of events and the expected number of events shows whether the rate for the hospital referral hospital, taking into account differences in the age composition, is lower (at a ratio below 1) or higher (at a ratio above 1) than the national average rate. The age-adjusted rate is calculated by multiplying the ratio by the national rate.

The age-adjusted rate per inhabitant for an event in a hospital referral area j is calculated as follows:

$$Rate_j = \frac{\sum_{i=1}^{K} n_{ij}}{\sum_{i=1}^{K} (N_{ij} \cdot r_{iN})} \cdot r_N,$$

where n_{ij}, N_{ij}, r_{iN}, r_N and K are defined as follows:

n_{ij} number of events in hospital referral area j and age group i
N_{ij} number at risk of the event (e.g. number of births) in hospital referral area j and age group i
r_{iN} the national rate for age group i
r_N the total national rate (total for all age groups)
K number of age groups (in this atlas, 3)

2.4 Definitions

Episode of care

A patient can be assessed, treated or followed up in several different departments at a hospital or transferred between different hospitals. In order to be able to count patients in a consistent manner regardless of transfers between departments and hospitals, we have defined the term ‘episode of care’.

[2] In the analyses based on data from NPR and KUHR, age groups are defined in such a way that there are about the same number of events in each age group. The age group division will consequently vary between patient samples. In the analyses based on data from the MBRN, fixed separate age groups are used for primiparous women (≤26, 27–30, ≥31 years) and multiparous women (≤ 29, 30–33, ≥ 34 years).

All hospital contacts where the time of registration is less than eight hours after the time of discharge from a previous contact for the same patient are defined as an episode of care (Hassani et al. 2015; Hansen et al. 2016). This means that all contacts that are less than eight hours apart count as one episode of care, regardless of whether the stays took place in the same or different hospitals.

Examples of an episode of care:

- a patient is admitted to one department, transferred to another department at the same hospital and discharged
- a patient is admitted to a local hospital, transferred to a university hospital and transferred back to the local hospital without having been discharged or with less than eight hours between discharge and the next admission
- a patient has one outpatient contact

This healthcare atlas presents the number of episodes of care defined as either a *postnatal readmission* or an *outpatient contact*. Postnatal readmission and outpatient contacts are defined as episodes of care in aggregate data as described below.

Outpatient contacts

The term *outpatient contact* is used to describe the following episodes of care:

- outpatient contacts in hospital
- outpatient contacts with specialists in private practice under public funding contracts
- day patient treatments
- department stays where a patient was admitted and discharged, alive, on the same day

Postnatal readmission

In this healthcare atlas, a postnatal readmission (of the mother or the newborn) is defined as an admission that takes place no earlier than one day after discharge from the maternity stay, regardless of the reason for the admission. An admission is defined as an episode of care with a duration of 24 hours or more. The atlas presents the number of readmissions during the postnatal period, defined as the first six weeks after birth (see page 19).

2.5 Contacts during pregnancy and the postnatal period

Antenatal appointments

Antenatal appointments with the specialist health service

We calculate the average number of appointments with the specialist health service per pregnancy for each hospital referral area. This calculation is based on an event history analysis where we follow women who have given birth during the period from 1 January 2015 to 31 December 2017 back in time from the date of birth to 255 days (approx. 8.5 months) before the birth. This

roughly corresponds to the date of the missed menstruation for an average menstrual cycle and a pregnancy of average duration. The data come from NPR.

In the analyses, the date of birth is defined as the date of admission[3] for the maternity stay.

A maternity stay is defined as an episode of care (see Chapter 2.4) for which one of the following diagnosis codes for outcome of delivery is registered:

Single birth	Twins		Other multiple births	
Z37.0	Z37.2	Z37.3	Z37.5	Z37.6

All contacts (except for the maternity stay) registered with one or more of the diagnosis or procedure codes listed in Table E.1 and E.2 in Appendix E in the Norwegian version of the report, are included in the analysis. Some women have given birth twice during the period in question, and each of their pregnancies are considered separately.

When we calculate the number of antenatal appointments with the specialist health service per pregnancy, all appointments for one pregnancy will be assigned to the year when the birth took place in order to ensure that the numerator (the number of appointments) and denominator (the number of pregnancies/births) 'belong together' in that they relate to the same pregnancies.

Antenatal appointments with the primary healthcare service

Chapter 4.1 *Antenatal care* includes figures for the activities of municipal midwifes, RGPs and the emergency primary healthcare service. We calculate the average number of antenatal appointments with RGPs/the emergency primary healthcare service and midwives per pregnancy for each hospital referral area. The sample is described in Appendix E in the Norwegian version of the report. The data come from the KUHR database.

When calculating the number of antenatal appointments per pregnancy with RGPs/the emergency primary healthcare service and midwives, we assign all appointments to the year in which they took place. The reason for this is that we only have aggregate data from KUHR. Since we use the same denominator to calculate the number of appointments with RGPs/the emergency primary healthcare service and midwives per pregnancy as we use to calculate the number of antenatal appointments with the specialist health service per pregnancy, the numerator (the number of appointments) and denominator (the number of pregnancies/births) will not 'belong together', as only a certain proportion of the appointments that took place during a given year will relate to a birth in the same year.

This means that the calculated number of antenatal appointments per pregnancy with the specialist health service and with RGPs/the emergency primary healthcare service and midwives are not entirely comparable. However, the birth numbers (number of births per year) did not change much during the period 2015–2017, and the average number of antenatal appointments per pregnancy is not expected to have changed much during the period either, so this is unlikely to be a material source of error.

[3] When we count antenatal appointments, the date of birth is defined as the date of admission for the maternity stay, but when we count contacts during the postnatal period, the date of birth is defined as the date of discharge from the maternity stay. This is done to ensure that we do not under any circumstances include any outpatient contacts registered *during* the maternity stay.

Mothers' contact with the health service during the postnatal period

Mothers' contact with the specialist health service

We calculate:

- the number of women who had at least one outpatient contact during the postnatal period per 1,000 births
- the number of women who had at least one readmission during the postnatal period per 1,000 births
- the number of outpatient contacts for mothers during the postnatal period per 1,000 births

This calculation is based on an event history analysis that has followed women for six weeks (42 days) from the date on which they gave birth. In the analyses, the date of birth is defined as the date of discharge[4] from the maternity stay. The maternity stay is defined in the same way as in the analysis for antenatal appointments (see the section above). The data come from NPR.

We have included in our analysis all contacts starting no earlier than one day after and no later than 42 days after the birth (date of discharge from the maternity stay). Some women have given birth twice during the three-year period in question, and each of their pregnancies and postnatal periods are considered separately. Ten per cent of admissions within these six weeks were coded as planned, but many were registered with a diagnosis code consistent with an acute condition such as sepsis, infection, haemorrhage etc. We have therefore defined both emergency and planned admissions as readmissions.

Uncertain coding quality makes it impossible to use diagnosis or procedure codes to select only the contacts that are related to childbirth and the postnatal period. Therefore, all outpatient contacts with the specialist health service during the first six weeks after childbirth have been included in the analysis. The analyses will therefore also include some contacts not related to childbirth and the postnatal period. They are assumed to be relatively evenly distributed between hospital referral areas and should not constitute a material source of error in terms of geographical variation.

Mothers' contacts with their RGP/the emergency primary healthcare service

In Chapter 4.12 *The postnatal period* we have also included contacts with the women's regular GPs and the emergency primary healthcare service. We calculate:

- the number of contacts with their RGP/the emergency primary healthcare service per 1,000 births
- the number of postpartum women who had at least one contact with their RGP/the emergency primary healthcare service per 1,000 births

The sample is described in Appendix F in the Norwegian version of the report. The denominator (the number of births) is the same as we use to calculate the number of outpatient contacts for mothers during the postnatal period per 1,000 births. The data come from the KUHR database.

Newborn babies' contact with the health service during the postnatal period

Newborn babies' contact with the specialist health service

We calculate:

- the number of newborns who had at least one outpatient contact during the postnatal period per 1,000 newborns
- the number of newborns who had at least one readmission during the postnatal period per 1,000 newborns

This calculation is based on an event history analysis where liveborn babies were followed for 42 days from their date of birth. The analysis includes outpatient contacts and readmissions starting no earlier than one day after discharge from the maternity stay and no later than 42 days after the date of birth. Outpatient contacts registered during the maternity stay are not included in the calculated number of outpatient contacts. The same principle applies to outpatient contacts registered during readmissions, where only the readmission is counted. The data come from NPR.

Some newborns are not registered in NPR on their date of birth. Potential reasons include home births, transport births and uncertainty regarding coding quality. If a newborn's first admission or outpatient contact begins at between one and three days of age and is coded with the diagnosis code for liveborn infant (Z38), this stay/contact will be registered as the maternity stay. The number of outpatient contacts and readmissions is calculated in the same way as for newborns registered on their date of birth.

Home visit by a municipal midwife

Chapter 4.12 *The postnatal period* contains two figures that show:

- home visits by midwives within three days of discharge from the maternity unit
- newborns who have received a home visit from a midwife or health visitor within two weeks of discharge

The data come from Statistics Norway (see page 14). The data for many municipalities could not be made public because they had three or fewer events. Where data are missing because there were too few events, we have assumed that the number of events was 3. This will result in a slight overestimation of the total number of events, but is not expected to have any material impact on the results.

2.6 Assessment of variation

The observed variation comprises random and systematic variation. There is no single measurement that can tell us whether the observed variation is large or small, or warranted or unwarranted. The ratio between the extremes is often used as an indication of whether the observed variation is large or small. If there is twice as many events in one hospital referral area as in another, that will often be described as high or substantial variation.

At the same time, the number of events and the size of the denominators must be taken into consideration. Small numbers mean a larger element of random variation. In cases where numbers are very small, the random variation will dominate to such an extent that it will be impossible to determine whether the observed variation contains a systematic component or is wholly due to random variation. Generally speaking, the proportion of the total variation that is due to chance will be smaller the greater the denominators, the more events, the fewer hospital referral areas and the smaller the difference between the denominators in the different hospital referral areas.

It is reasonable to expect the need for the services included in this healthcare atlas to be the same regardless of where the patients live. If the health services are equitably distributed in the population, we would therefore expect little geographical variation in their use, other than random variation. When the observed variation does not tally with these expectations and the element of random variation is not too large taking variation from one year to the next and the size of the samples into account, we can assume that some of the observed variation is unwarranted. The term *unwarranted variation* refers to the part of the observed variation that is not due to chance, patient preferences or differences in underlying morbidity. The overall assessment includes elements of discretionary judgement.

A more through description of the assessment of variation in the use of health services can be found in the Healthcare Atlas for the Elderly in Norway (Balteskard et al. 2017) and in the report *Indikatorer for måling av uberettiget variasjon* (SKDE 2016).

Chapter 3

Births in Norway 2015–2017

This chapter provides a general description of the births and mothers included in the Obstetric Healthcare Atlas. Among other things, we describe how the births break down by the health trusts' hospital referral areas, variation between years in the number of births, geographical variation in the occurrence of breech presentation, the average age of first-time mothers and geographical variation in the prevalence of overweight and obesity in mothers.

3.1 Births

Number of births broken down by hospital referral area

Over the past decade, the number of births registered in the MBRN has decreased from 60,371 in 2008 to 56,547 in 2017. The greatest decrease was from 2016 to 2017. During the three-year period studied in this healthcare atlas (2015–2017), the MBRN registered an average of 58,198 births per year, of which 57,572 (98.4%) are included in the Obstetric Healthcare Atlas. About 700 births per year were excluded because the mother had no known residence in Norway or because the child had a birth weight of under 500 grams or was stillborn.

The results in the chapters on antenatal care and the postnatal period are primarily based on information about women who gave birth and newborns registered in NPR. During the period 2015–2017, an average of 57,117 births per year were registered with at least one liveborn child and a mother with a known residence in Norway. These births resulted in 60,137 registered newborns per year with known residence in Norway.

Figure 3.1 shows the average number of births registered in the MBRN per year for the period 2015–2017 broken down by the mother's residence by the geographical areas that make up the health trusts' general hospital referral areas for medical emergency care (see Chapter 2.2 and Appendix C). From here on, the hospital referral areas will be referred to using their short names (see Chapter 2.2), meaning that 'residents of the hospital referral area of the University Hospital of Northern Norway Trust' will be shortened to 'residents of UNN hospital referral area'.

The highest number of births was found in the hospital referral areas of Bergen and Akershus (approx. 5,400 per year), while the areas of Helgeland and Finnmark had the lowest number of births (approx. 750 per year).

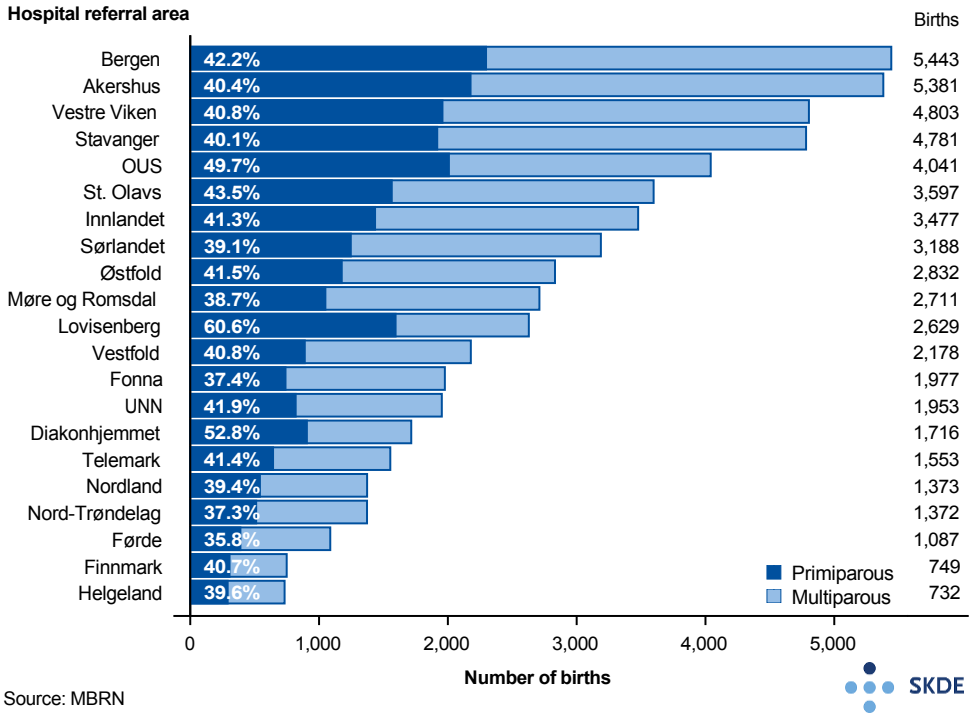


Figure 3.1: Number of births in the Obstetric Healthcare Atlas broken down by primiparous and multiparous women. Average per year for the period 2015–2017, broken down by hospital referral area.

Variation through the year

Figure 3.2 shows the average number of births registered in NPR per day and per week. The numbers are highest in the period from April to August, with the fewest births around the New Year. The average for July is 173 births per day, while for December the average is 131. However, there was considerable variation from day to day.

Around New Year, we see a leap from an average of 126 births per day in week 52 to an average of 149 births per day in week 1. One possible explanation is that planned caesarean sections (on average 3,220 per year, or approx. 9 per day) are usually not scheduled for the week between Christmas and New Year's Eve, but instead delayed until the New Year.

Parity

In this healthcare atlas, we will use the term primiparous women to refer to women who are pregnant and give birth for the first time, and multiparous women to refer to women who have given birth at least once before.

For Norway as a whole, the mother was primiparous (first-time mother) in 42.5% of births, secundiparous (second-time mother) in 36.9% of births and tertiparous or more (third child or more) in 20.6% of births (Figure 3.3). The proportion of births to a primiparous mother was considerably higher for the hospital referral areas of Lovisenberg, Diakonhjemmet and OUS than for the rest of Norway.

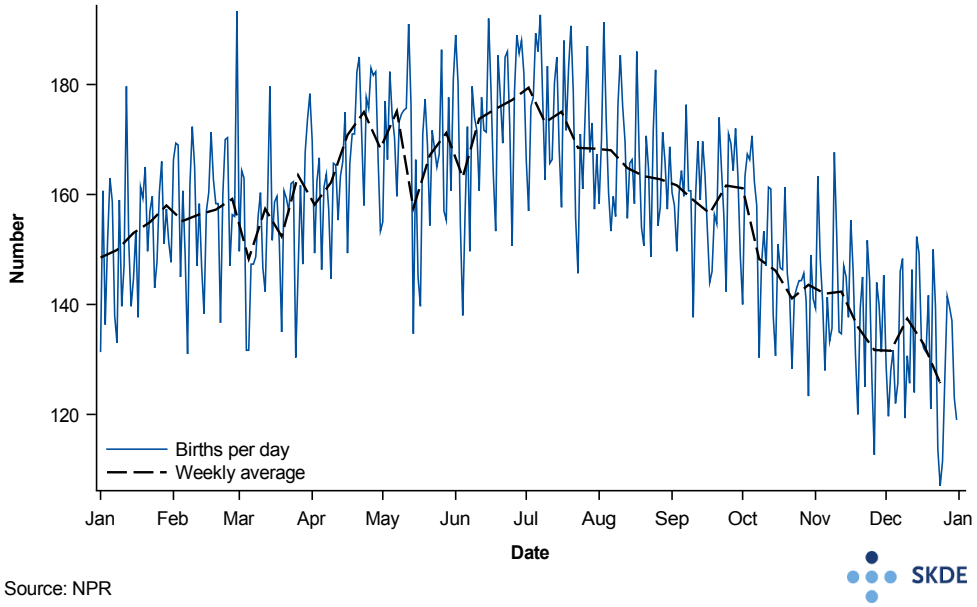


Figure 3.2: Variation through the year. Number of births per day and per week through the year. Average for the period 2015–2017.

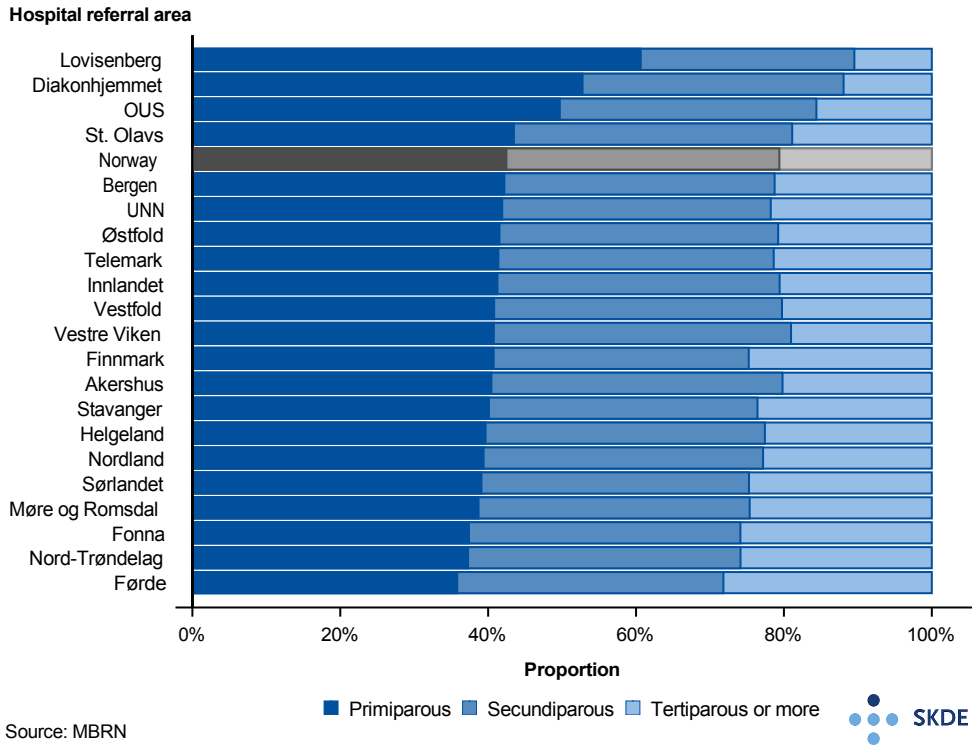


Figure 3.3: Number of births where the mother was primiparous, secundiparous or tertiparous or more. Average per year for the period 2015–2017, broken down by hospital referral area.

Multiple births

The proportion of births where two or more (multiple) children were born was 1.6% for Norway as a whole (data not shown). The proportion varied from 1.0% to 1.8% between hospital referral areas, and there was considerable variation between years for each area. This indicates that the observed variation was mostly random variation and that the proportion of multiple births was evenly distributed geographically in Norway.

Breech presentation

Figure 3.4 shows that the baby was in the breech position for 4.0% of all births in Norway. The proportion varied from 3.0% in Nord-Trøndelag hospital referral area to 5.2% in the Diakonhjemmet area. Despite some variation from year to year within hospital referral areas, it appears that breech presentation was slightly more common in the hospital referral areas in the Oslo region compared with the rest of the country. This is consistent with the fact that breech presentation occurs more frequently in primiparous women and that its frequency increases with the mother's age regardless of parity (Albrechtsen et al. 1998). Data showing when external cephalic version has been used to turn the baby from a breech into a head-down position are not available for analysis.

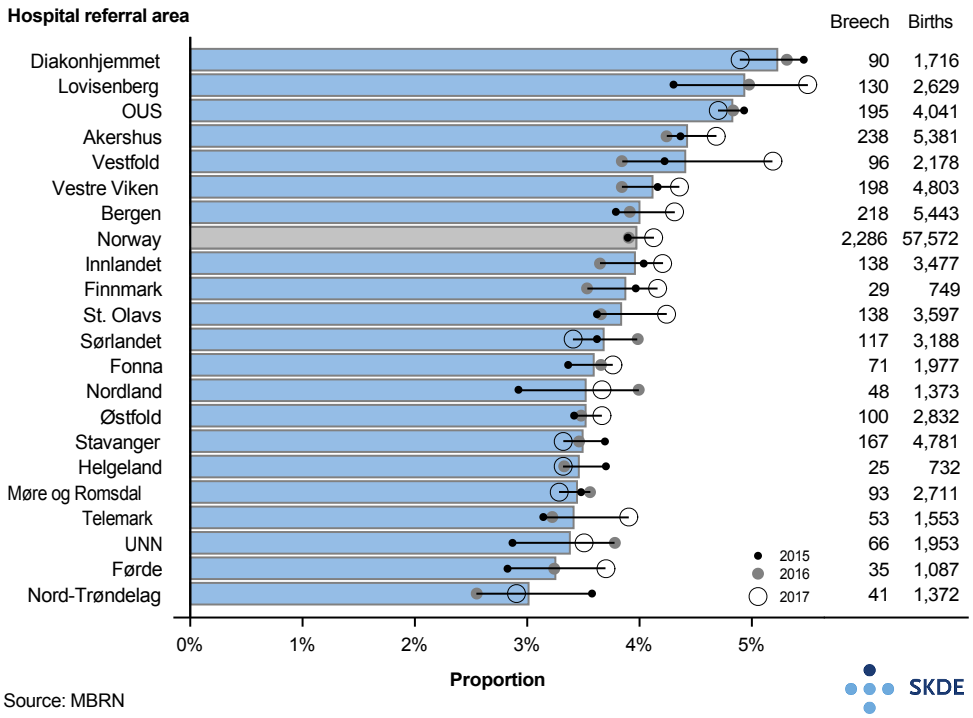


Figure 3.4: Proportion of births where the child was in the breech position when labour began. Number of breech deliveries and total number of births on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Births before the 37th week of pregnancy

For Norway as a whole, 5.4% of births took place before the 37th week of pregnancy (data not shown). The proportion varied between hospital referral areas, from 4.5 to 6.7%, and there was

some variation from one year to the next within each hospital referral area. This indicates that the proportion of births before the 37th week of pregnancy is more or less the same throughout Norway.

3.2 Mothers

Age when giving birth for the first time

The average age of first-time mothers was 28.6 years. The average age varied between hospital referral areas, from 26.7 years to 31.9 years (Figure 3.5). Women resident in the Oslo region were considerably older when giving birth for the first time than women in other parts of Norway.

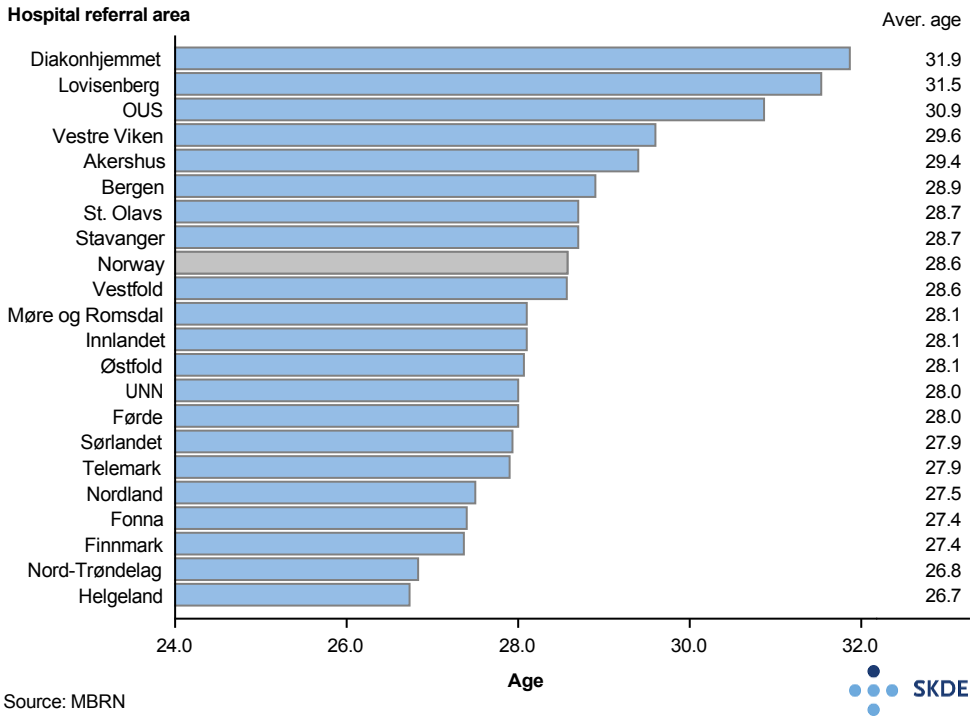


Figure 3.5: Average age for primiparous women during the period 2015–2017, broken down by hospital referral area.

Proportion of mothers aged 39 years or older

In 5.6% of all births, the mother was 39 years or older (Figure 3.6). The proportion varied from 3.3% in Helgeland hospital referral area to 8.7% in the Diakonhjemmet area. The proportion of women who were 39 years or older when they gave birth was higher for women resident in the Oslo region than for women in other parts of Norway.

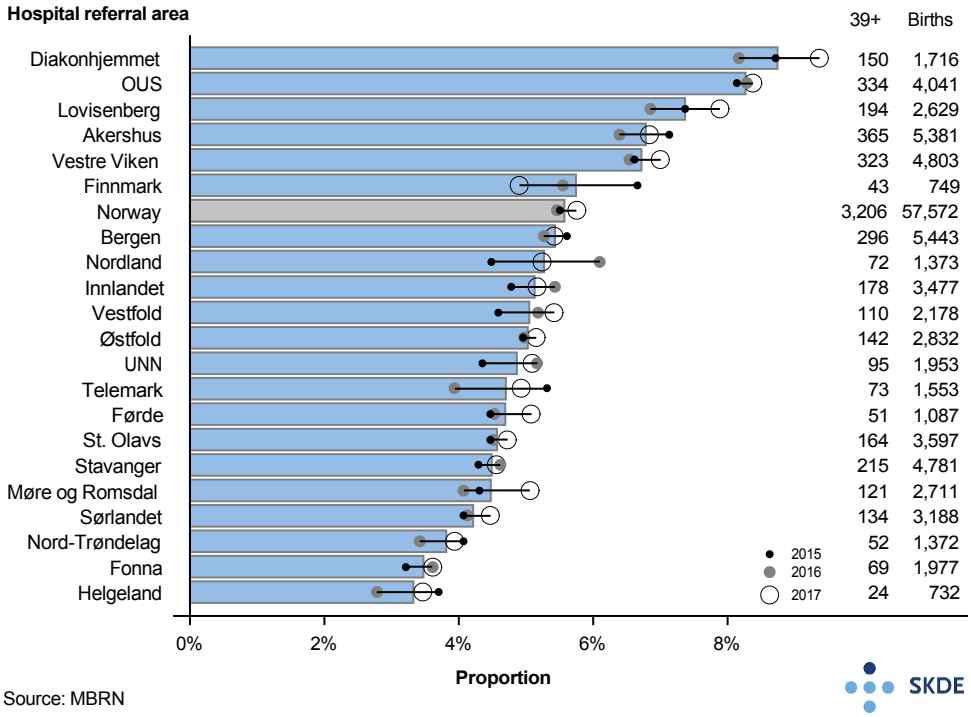


Figure 3.6: Proportion of births where the mother was 39 years or older. Proportion of births where the mother was 39 years or older and total number of births on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Overweight mothers

At the start of the pregnancy, 30% of women expecting their first child had a body mass index (BMI) of 25 kg/m2 or more (overweight by the World Health Organization's definition) (Figure 3.7). One in ten women had a BMI of 30 kg/m2 or more (obesity).

As many as 37% of pregnant women who were not first-time mothers were overweight at the start of the pregnancy (Figure 3.8). Of the multiparous women, 13% were obese.

Information about BMI before pregnancy was lacking for 18% of mothers. The proportion varied between hospital referral areas from under 5% in the Stavanger area to more than 50% in the areas of Nord-Trøndelag and St. Olavs. It is uncertain whether the mothers who had information about their BMI before pregnancy are representative for the birth population, so the figures for different hospital referral areas are not necessarily comparable. The figures indicate that the proportion of women who were overweight or obese before pregnancy was somewhat lower in the hospital referral areas in the Oslo region than in the rest of Norway.

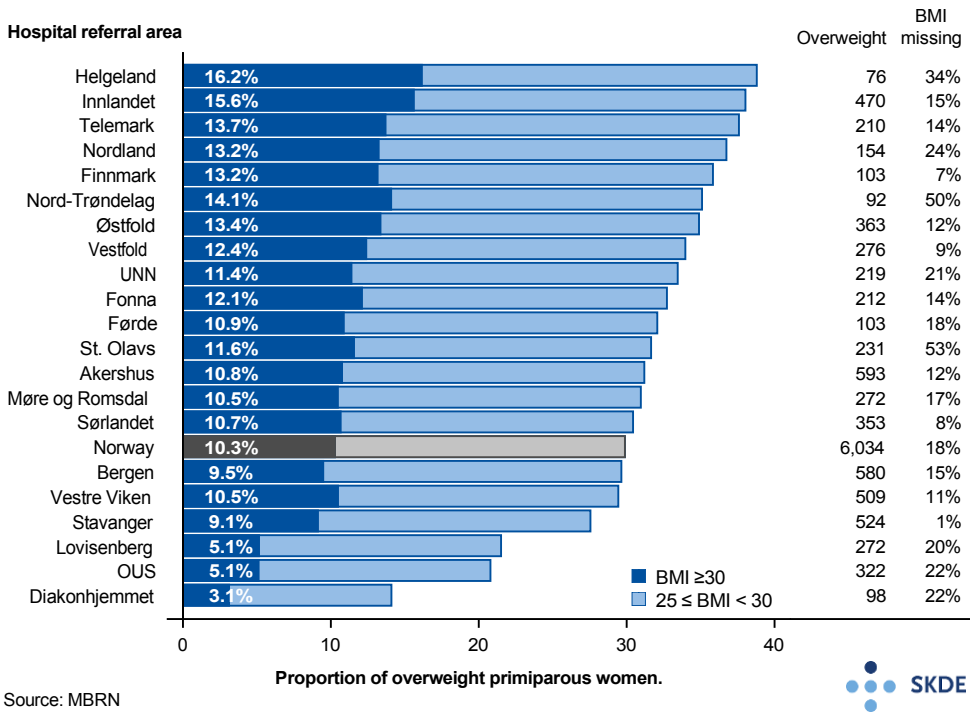


Figure 3.7: Proportion of overweight (BMI of 25 or more at the start of the pregnancy) primiparous women, adjusted for age. Number of overweight/obese women and proportion of births for which no pre-pregnancy BMI is provided on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

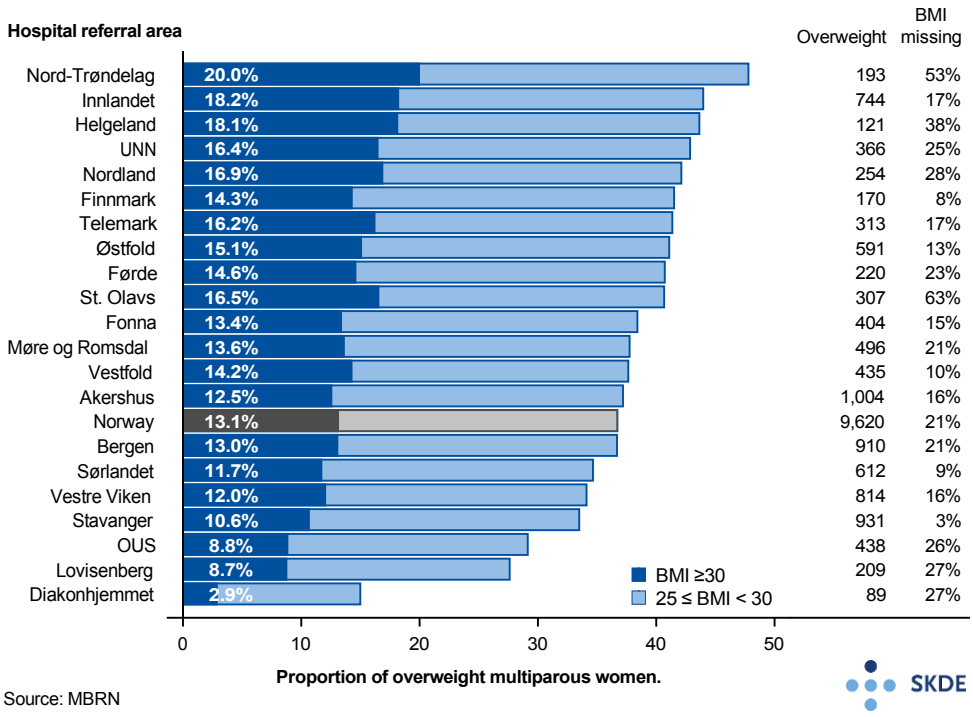


Figure 3.8: Proportion of overweight (BMI of 25 or more at the start of the pregnancy) multiparous women, adjusted for age. Number of overweight/obese women and proportion of births for which no pre-pregnancy BMI is provided on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Mother's country of birth

Around one in three women who gave birth in Norway during the period 2015–2017 were not born in Norway. For Norway as a whole, 28.9% of primiparous and 29.6% of multiparous women were born abroad. The proportion of primiparous women born abroad varied from around 20% in Nord-Trøndelag hospital referral area to nearly 40% in the Akershus area. More than 40% of multiparous women giving birth in Lovisenberg, Akershus and OUS hospital referral areas were born abroad.

For Norway as a whole, half of the women who were not born in Norway were born either in Africa or the Middle East or in Central or Eastern Europe or Central Asia (Figures 3.9 and 3.10). For primiparous women, no hospital referral area had a significantly higher proportion of women from any particular region giving birth. For multiparous women, the areas of Lovisenberg, Akershus and OUS had a high proportion of non-Norwegian-born mothers in general. More than 20% of multiparous women resident in Lovisenberg hospital referral area were themselves born in Africa or in the Middle East.

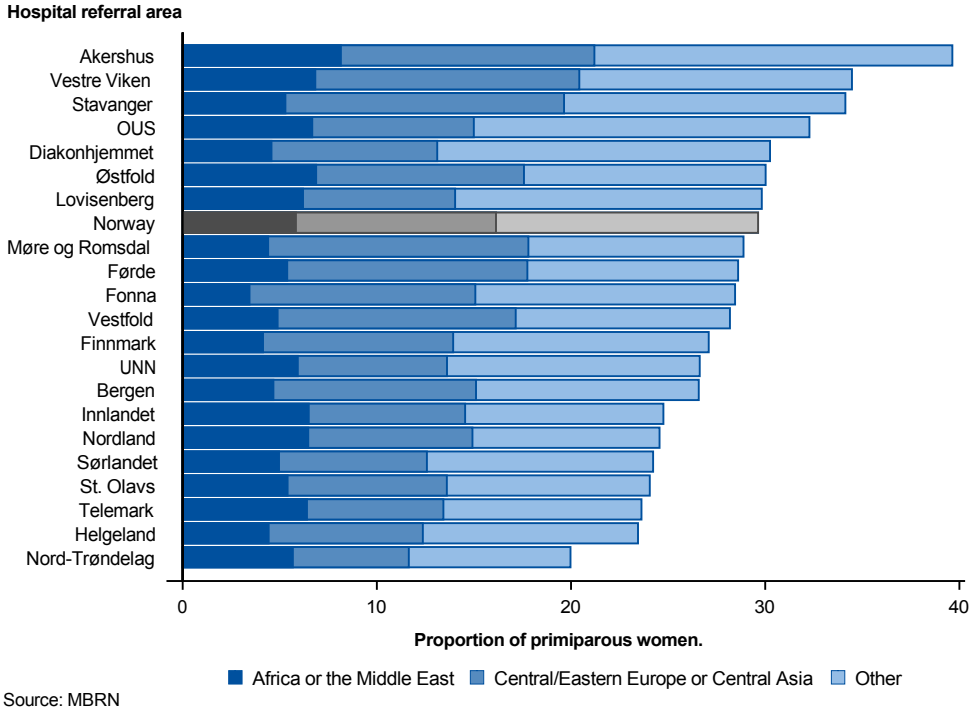


Figure 3.9: Mother's country of birth. Proportion of primiparous women born in Africa or the Middle East, Central Europe, Eastern Europe or Central Asia or other countries (Other), adjusted for age. Average per year for the period 2015–2017, broken down by hospital referral area.

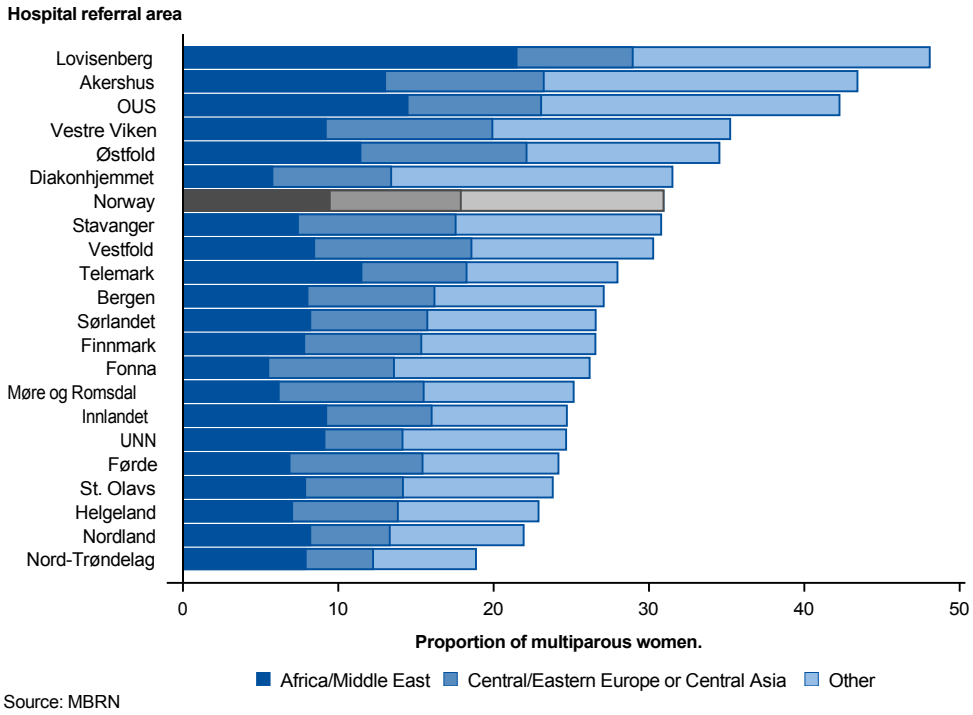


Figure 3.10: Mother's country of birth. Proportion of multiparous women born in Africa or the Middle East, Central Europe, Eastern Europe or Central Asia or other countries (Other), adjusted for age. Average per year for the period 2015–2017, broken down by hospital referral area.

Risk of obstetric complications based on Robson Groups

Robson's Ten Group Classification System is a simple system that classifies all women giving birth into one of ten mutually exclusive groups.

The Robson groups are as follows:

1. Primiparous women with a single cephalic pregnancy, > 37 weeks gestation in spontaneous labour
2. Primiparous women with a single cephalic pregnancy, > 37 weeks gestation who had labour induced (2a) or were delivered by caesarean section before labour (2b)
3. Multiparous women with a single cephalic pregnancy, > 37 weeks gestation in spontaneous labour
4. Multiparous women with a single cephalic pregnancy, > 37 weeks gestation who had labour induced (4a) or were delivered by caesarean section before labour (4b)
5. All multiparous women with at least one previous caesarean section with a single cephalic pregnancy, > 37 weeks gestation
6. All primiparous women with a single breech pregnancy
7. All multiparous women with a single breech pregnancy
8. All multiple pregnancies
9. All women with a single pregnancy with a transverse or oblique lie

10. All women with a single cephalic pregnancy < 37 weeks gestation

Primiparous women can be placed in Robson groups 1, 2a, 2b, 6, 8, 9 and 10, while multiparous women can be placed in groups 3, 4a, 4b, 5, 7, 8, 9 and 10. The system is much used to analyse the use of caesarean section (how the use of emergency caesarean sections is distributed between the ten groups), the outcome for the baby (e.g. Apgar score, a vitality index) and complications in the mother such as damage to the anal sphincter (sphincter rupture) or postpartum haemorrhage > 1,500 ml.

Figure 3.11 shows that, for Norway as a whole, 65% of primiparous women were placed in Robson group 1, 22% were placed in group 2a, and 13% were assigned to other Robson groups. There were only minor differences between hospital referral areas. Figure 3.12 shows that 60% of multiparous women were placed in Robson group 3, 15% were placed in group 4a, and 25% were assigned to other Robson groups in Norway as a whole. Again, there were only minor differences between hospital referral areas.

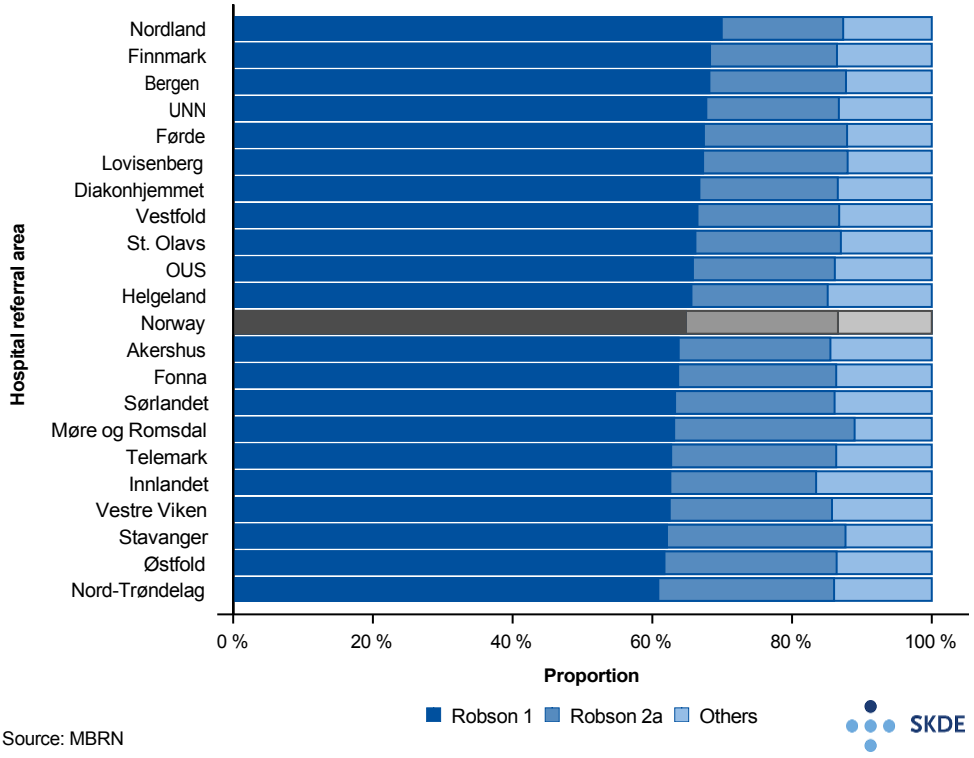


Figure 3.11: Proportion of primiparous women assigned to Robson groups 1, 2a and others, adjusted for age. Average per year for the period 2015–2017, broken down by hospital referral area.

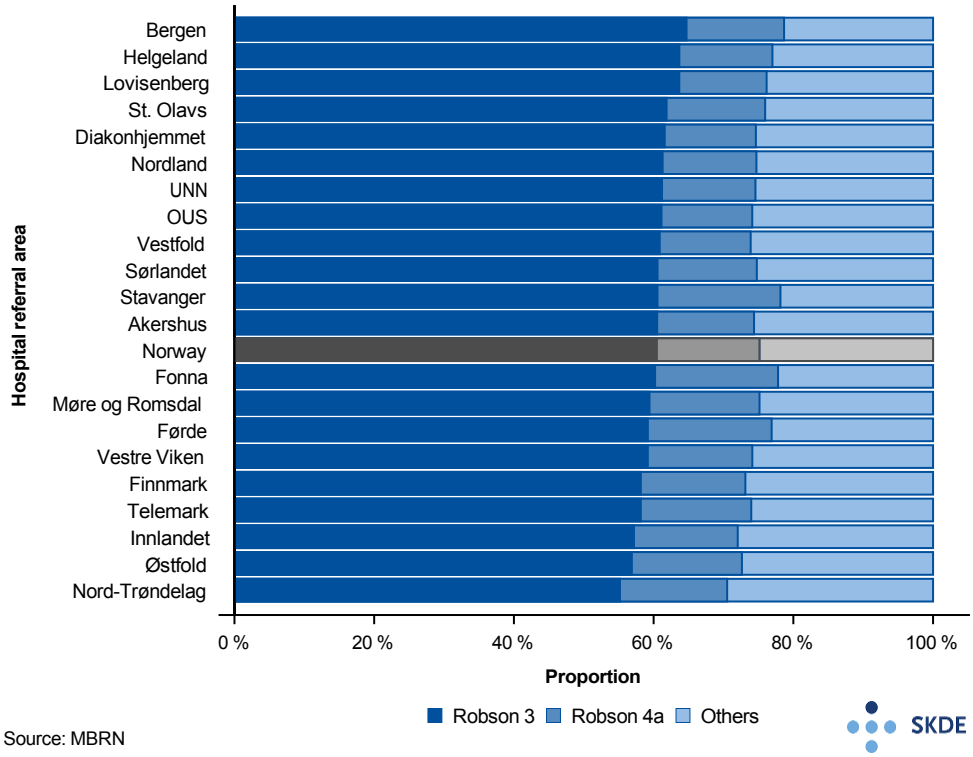


Figure 3.12: Proportion of multiparous women assigned to Robson groups 3, 4a and others, adjusted for age. Average per year for the period 2015–2017, broken down by hospital referral area.

Chapter 4

Results

4.1 Antenatal care

All pregnant women are entitled to antenatal care. This care is free of charge, and the purpose is to prevent serious complications and illness for both mother and baby in the short and long term. The primary healthcare service is responsible for antenatal care, and it is up to the pregnant women themselves to choose whether to have their antenatal appointments with their GP or a midwife. In some cases, specialists in private practice under public funding contracts provide antenatal care for healthy women with a normal pregnancy.

The national guidelines for antenatal care (‘*Nasjonal faglig retningslinje for svangerskapsomsorgen’*) (Helsedirektoratet 2018b) recommend that pregnant women with a normal pregnancy are offered a basic programme of eight appointments including an ultrasound scan. More frequent appointments are recommended in cases where abnormal conditions are identified or if the woman has any illnesses or other significant risk factors, such as hypertension, diabetes, complications in connection with previous pregnancies and births, use of medication or alcohol, or has psychosocial problems. It is recommended that the first antenatal appointment takes place at an early stage of the pregnancy (week 8-12) in order to provide guidance on a healthy lifestyle and identify any risks relating to the pregnancy. The second appointment (usually in week 17–19) is an ultrasound scan. The purpose of this appointment is to estimate the due date as accurately as possible. In addition, the number of foetuses is determined and the position of the placenta and the anatomy of the foetus are checked. It is possible to find out the sex of the baby. The results of tests and consultations are documented in the antenatal care record card (‘*Helsekort for gravide’*). These notes are kept on paper and held by the woman herself, but data from the antenatal care record are regrettably usually not available for other purposes.

Women with an increased risk of severe foetal abnormalities or who are very anxious may be offered an early ultrasound scan. Prenatal diagnostic testing is routinely offered to all women over the age of 38 and other groups at risk of genetic conditions or disorders. At the early stages of pregnancy, it may sometimes be necessary to perform an ultrasound scan to determine whether the pregnancy is still intact, for example in connection with bleeding. Ultrasound scans are also performed if an ectopic pregnancy is suspected. The purpose of later antenatal appointments is to monitor the health and development of the mother and baby. After the 40th week of pregnancy, pregnant women are referred to a maternity unit for a check-up after 7-9 days. The responsibility for further follow-up and, if relevant, induction of labour is transferred to the hospital.

In addition to foetal abnormalities, the antenatal appointments also aim to identify conditions that may make it necessary to refer the woman to a specialist or a maternity outpatient clinic. Among other things, the pregnant woman's blood pressure is closely monitored, as high blood pressure can be a sign of pre-eclampsia. Urine tests for signs of infection, protein and glucose are intended to identify women with undiagnosed diabetes and those who develop diabetes during pregnancy, among other things. Gestational diabetes increases the risk of complications during pregnancy and childbirth for both mother and baby. New national guidelines for gestational diabetes were issued in 2017 and took effect from 2018 (Helsedirektoratet 2018a). These guidelines introduce a more or less general screening, while it used to be more risk-based. An oral glucose tolerance test (blood samples taken before and two hours after drinking a standardised amount of glucose) is recommended for pregnant women who have one or more risk factors (primiparous women over the age of 25, women from countries outside Europe, heredity, overweight and events during previous pregnancies). There are probably 40,000 pregnant women per year who meet the criteria for screening. The new guidelines have been heavily criticised (Backe 2018; Eskild et al. 2019), and the Norwegian Directorate of Health will revise them. The guidelines that applied to the patients included in this healthcare atlas during the period 2015–2017 mostly entailed testing all pregnant women's urine for glucose. Women whose urine test was positive have undergone specific diagnostic testing with fasting blood sugar, oral glucose tolerance testing and/or average glucose levels (HbA1C).

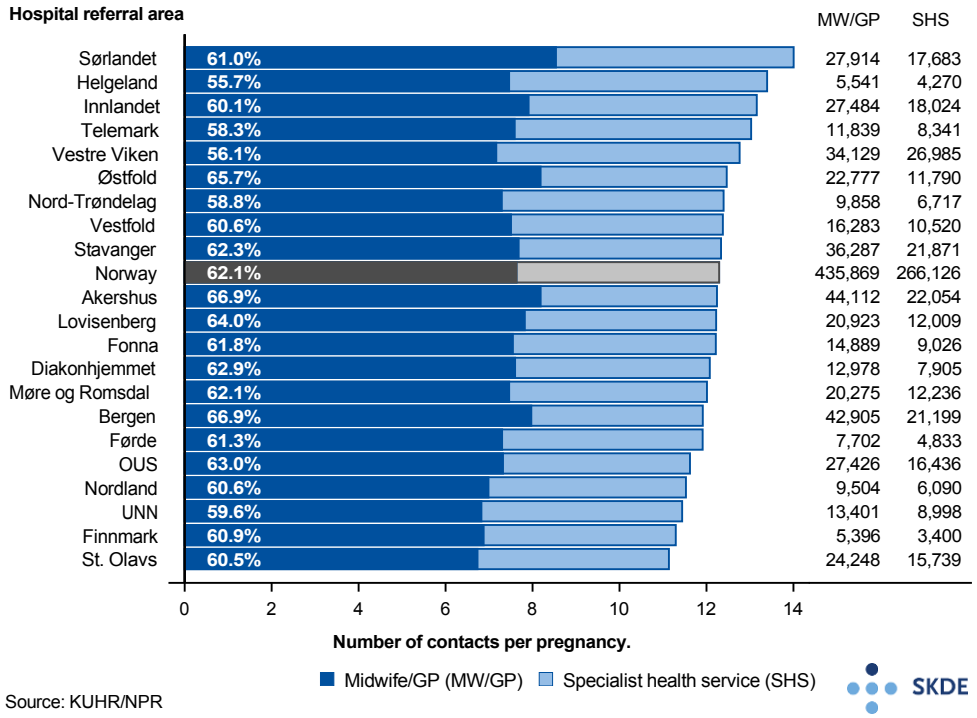
Gestational diabetes normally goes away after the baby is born, but women who have experienced gestational diabetes are at increased risk of developing type 2 diabetes during their next pregnancy and later. The increased incidence of gestational diabetes is explained by an increase in risk factors for the disease, including overweight, increasing age when giving birth for the first time and originating from countries with a high prevalence of diabetes.

Findings

During the period 2015–2017, about 700,000 contacts with the primary healthcare and specialist health service per year related to follow-up of pregnant women. About 40% of these contacts were with the specialist health service. For Norway as a whole, women had an average of approx. 12 contacts per pregnancy, with around 3 contacts with their RGP/the emergency primary healthcare service, 4 contacts with a midwife and 5 contacts with the specialist health service.

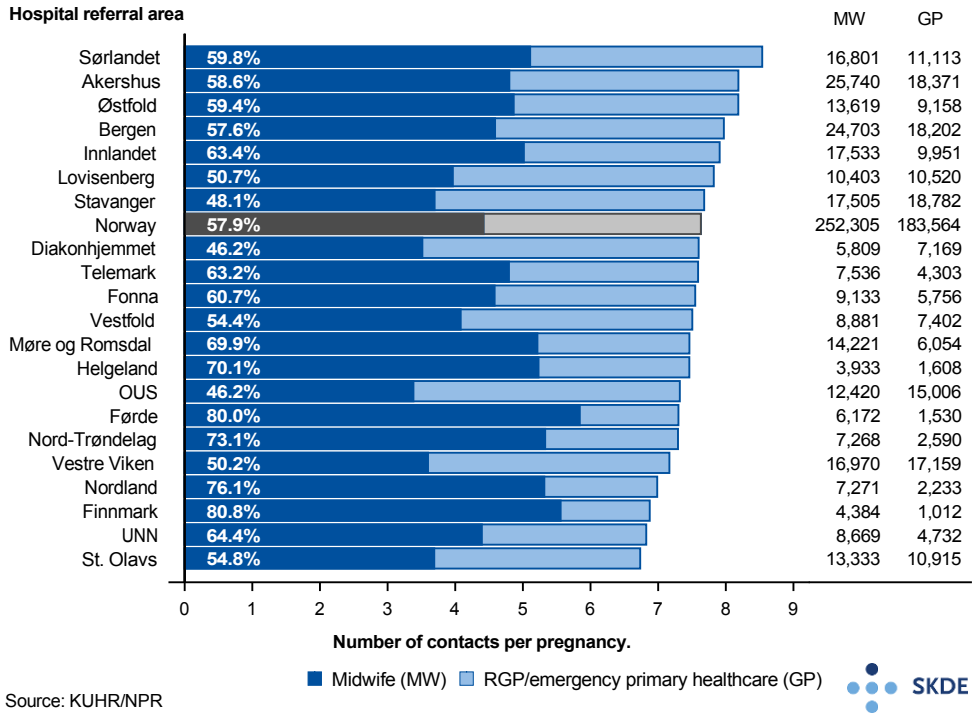
Figure 4.1 shows that Sørlandet hospital referral area stands out with a slightly higher rate of 14 contacts per pregnancy on average. Otherwise, there was little geographical variation in the total number of contacts per pregnancy. On average, pregnant women resident in Helgeland hospital referral area had 13 contacts with the health service during their pregnancy, while pregnant women resident in the St. Olavs area had 11 contacts.

For Norway as a whole, approx. 7.5 contacts per pregnancy were with the primary healthcare service, with little variation between hospital referral areas. Approximately 58% of contacts were with a midwife and approximately 42% with a GP, but the breakdown between midwife and GP contacts varied considerably between hospital referral areas (Figure 4.2). Women resident in OUS and Diakonhjemmet hospital referral areas only had 46% of their contacts with a midwife, while the corresponding proportion for women resident in the Finnmark area was 81%.



Source: KUHR/NPR

Figure 4.1: Antenatal appointments (in total). Number of contacts per pregnancy with RGPs/the emergency primary healthcare service/midwives and with the specialist health service, adjusted for age. Number of contacts on the right. Average per year for the period 2015–2017, broken down by hospital referral area.



Source: KUHR/NPR

Figure 4.2: Antenatal appointments with the primary healthcare service. Number of contacts per pregnancy broken down by RGP/the emergency primary healthcare service and midwives, adjusted for age. Number of contacts on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

The geographical variation in the number of outpatient contacts per pregnancy was higher for the specialist health service than for the primary healthcare service (Figure 4.3). Pregnant women resident in Helgeland hospital referral area had approximately 50% more outpatient contacts during their pregnancy (6 on average) than women in the Bergen area (4 contacts on average).

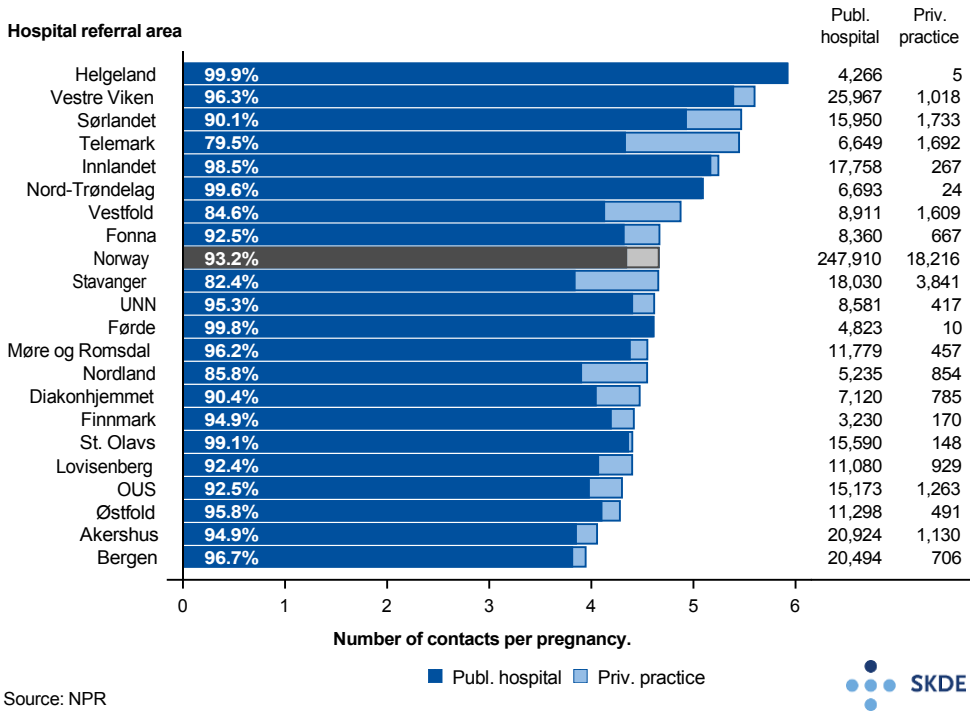


Figure 4.3: Antenatal appointments. Number of outpatient contacts with the specialist health service per pregnancy, adjusted for age. Number of contacts at hospital and with specialists in private practice under public funding contracts on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

The proportion of contacts with specialists in private practice under public funding contracts was approx. 7% for Norway as a whole, and varied from 20% for women resident in the Telemark area to under 1% for those resident in Helgeland and Førde hospital referral areas.

A very small group (approx. 1% of pregnant women) had no contact with the specialist health service during their pregnancy. Only 13% of pregnant women had only one contact with the specialist health service, while a majority (56%) had between 2 and 5 contacts with the specialist health service during their pregnancy. A large group (30% of pregnant women) had 6 or more contacts.

Figures 4.4 and 4.5 show how many per 1,000 women were diagnosed with gestational diabetes for primiparous and multiparous women, respectively. There is considerable geographical variation in the use of the gestational diabetes diagnosis, and Førde hospital referral area stands out with particularly high rates both for primiparous and multiparous women. If we exclude Førde hospital referral area, the variation was more moderate.

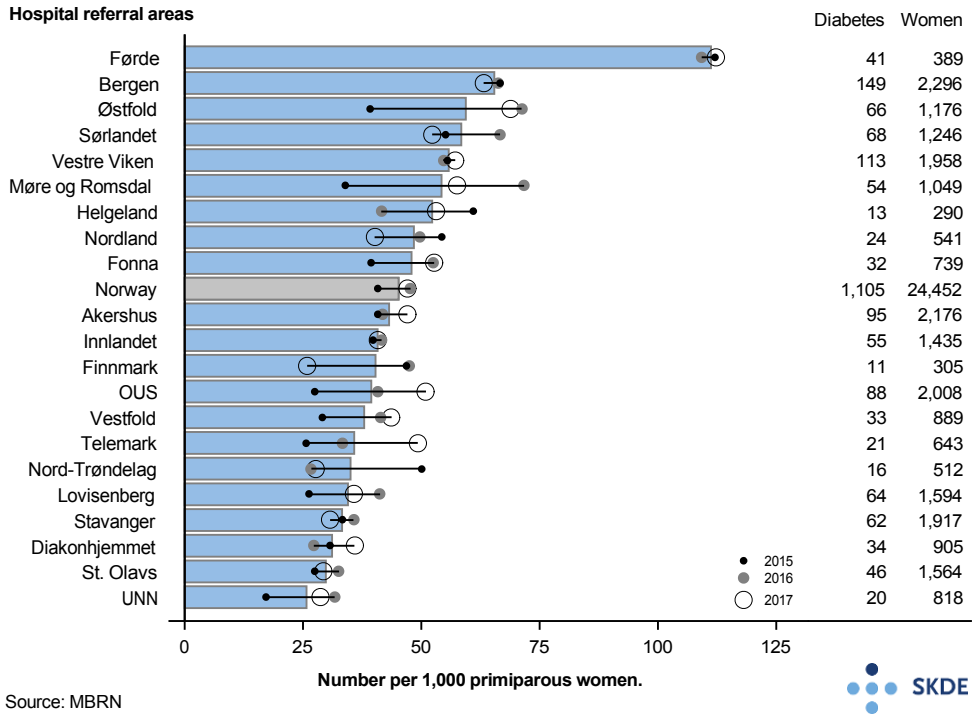


Figure 4.4: Gestational diabetes. The number of primiparous women with gestational diabetes per 1,000 primiparous women, adjusted for age. Number of pregnant women with gestational diabetes and all primiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

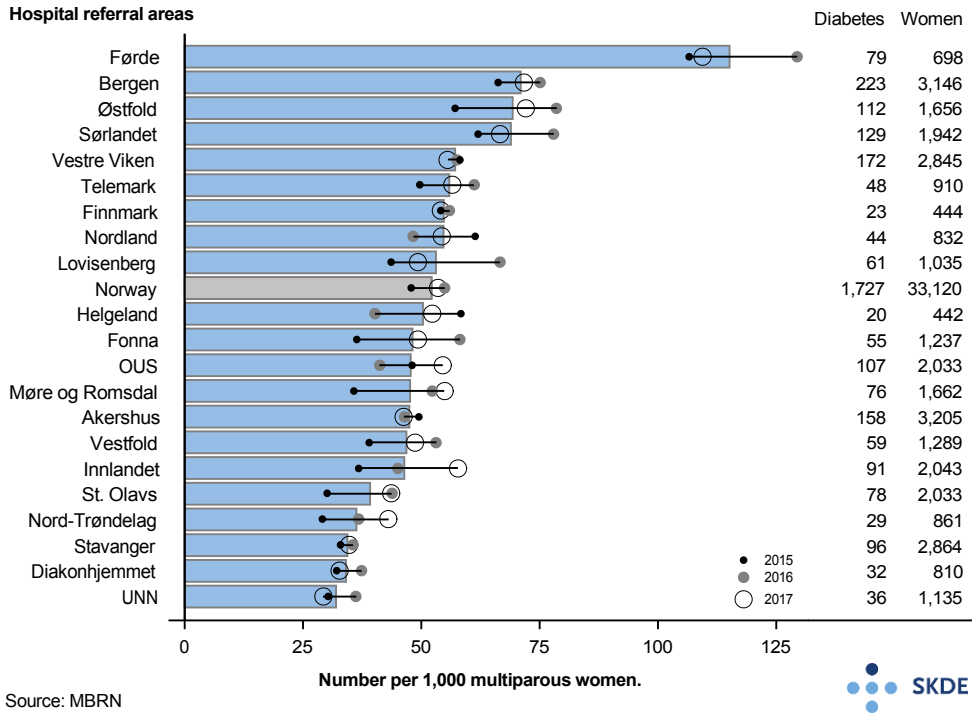


Figure 4.5: Gestational diabetes. The number of multiparous women with gestational diabetes per 1,000 multiparous women, adjusted for age. Number of pregnant women with gestational diabetes and all multiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

The average of 12 appointments for all pregnant women during the period 2015–2017 is relatively high seen in relation to the national recommendations that prescribe 8 appointments for a normal pregnancy. In particular, 4-6 appointments with the specialist health service seems to be more than we would expect. In principle, the specialist health service performs a routine ultrasound scan in week 17–19 and, if relevant, check-ups 7-9 days after the due date. Follow-up of certain pregnant women who need additional consultations come in addition to this. In connection with 30% of all pregnancies, the woman had six or more appointments with the specialist health service. This number of specialist appointments indicates either some abnormal condition relating to the mother or baby or that the appointments take place at too specialised a level. The total number of contacts per pregnancy did not vary much between hospital referral areas. The use of municipal midwives varied considerably. The hospital referral areas that include Norway's biggest cities had the lowest proportion of appointments with municipal midwives. The following hospital referral areas had a proportion of 50% or lower: OUS (Oslo), Diakonhjemmet (Oslo), Lovisenberg (Oslo), Vestre Viken (Drammen) and Stavanger.

There was a strikingly high variation between hospital referral areas in the incidence of gestational diabetes. In particular, Førde hospital referral area had a strikingly high incidence. All pregnant women's urine is tested for glucose in connection with each antenatal appointment. If glucose is detected in the urine, the diagnosis is made on the basis of an oral glucose tolerance test. The woman's fasting blood sugar level is measured, and the level is measured again two hours after drinking a standardised amount of sugar. The quality of this test is not very high, meaning that the results cannot always be reproduced (Riccardi et al. 1985; Harlass et al. 1991). However, it is unlikely that this should result in one hospital referral area, in this case Førde, having consistently higher test results over a three-year period compared with all the other hospital referral areas. Data from the Medical Birth Registry of Norway's statistics databank show that Sogn og Fjordane county has had the highest incidence of gestational diabetes in Norway since 2010 (Statistics databank, Medical Birth Registry of Norway). At the same time, the report *Health status in Norway 2018* describes Sogn og Fjordane as one of the Norwegian counties with the lowest use of medication for diabetes (Folkehelseinstituttet 2018). Older women, overweight women and women who were themselves born outside Europe have a higher risk of developing gestational diabetes. When comparing the hospital referral areas with the highest and lowest incidence, namely Førde and UNN, we find that they are quite similar in terms of age composition, the proportion of overweight pregnant women (and the proportion for whom information about BMI at the start of the pregnancy is missing) and the proportion of women who were themselves born outside Norway. The population composition cannot explain the differences. Possible explanations include differences in compliance with the national guidelines that applied at the time and variations in reporting to the MBRN.

4.2 Uncomplicated births

Avoiding unnecessary intervention during normal births and inappropriate use of technology is an important principle of modern maternity care (Chalmers et al. 2001). The Norwegian Mother and Child Cohort Study, which took place between 1999 and 2008, showed that 72% of women wanted a natural childbirth (Kringeland et al. 2010). It is debated in the expert community what natural childbirth actually is. The World Health Organization (WHO) uses the following definition:

> *We define normal birth as: spontaneous in onset, low-risk at the start of labour and remaining so throughout labour and delivery. The infant is born spontaneously in the vertex position between 37 and 42 completed weeks of pregnancy. After birth mother and infant are in good condition.*

Strictly speaking, this means that a normal birth should not be induced, no epidural anaesthesia or episiotomy should be required, and operative delivery or caesarean section are excluded from the definition. Undesirable events or complications such as sphincter rupture, postpartum haemorrhage, low 5 minute Apgar score (vitality index) or transfer to a neonatal intensive care unit should not occur.

The Norwegian Directorate of Health has established a national quality indicator called 'Births without major interventions or complications'. This quality indicator covers low-risk births where labour starts spontaneously when the foetus has reached a gestational age of 37 weeks or more, i.e. Robson groups 1 and 3. In order to be included in this indicator, the low-risk births should not end in interventions such as forceps delivery, vacuum extraction or caesarean section, or involve complications such as heavy postpartum bleeding, tears that affect the anal sphincter or a newborn with a 5-minute Apgar score lower than 7. Epidural anaesthesia or episiotomy are not mentioned in the definition of 'Births without major interventions or complications', and these interventions can thus be used during such births.

In this healthcare atlas, we have chosen not to limit our research to births in Robson groups 1 and 3, but to describe all births that have taken place without major interventions or complications as described for the national quality indicator. In the following, we will refer to them as 'uncomplicated births'.

Findings

During the period 2015–2017, there were approx. 14,600 uncomplicated births per year to primiparous women (corresponding to approx. 59.7% of all births to primiparous women) and approx. 26,000 uncomplicated births per year to multiparous women (corresponding to approx. 78.6% of all births to multiparous women).

Figure 4.6 and figur 4.7 show the number of uncomplicated births per 1,000 births for primiparous and multiparous women, respectively. Vestfold hospital referral area stands out with a somewhat higher rate for primiparous women. The reason for this is that the use of forceps delivery, vacuum extraction and emergency caesarean section is significantly lower in Vestfold than in the other hospital referral areas (see Chapter 4.7, Figure 4.25 page 63).

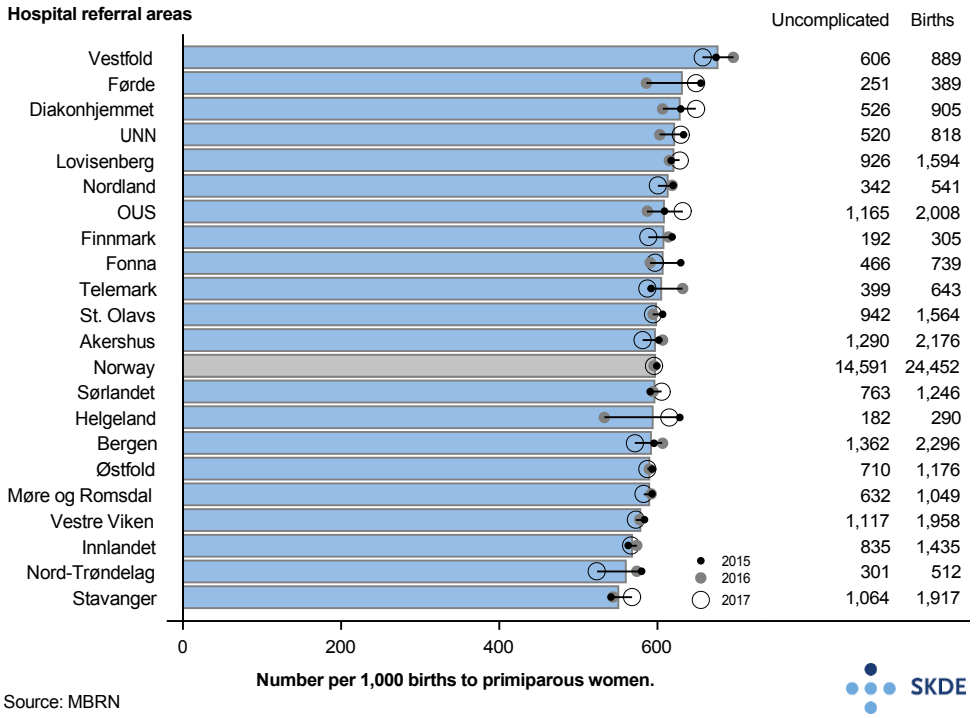


Figure 4.6: Uncomplicated births. Number of uncomplicated births per 1,000 births to primiparous women, adjusted for age. Number of uncomplicated births and total number of births to primiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

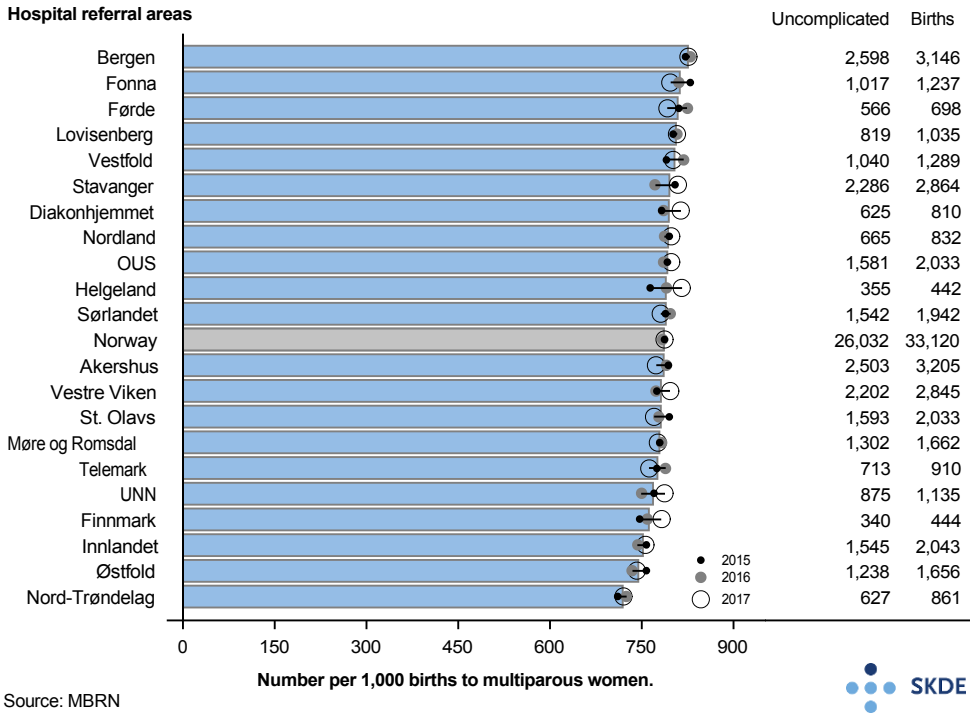


Figure 4.7: Uncomplicated births. Number of uncomplicated births per 1,000 births to multiparous women, adjusted for age. Number of uncomplicated births and total number of births to multiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Nord-Trøndelag stands out with a lower rate for multiparous women. This is because the use of forceps delivery, vacuum extraction and emergency caesarean section is significantly higher in Nord-Trøndelag than in the other hospital referral areas (see Chapter 4.7, Figure 4.26 page 64). Otherwise, there was little geographical variation in the number of uncomplicated births per 1,000 births both for primiparous and multiparous women.

4.3 Induction of labour

In some cases it will be desirable to induce vaginal delivery. This normally applies to women who are past their due date or if other medical factors makes it desirable for the child to be born before the spontaneous onset of labour. Starting the birth artificially is called induction of labour.

The most common medical reasons for inducing labour are pregnancies that continue for 7-9 days past the due date, twin pregnancies, elevated blood pressure, pre-eclampsia, diabetes or the waters breaking without labour starting within 24 hours. The methods used to try to induce labour are inserting a balloon catheter (initial measure if the cervix is 'unripe'), medication (prostaglandins) to ripen the cervix, rupturing the amniotic membrane ('breaking the waters', amniotomy, only if the cervix is ripe and has started to dilate) and administering the hormone oxytocin to stimulate contractions (Veileder i fødselshjelp, kapittel 33 2014).

Which method is chosen depends on how ripe the cervix is and the woman's previous births, as well as the maternity unit's procedures. There is a certain risk associated with inducing labour. Uterine hyperstimulation may occur, and infection of the foetal membranes if the waters are broken early. If attempts to induce labour are unsuccessful, caesarean section will be considered.

Induction increases the resource use, as the birth will need to be more closely monitored. Correct use can probably reduce overall resource use as well as complications in mother and baby, and may also reduce the need for emergency caesarean sections (Boers et al. 2010; Koopmans et al. 2009).

The proportion of births that are induced has been a national quality indicator since 2009.[4] The indicator gives the number and proportion of births that are induced per maternity unit. In 2017, the proportion varied between 10 and 29%. The proportion of births that are induced has risen from 16.6% in 2009 to 22.9% in 2017.

Findings

During the period 2015–2017, approx. 5,900 primiparous women and 6,600 multiparous women were induced each year. This corresponds to about 24% of primiparous women and 20% of multiparous women.

Figure 4.8 and 4.9 show induced births for primiparous and multiparous women, respectively. The geographical variation was low. The rates for the hospital referral areas with the highest rates were about 30–40% higher than those for the areas with the lowest rates.

There was a clear correlation between the use of induction in primiparous and multiparous women. The hospital referral areas with the highest induction rates for primiparous women are mostly among the areas with the highest rates for multiparous women (see Appendix A for details). For Norway as a whole, there appears to have been a definite increase in the use of induction during the period in question.

[4] Quality indicators at helsenorge.no: Induction of labour

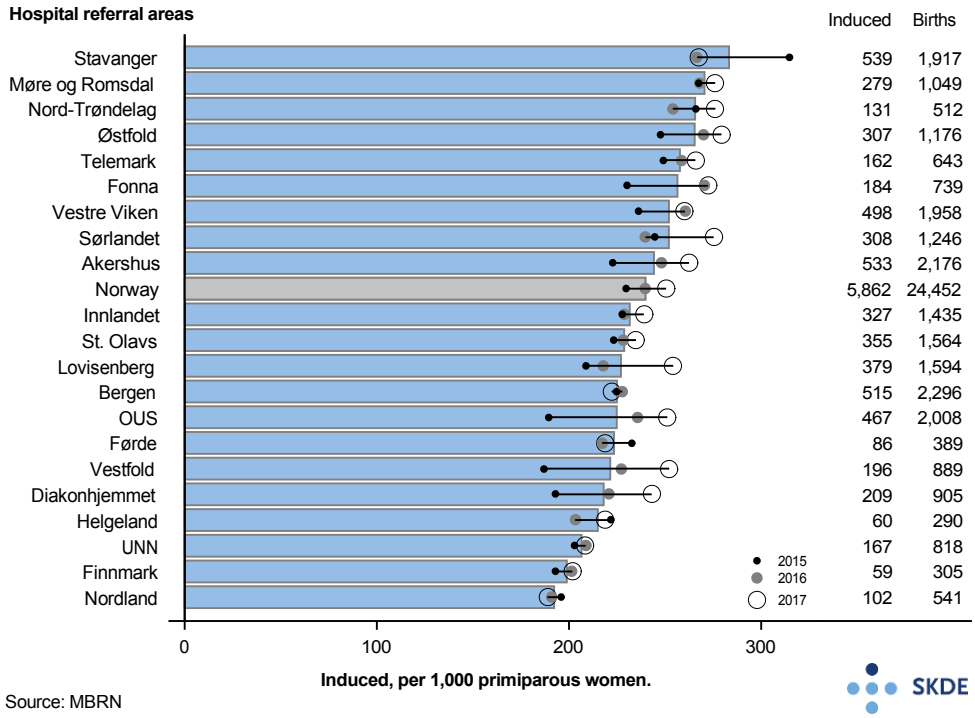


Figure 4.8: Induction of labour. Number of primiparous women induced per 1,000 primiparous women, adjusted for age. Number of primiparous women induced and all primiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

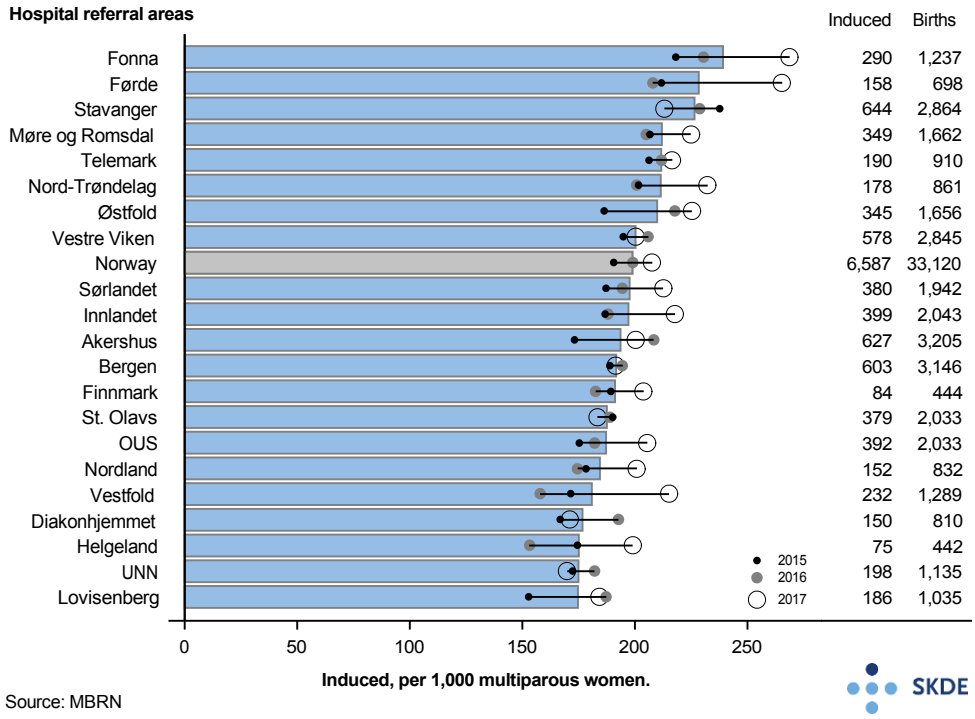


Figure 4.9: Induction of labour. The number of multiparous women induced per 1,000 multiparous women, adjusted for age. Number of multiparous women induced and all multiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

The Norwegian Society of Gynecology and Obstetrics' obstetrics guide (Veileder i fødselshjelp, kapittel 33 2014) provides clear recommendations about induction of labour. Even when clear recommendations exist for when labour should be induced, there will always be room for discretionary judgement and interpretation that can result in geographical variation.

The fact that the hospital referral areas with high rates for primiparous women usually had high rates for multiparous women as well could indicate that a significant component of the observed variation is systematic and not caused by random variation alone. Some of the variation is probably due to variations in practice.

However, it is reasonable to interpret the modest scale of geographical variation as a sign that the guidelines are mostly complied with. We therefore believe that there is no basis for characterising this variation as unwarranted. Stimulation when labour is progressing slowly is not discussed here.

4.4 Epidural pain relief during vaginal delivery

Labour is very painful, and most women will describe it as the most intense pain they have ever experienced. Better pain relief during labour could be one way of reducing the number of pregnant women who want a caesarean section in their next pregnancy. Epidural pain relief is the most effective form of treatment for labour pain. A fine plastic tube called an epidural catheter is inserted between two lumbar vertebrae by means of a needle and remains in place in the spinal canal until the birth is over. Drugs are administered regularly through the catheter, often a combination of an anaesthetic and a morphine-like drug. This numbs the nerve roots that pass through this part of the spinal canal, and this procedure provides pain relief for as long as the catheter remains in position and the medication is topped up. The woman will still feel the contractions and can participate actively in the birth, but epidural pain relief takes the edge off the pain.

It is not uncommon for the contractions to become weaker after epidural anaesthesia is administered, and it may become necessary to stimulate contractions by administering oxytocin. An epidural should normally not affect the movement of the legs, but high doses can cause numbness. The midwife assesses the need for epidural anaesthesia in consultation with the woman in labour, and the obstetrician on duty is always consulted. The epidural catheter is inserted by an anaesthetist. The availability of anaesthetists could limit the possibility of receiving epidural anaesthesia.

In some cases, epidural anaesthesia will be recommended for medical reasons. Indications include breech presentation, multiple births, pre-eclampsia or high BMI. Epidural anaesthesia could cause complications such as prolonged labour and a higher frequency of operative delivery, but is not associated with an increased risk of caesarean section. After delivery, the woman can experience symptoms such as temporary numbness of the legs and headaches.

Findings

During the period 2015–2017, about half of all primiparous women (10,000 per year) and a quarter of all multiparous women (approx. 7,200 per year) who gave birth vaginally received epidural anaesthesia. Figure 4.10 shows moderate geographical variation in the use of epidural anaesthesia among primiparous women who gave birth vaginally. Among primiparous women resident in Diakonhjemmet and Bergen hospital referral areas, nearly twice as many had an epidural as among primiparous women resident in the areas of UNN and Finnmark.

Figure 4.11 shows that there was greater geographical variation in the use of epidurals for multiparous women who gave birth vaginally than for primiparous women. Nearly three times as many women resident in Diakonhjemmet hospital referral area had an epidural compared with residents of the UNN area. Approximately twice as many women per 1,000 births in Bergen hospital referral area had an epidural compared with those resident in the areas of Finnmark and Sørlandet.

There was a clear correlation between the use of epidurals in connection with vaginal births in primiparous and multiparous women. The hospital referral areas with the highest rates for primiparous women are mostly among the areas with the highest rates for multiparous women (see Appendix A for details).

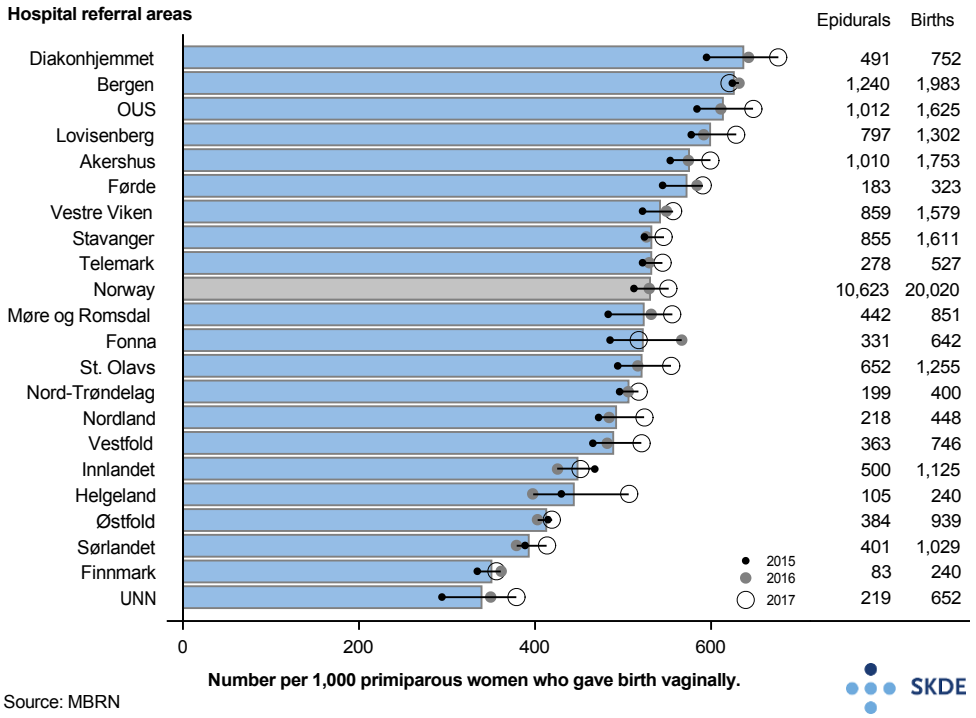


Figure 4.10: Epidurals. Number of primiparous women who received an epidural per 1,000 primiparous women who gave birth vaginally, adjusted for age. Number of primiparous women who received an epidural and all primiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

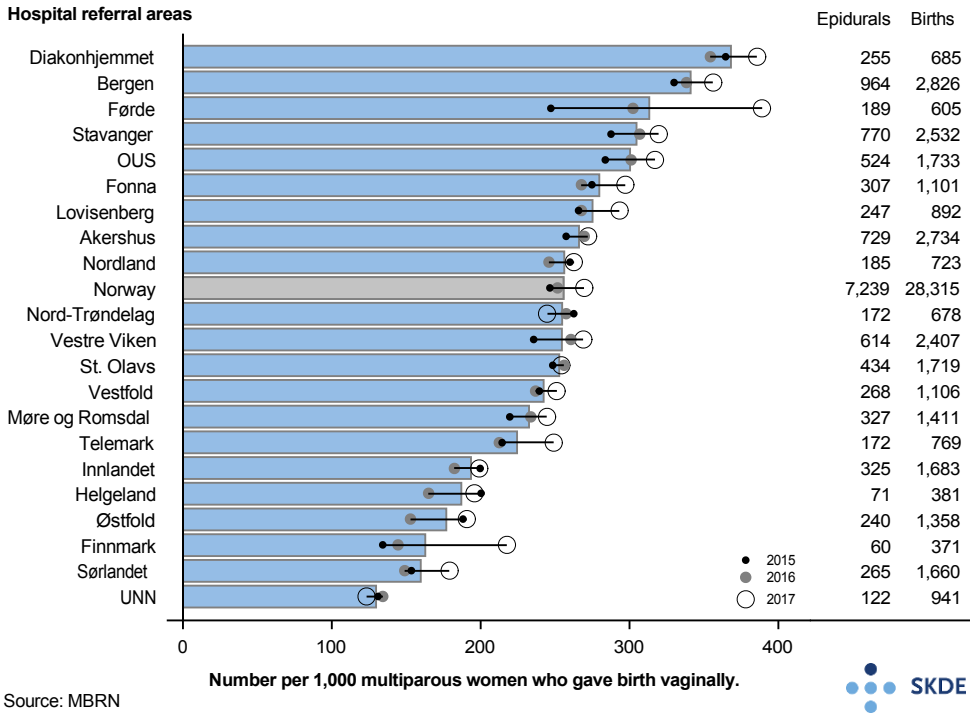


Figure 4.11: Epidurals. Number of multiparous women who received an epidural per 1,000 multiparous women who gave birth vaginally, adjusted for age. Number of multiparous women who received an epidural and all multiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Epidural pain relief, Robson groups 1 and 3

During the period 2015–2017, epidural anaesthesia was administered in connection with approx. 7,900 births per year in Robson group 1[5] (corresponding to 50% of all births in Robson group 1). In Robson group 3, epidural pain relief was administered in connection with approx. 3,600 births (corresponding to 18% of all births in Robson group 3). The geographical variation in the use of epidural pain relief was moderate for Robson group 1 and high for Robson group 3.

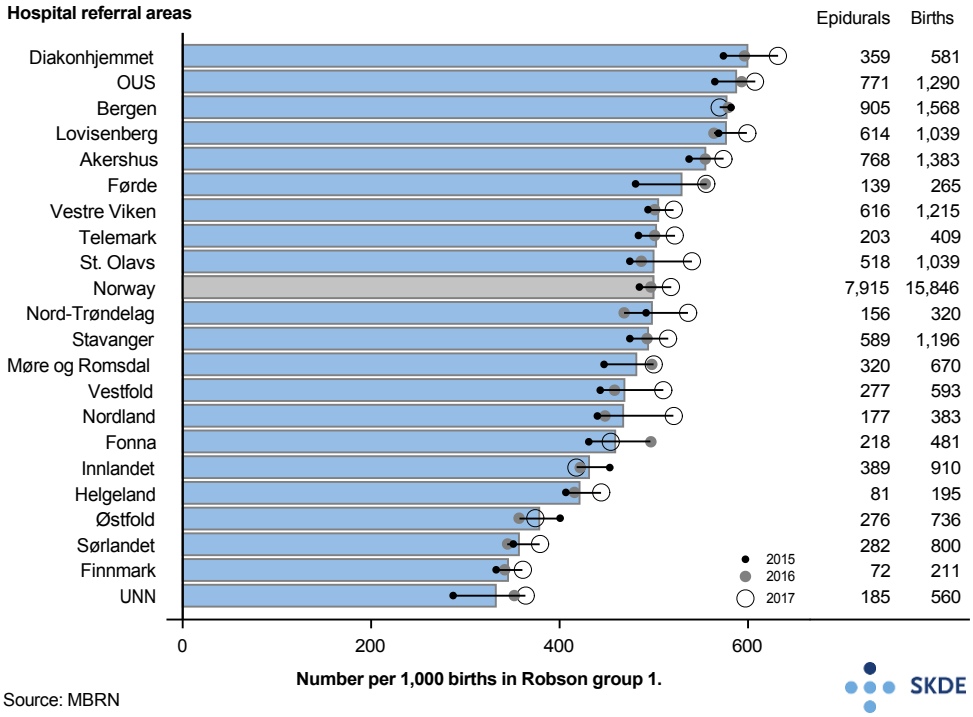


Figure 4.12: Robson group 1, births with epidural anaesthesia. Number of births with epidural anaesthesia per 1,000 births in Robson group 1, adjusted for age. Number of births with epidural anaesthesia and number of births in Robson group 1 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

For Norway as a whole, the proportion of women who received epidural pain relief during childbirth has increased by about 10 percentage points over the past 10 years, from 27.9% in 2008 to 37.8% in 2017. The obstetrics guide recommends administering epidurals for 'intense pain, particularly in connection with stimulation of contractions when labour is progressing slowly', for pre-eclampsia and for labouring women who want an epidural and have regular contractions if there are no contraindications.

Overall, there was considerable geographical variation in the use of epidural pain relief in connection with vaginal births during the period 2015–2017. The variation was greatest among multiparous women and more moderate for primiparous women.

The geographical variation in the proportion of births with one or more material risk factors present (births in Robson groups 4-10) was low (see Figure 3.11 and figur 3.12 in Chapter 3).

[5] See the description of Robson groups in Chapter 3, page 32.

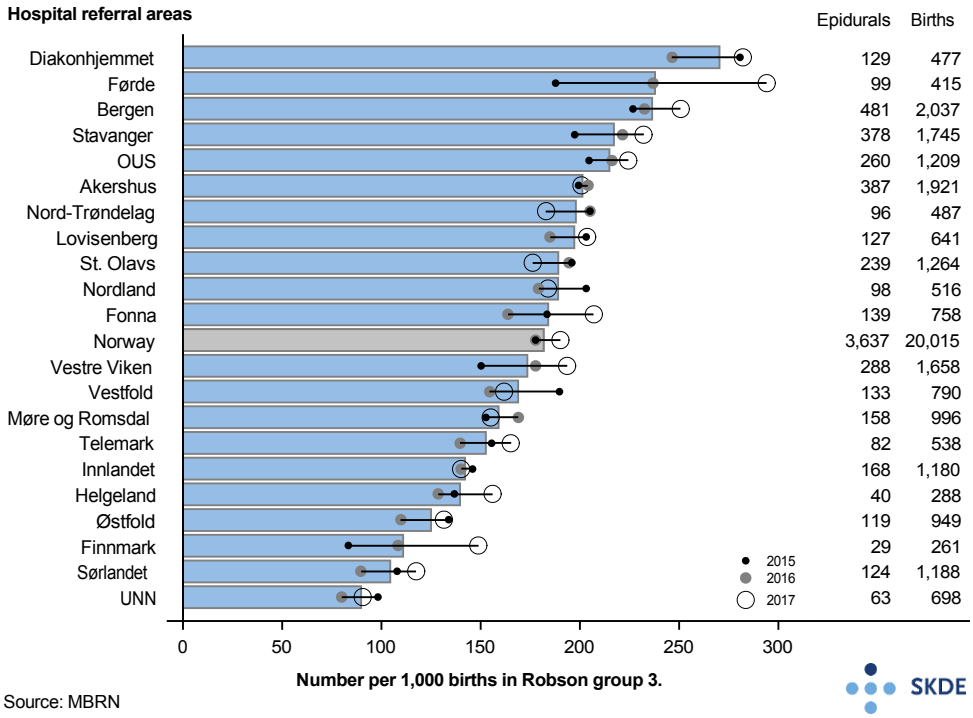


Figure 4.13: Robson group 3, births with epidural anaesthesia. Number of births with epidural anaesthesia per 1,000 births in Robson group 3, adjusted for age. Number of births with epidural anaesthesia and number of births in Robson group 3 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

We also see that the geographical variation in the use of epidurals by women in Robson groups 1 and 3 roughly corresponds to that for all types of births. Together, these observations indicate that the reason for the observed geographical variation is not a geographical variation in the proportion of births where special risk factors are present.

Moreover, there was a clear correlation between the use of epidurals by primiparous and multiparous women. This indicates that the observed variation is largely systematic and not caused by random variation alone. It is probable that variations in practice are a material cause of this variation, and that it must be deemed to be unwarranted.

4.5 Episiotomy during childbirth

Just before a baby's head is born, the muscle and tissue around the vagina and anus are stretched to the maximum. Although it may seem tight, the tissue is very elastic and flexible. The birthing position, how quickly the head is born and the size of the baby will all influence how the vaginal opening stretches. Despite the tissue's elasticity, many women suffer tearing around the vaginal opening. If the baby is born quickly, maximum stretching of the tissue is not achieved. For breech delivery or operative delivery, more space is needed. In such cases, an incision, known as an episiotomy, is made and will have to be stitched up afterwards. A particularly liberal approach to episiotomy should be practised in connection with operative vaginal delivery of primiparous women, for whom episiotomy is believed to have a 'protective' effect.

The best way of performing an episiotomy is to make the incision from the back of the vagina at an angle of between 40 and 60 degrees laterally or start at the 5 o'clock position in the vaginal opening and cut at an angle of between 40 and 60 degrees laterally (mediolateral and lateral episiotomy).

Episiotomy was the rule rather than the exception in the 1960s, particularly for primiparous women. However, the frequency dropped as it has become clear that there is no scientific basis for the benefit of these episiotomies. According to the MBRN, approx. 200 episiotomies were performed per 1,000 births in the year 2000, compared with 170 in 2017. The episiotomy rate increases with the maternity units' birth volume. The lowest rates are found at maternity units with fewer than 500 births per year, while the highest rates are at units with more than 3,000 births per year. A spontaneous (first-degree or second-degree) tear will often heal faster, be less painful and cause less long-term problems than an episiotomy.

Findings

During the period 2015–2017, approximately 7,300 primiparous women and 2,400 multiparous women had episiotomies in connection with vaginal delivery. This corresponds to 36.5% of primiparous women and 8.3% of multiparous women who gave birth vaginally.

Nearly twice as many episiotomies were performed per 1,000 primiparous women resident in Telemark hospital area compared with the Førde area (Figure 4.14). Most of the hospital referral areas with rates above the national average had very similar rates.

The geographical variation was greater for multiparous women than for primiparous women (Figure 4.15). More than twice as many episiotomies were performed per 1,000 births on women resident in Møre og Romsdal hospital referral area compared with the St. Olavs area.

There was a clear correlation between the use of episiotomy in primiparous and multiparous women. The hospital referral areas with the highest episiotomy rates for primiparous women are mostly among the areas with the highest rates for multiparous women (see Appendix A for details).

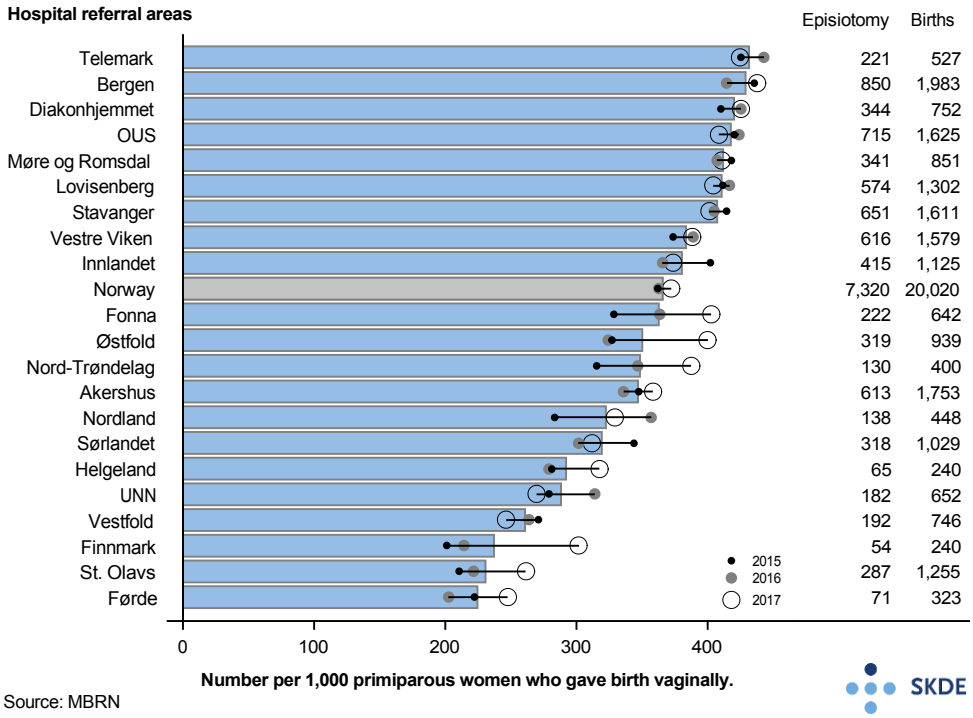


Figure 4.14: Episiotomy. Number of primiparous women who underwent an episiotomy per 1,000 primiparous women who gave birth vaginally, adjusted for age. Average number of primiparous women who had an episiotomy and all primiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

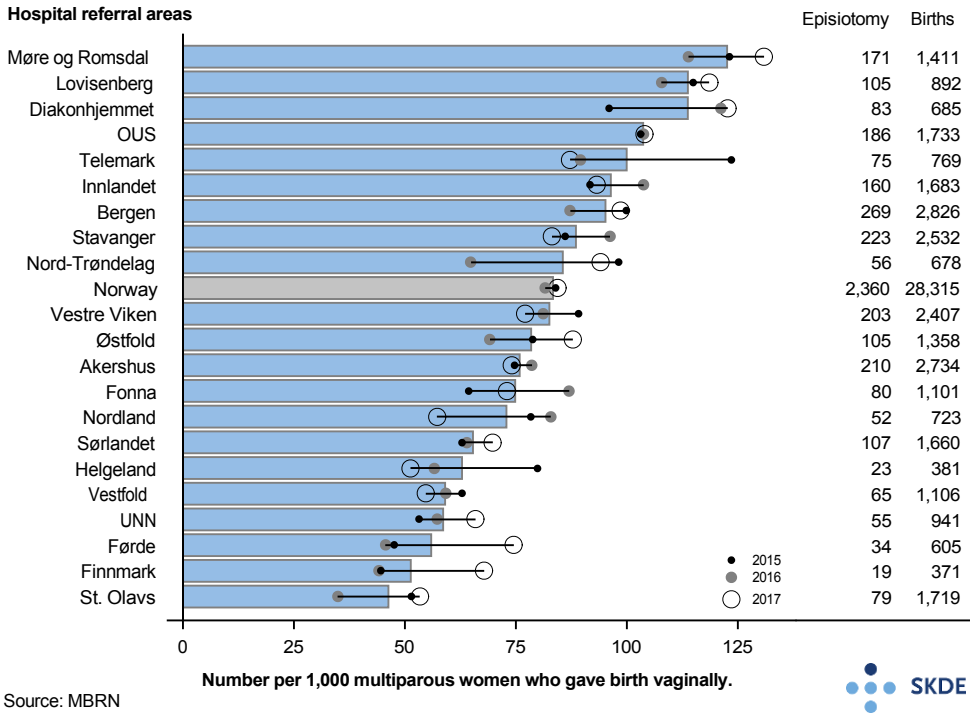


Figure 4.15: Episiotomy. Number of multiparous women who underwent an episiotomy per 1,000 multiparous women who gave birth vaginally, adjusted for age. Average number of multiparous women who had an episiotomy and all multiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Episiotomy, Robson groups 1 and 3

During the period 2015–2017, episiotomies were performed in connection with approx. 4,900 births per year in Robson group 1[6] (corresponding to 31% of all births in Robson group 1) and approx. 1,000 births in Robson group 3 (corresponding to 5.1% of all births in Robson group 3). There was considerable geographical variation in the use of episiotomy for Robson groups 1 and 3 alike.

Women in Robson group 1 had about twice as many episiotomies per 1,000 births in Telemark hospital referral area as in the Førde area (Figure 4.16). Most of the hospital referral areas with rates above the national average had relatively similar rates. The geographical variation was higher among women in Robson group 3 (Figure 4.17). More than three times as many episiotomies were performed per 1,000 births on women resident in Møre og Romsdal hospital referral area compared with the St. Olavs area. However, the number of episiotomies was so low that there could be a considerable element of random variation.

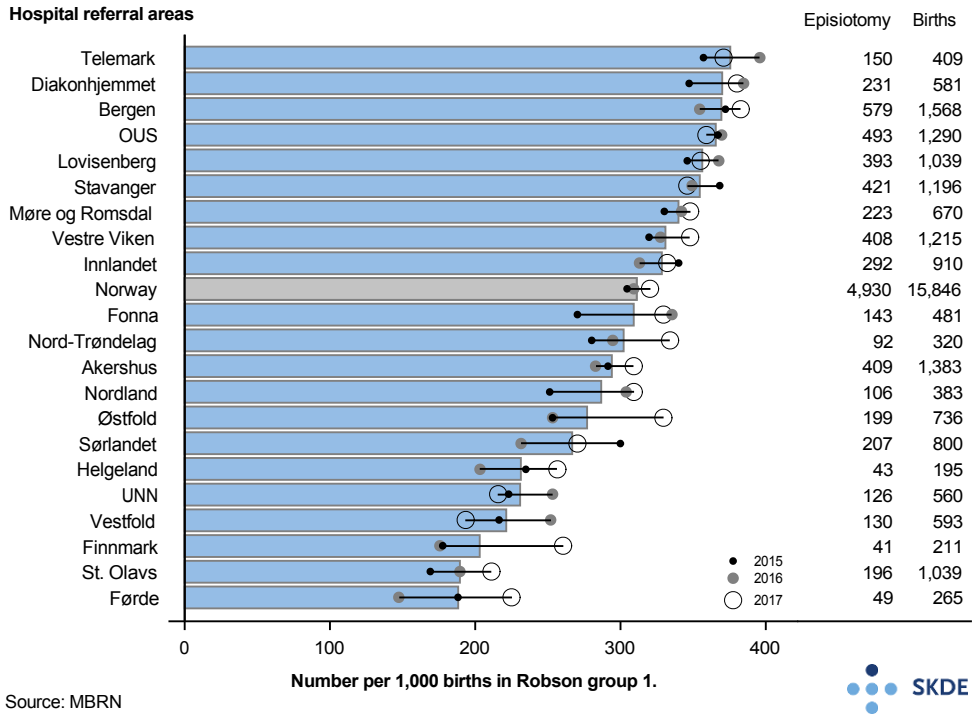


Figure 4.16: Robson group 1, births with episiotomy. Number of births with episiotomy per 1,000 births in Robson group 1, adjusted for age. Number of births with episiotomy and number of births in Robson group 1 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

[6] See the description of Robson groups in Chapter 3, page 32.

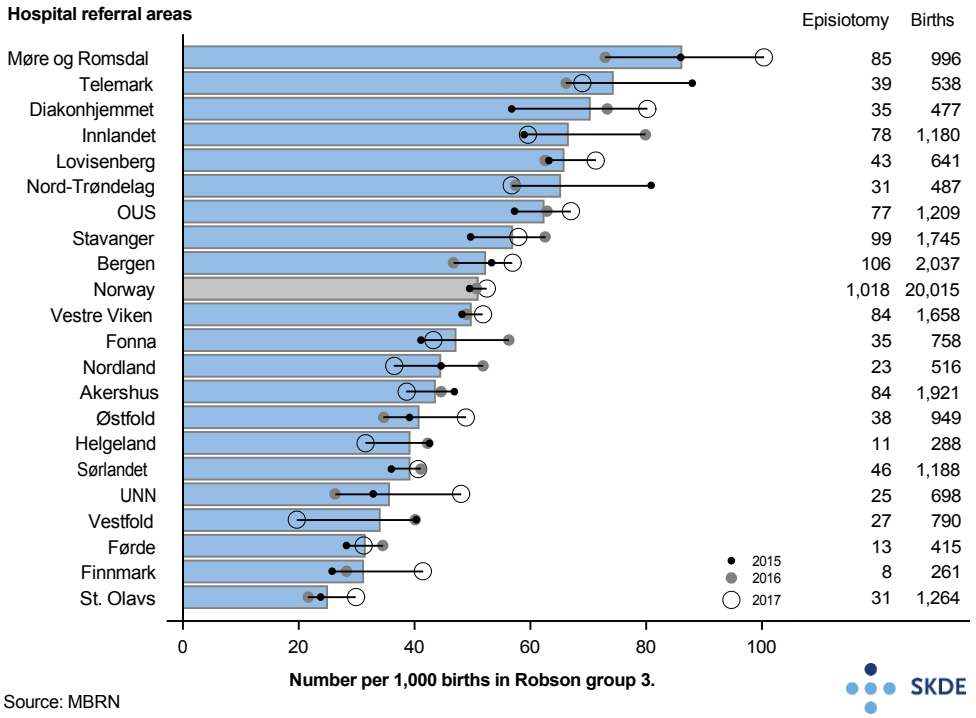


Figure 4.17: Robson group 3, births with episiotomy. Number of births with episiotomy per 1,000 births in Robson group 3, adjusted for age. Number of births with episiotomy and number of births in Robson group 3 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

The obstetrics guide states that: 'Episiotomy is only to be performed when it can reduce the risk of severe perineal tearing or when it is desirable to deliver the baby quickly due to threatened foetal asphyxia.' Each year, approx. 10,000 episiotomies are performed and approx. 850 sphincter ruptures occur. It is not known how many sphincter ruptures are prevented by episiotomies. Episiotomies are most common in connection with forceps deliveries and vaginal breech deliveries, and there are approx. 1,000 births in each of these categories per year. In Robson groups 1 and 3, which are relatively low-risk groups, episiotomies are nevertheless performed in connection with approx. 6,000 births per year. It is not uncommon for situations to arise during a birth that could not be foreseen at the beginning, but the number of episiotomies seems to be somewhat higher than the assumed need. According to the MBRN's institutional statistics, there is a clear correlation between the proportion of births with episiotomy and a maternity unit's total number of births (more episiotomies the more births per year).

4.6 Operative vaginal delivery

According to the Medical Birth Registry of Norway, about 10% of all births end in what is known as an operative vaginal delivery, meaning that the baby is delivered using forceps (1.6%) or vacuum (suction cup) (8.8%). Such methods are used when it becomes necessary to deliver the baby quickly for some reason or if the birth is taking a long time, the labouring woman is exhausted and the contractions are becoming weaker. These methods are conditional on the cervix being effaced and the head being descended as far as the ischial spines (bony prominences in the pelvis) or lower. Forceps delivery or vacuum extraction is nearly always performed by an obstetrician. The choice of technique depends on the situation and partly on preference. Vacuum extraction is the most commonly used technique, but it requires adequate contractions and that the labouring woman is capable of pushing. Forceps delivery is not dependent on contractions or the woman pushing.

Operative vaginal delivery is associated with greater risk of complications than vaginal delivery where no forceps or vacuum extractor was needed. Randomised studies have shown that the forceps have a higher success rate than vacuum extraction, but also carries a somewhat higher risk of sphincter injuries and vaginal tears in the mother and facial injury in the newborn (O'Mahony et al. 2010). The MBRN states that for the period 2015–2017, the proportion of forceps deliveries that ended in severe (third- and fourth-degree) tears was 6.3% for primiparous women and 5.2% for multiparous women. The proportion of vacuum-assisted deliveries that ended in severe tears during the same period was 5.0% for primiparous women and 3.8% for multiparous women. There is no evidence to suggest that the choice of delivery technique has any bearing on the long-term outcome for the baby (Johanson et al. 1999; Carmody et al. 1986).

Findings

During the period 2015–2017, approximately 4,500 primiparous women and 1,400 multiparous women per year underwent a forceps delivery or vacuum extraction. About 85% of them underwent vacuum extraction, but this proportion varied considerably between hospital referral areas. Forceps deliveries were particularly common in Bergen and Fonna hospital referral areas.

Figure 4.18 shows the number of forceps or vacuum-assisted deliveries per 1,000 primiparous women who gave birth vaginally. There were more than twice as many forceps or vacuum-assisted deliveries per 1,000 births among women resident in Stavanger hospital referral area compared with women resident in the Vestfold area. The proportion of vacuum extractions varied from 43.6% in Bergen hospital referral area to 99.7% in the UNN area.

Figure 4.19 shows the number of forceps or vacuum-assisted deliveries per 1,000 multiparous women who gave birth vaginally. There were more than twice as many forceps or vacuum-assisted deliveries per 1,000 births among women resident in Stavanger hospital referral area compared with women resident in the Vestfold area. The proportion of vacuum extractions varied from 50.7% in Bergen hospital referral area to 99.0% in the UNN area.

There was a clear correlation between operative deliveries in primiparous and multiparous women. The hospital referral areas with the highest operative delivery rates for primiparous women are mostly among the areas with the highest rates for multiparous women (see Appendix A for details).

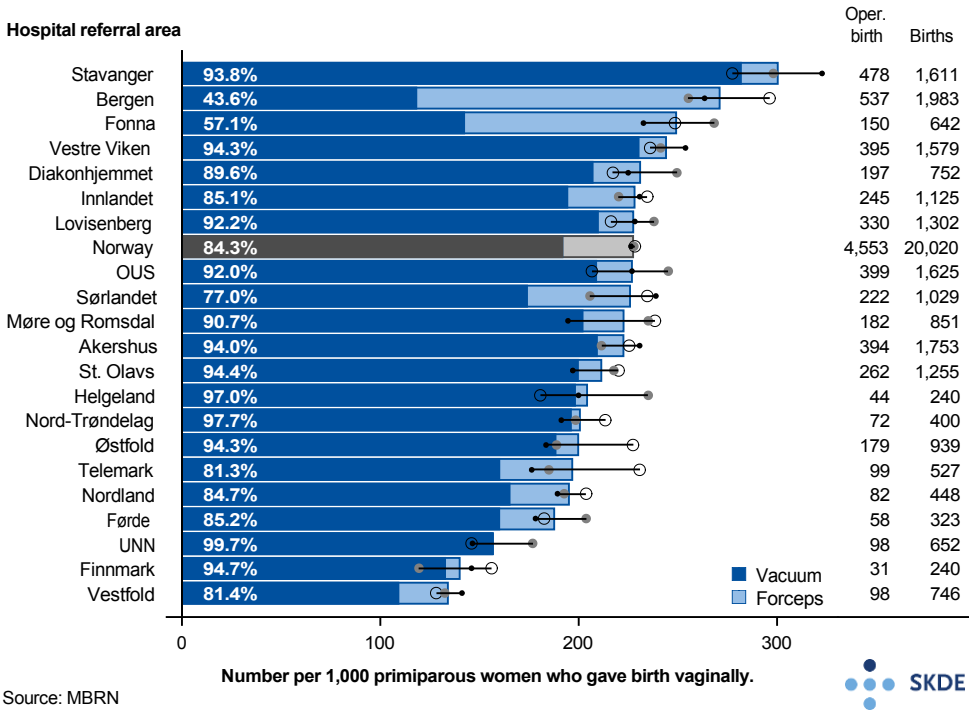


Figure 4.18: Operative vaginal delivery. Number of forceps and vacuum-assisted deliveries per 1,000 primiparous women who gave birth vaginally, broken down by forceps delivery and vacuum extraction, adjusted for age. Number of operative deliveries on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

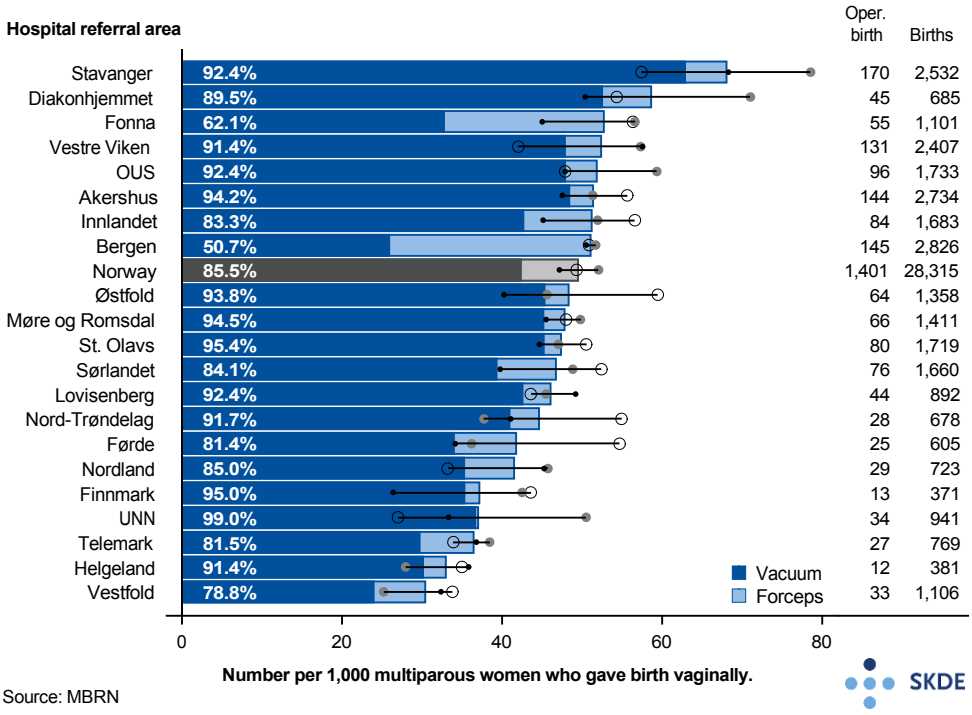


Figure 4.19: Operative vaginal delivery. Number of operative vaginal deliveries per 1,000 multiparous women who gave birth vaginally, broken down by forceps delivery and vacuum-assisted delivery, adjusted for age. Number of operative deliveries on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Operative vaginal delivery, Robson groups 1 and 3

For Norway as a whole, about 3,000 births in Robson group 1 ended in operative vaginal delivery (corresponding to 19% of all births in Robson group 1). In Robson group 3, just over 500 births (corresponding to 2.6% of all births in Robson group 3) ended in operative vaginal delivery. There was considerable geographical variation in the use of operative delivery methods for Robson group 1.

Figure 4.20 and figur 4.21 show the number of operative deliveries per 1,000 births in Robson groups 1 and 3. There were more than twice as many forceps or vacuum-assisted deliveries per 1,000 births in Robson group 1 among women resident in Stavanger hospital referral area compared with women resident in the Vestfold area. The number of forceps or vacuum-assisted deliveries in Robson group 3 was so low that the observed variation must be assumed to include a significant element of random variation. This is reflected in Figure 4.21, which shows high variation between years for each hospital referral area. It is therefore impossible to determine whether systematic geographical variation exists in the use of operative vaginal delivery for women in Robson group 3.

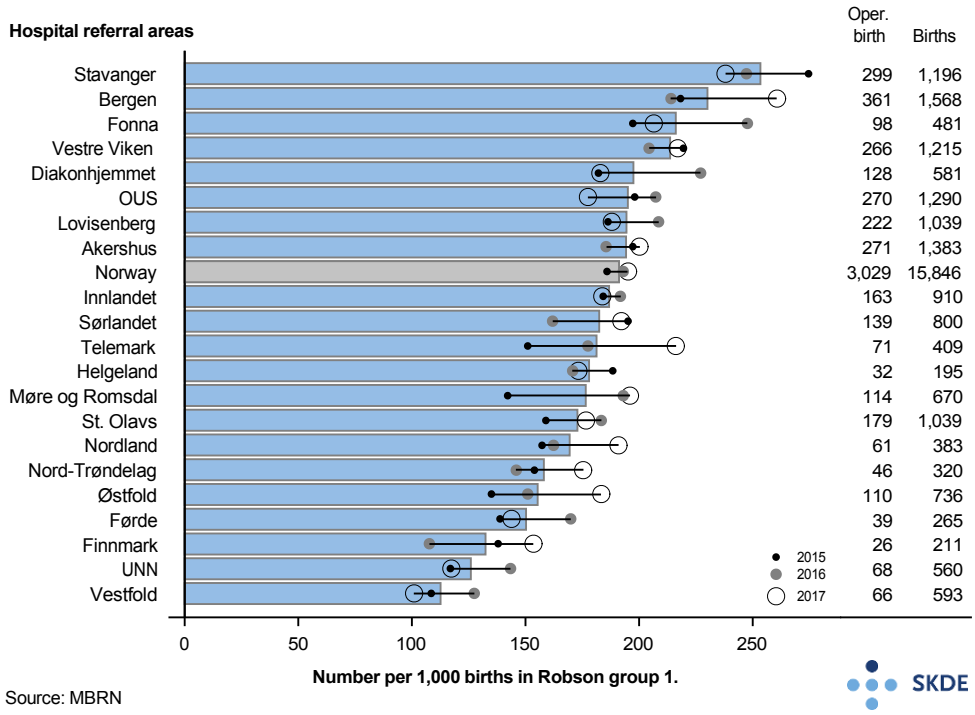


Figure 4.20: Robson group 1, vacuum-assisted and forceps deliveries. Number of vacuum-assisted and forceps deliveries per 1,000 births in Robson group 1, adjusted for age. Number of operative deliveries and number of births in Robson group 1 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

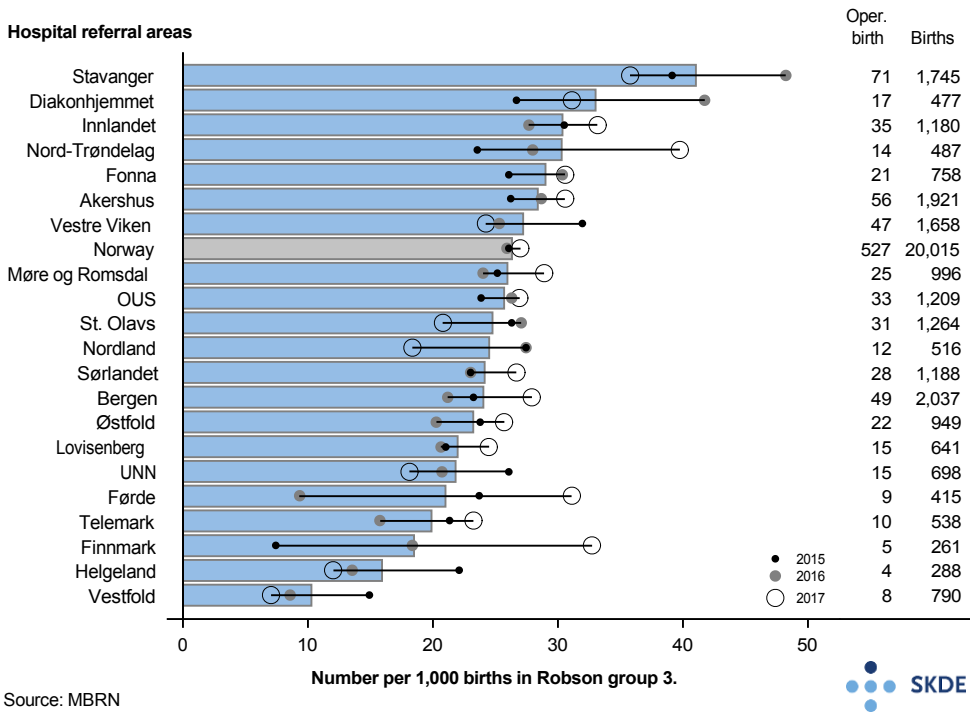


Figure 4.21: Robson group 3, operative vaginal deliveries. Number of operative vaginal deliveries per 1,000 births in Robson group 3, adjusted for age. Number of operative deliveries and number of births in Robson group 3 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

The use of operative vaginal delivery has decreased in countries with high caesarean delivery rates (Hamilton et al. 2015), and the use of forceps in particular has become less common. Over the past 20 years, Norway's caesarean delivery rate has increased slightly, and the proportion of forceps deliveries has remained stable and low at about 1.5-1.8%. There seems to be a preference for forceps delivery in some hospital referral areas, namely Bergen and Fonna. The use of vacuum extraction has increased by a couple of percentage points from 6.5% in 2000 to 8.8% in 2017. According to the MBRN, the incidence of (third- or fourth-degree) sphincter ruptures is not significantly higher for forceps deliveries than for vacuum extraction. The report 'Health at a glance 2017. OECD-indicators' (OECD 2017, *Obstetric trauma* page 118) shows that Norway is below the OECD average incidence of (third- or fourth-degree) sphincter ruptures following operative vaginal deliveries. The proportion of forceps or vacuum-assisted deliveries appears to have remained relatively stable over time, and there seems to be variations in practice between hospital referral areas when it comes to choosing between the operative methods (see also Chapter 4.7 page 63, Figures 4.25 and 4.26.)

The observed variation in operative vaginal delivery for primiparous women is deemed to be unwarranted. It is more challenging to determine whether this is also the case for multiparous women, since the low number of operative deliveries means that there is a greater element of random variation. Nevertheless, we believe that there is reason to ask whether the observed variation for multiparous women could also be unwarranted.

4.7 Emergency and planned caesarean sections

The number of births that end in a caesarean delivery has remained very stable in Norway over the past years, and in 2017 it was 16.2%.[7] In the 1960s very few babies, only around two per cent, were delivered by caesarean section. The rate increased until 2006, and has since remained at 16–17%. About one third of caesarean sections are planned, also known as elective. A planned caesarean section is one where the decision was made more than eight hours before the procedure. There are three main reasons for caesarean sections:

- Severe complications that make caesarean section absolutely necessary, such as total placenta previa
- An assessment of prevention of potential complications, based on monitoring before or during labour and the patient's medical history
- Social, cultural or legal factors where the woman has a right to participate in the decision regarding caesarean section

The probability of caesarean delivery is highest if the baby is in the breech position, in connection with multiple births and if the pregnant woman has had a caesarean section in connection with previous births. Caesarean sections entail an increased risk of acute complications relating to anaesthesia during the procedure and increases the risk of thrombosis and wound infections during the following days. The 30-day wound infection rate is 8-9%. The most important consequence of caesarean sections is a high probability (45%) of needing another caesarean section in the next pregnancy. Caesarean sections also increase the risk of complications such as spontaneous abortion, bleeding during the pregnancy and growth restriction in later pregnancies. There is also an increased risk of severe, but rare, complications such as uterine rupture, placenta previa, morbidly adherent placenta and premature separation of the placenta. It appears that a caesarean section has a negative effect on newborns in the head presentation, while breech babies may benefit from caesarean delivery (Villar et al. 2007; Wehberg et al. 2018; Hofmeyr et al. 2015).

Findings

During the period 2015–2017, approx. 860 primiparous women and 2,400 multiparous women per year had a planned caesarean section. This corresponds to 3.5% of primiparous women and 7.1% of multiparous women. In addition, approx. 3,600 emergency caesarean sections were performed on primiparous women and 2,400 on multiparous women each year, corresponding to 14.5% of primiparous women and 7% of multiparous women. For Norway as a whole, the ratio between emergency and planned caesarean sections was 4:1 for primiparous women and 1:1 for multiparous women.

Figures 4.22 and 4.23 show planned and emergency caesarean sections per 1,000 births for primiparous and multiparous women, respectively. Moderate geographical variation was observed for primiparous women. Primiparous women resident in Nord-Trøndelag hospital referral areas had about 80% more caesarean sections per 1,000 births than primiparous women in the Bergen area. The proportion of emergency caesarean sections for primiparous women varied from 72.8% for women resident in Diakonhjemmet hospital referral area to 85.3% for women in the Møre og Romsdal area.

[7] https://helsenorge.no/Kvalitetsindikatorer/graviditet-og-fodsel/keisersnitt

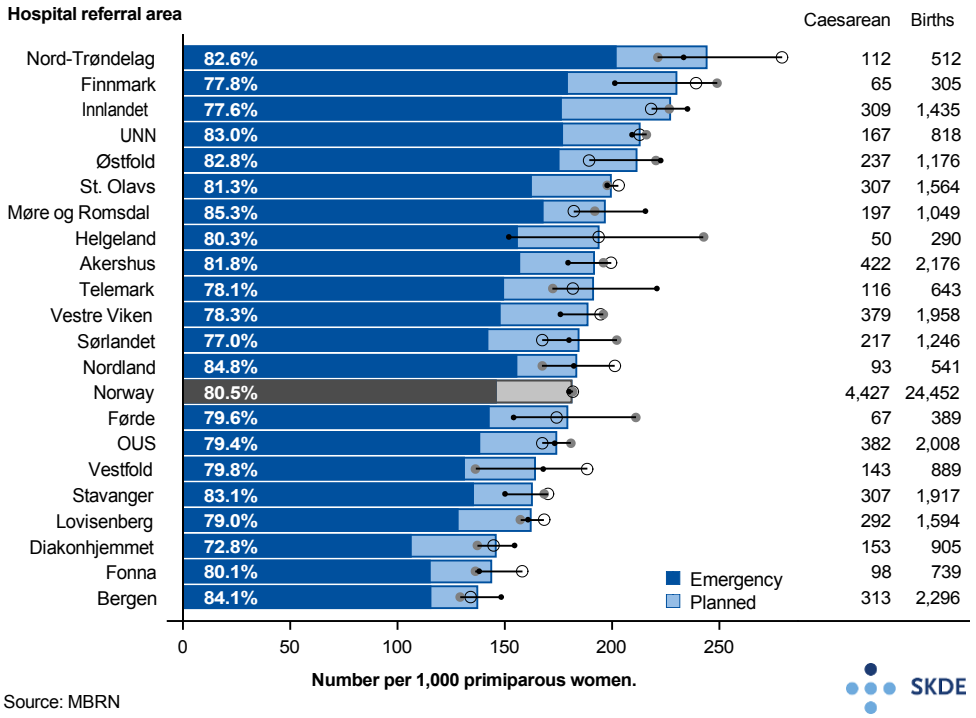


Figure 4.22: Caesarean sections, emergency and planned. Number of primiparous women who had a caesarean section per 1,000 primiparous women, adjusted for age. Number of primiparous women who had a caesarean section on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

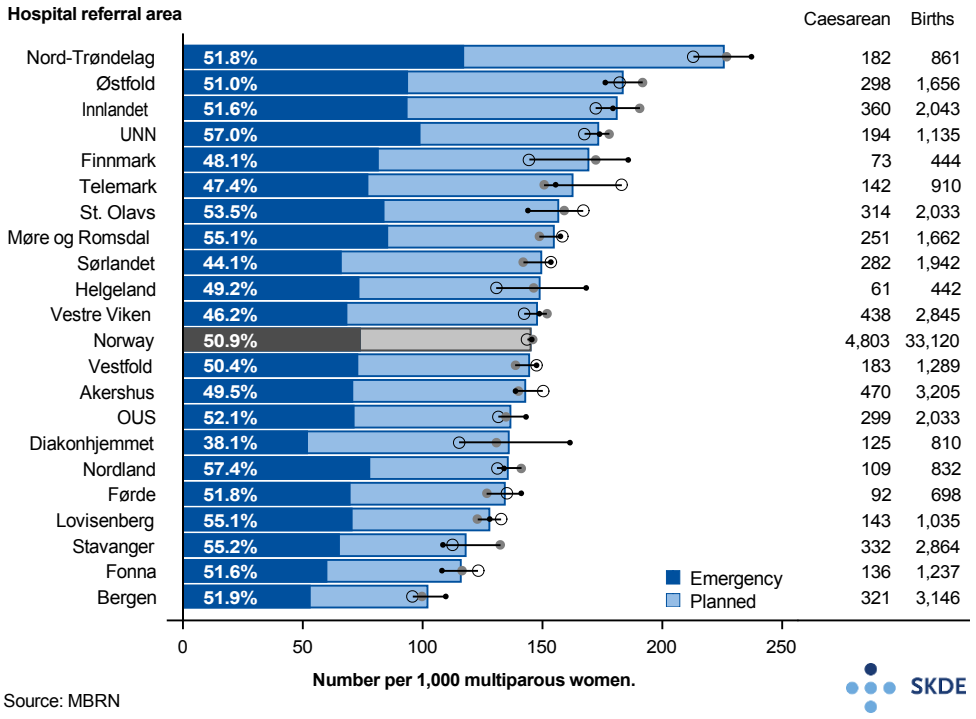


Figure 4.23: Caesarean sections, emergency and planned. The number of multiparous women who had a caesarean section per 1,000 multiparous women, adjusted for age. Number of multiparous women who had a caesarean section on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

The geographical variation was higher for multiparous women. Women resident in Nord-Trøndelag hospital referral area had more than twice as many caesarean sections per 1,000 births as women resident in the Bergen area. If we exclude Nord-Trøndelag hospital referral area, which had the highest rate, the variation for multiparous women was also moderate. For multiparous women, the proportion of emergency caesarean sections varied from 38.1% for women resident in Diakonhjemmet hospital referral area to 57.4% for women in the Nordland area.

There was a clear correlation between the use of emergency caesarean sections in primiparous and multiparous women. The hospital referral areas with the highest caesarean section rates for primiparous women are mostly among the areas with the highest rates for multiparous women. There is also a clear correlation for planned caesarean sections (see Appendix A for details).

Emergency caesarean sections, Robson group 1

During the period 2015–2017, approx. 1,300 births per year in Robson group 1[8] (corresponding to 8.4 % of all births in Robson group 1) and approx. 350 births in Robson group 3 (corresponding to 1.7 % of all births in Robson group 3) ended in emergency caesarean sections. Figure 4.24 shows the number of emergency caesarean sections per 1,000 births in Robson group 1, broken down by hospital referral area. There were twice as many emergency caesarean sections per 1,000 births in Robson group 1 among women resident in UNN hospital referral area compared with women resident in the Diakonhjemmet area.

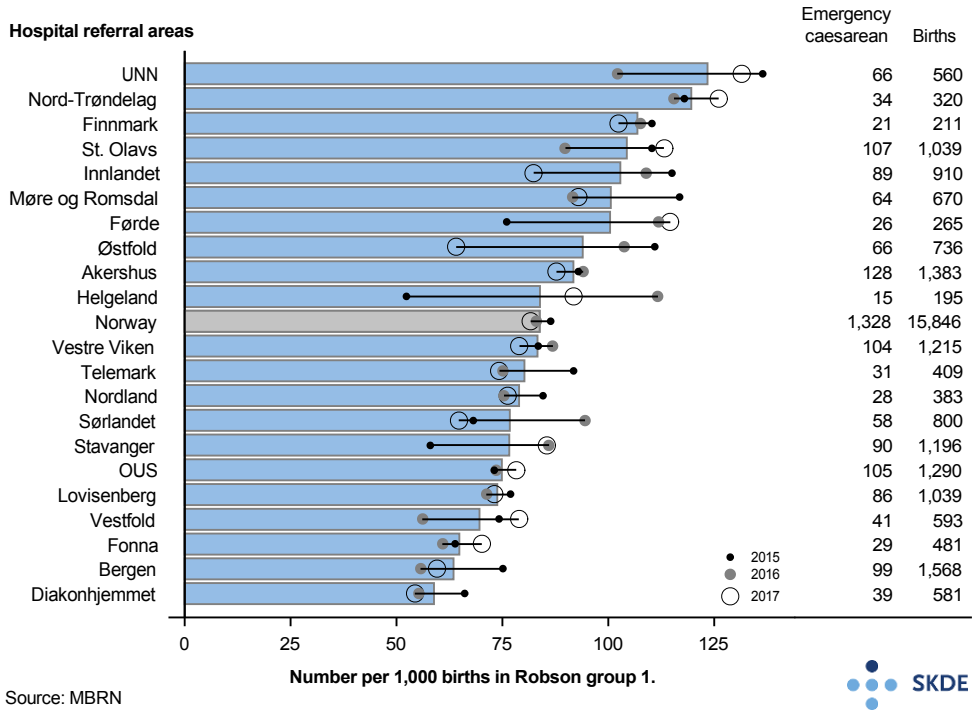


Figure 4.24: Robson group 1, births with emergency caesarean sections. Number of births with emergency caesarean sections per 1,000 births in Robson group 1, adjusted for age. Number of births with emergency caesarean sections and number of births in Robson group 1 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

[8] See the description of Robson groups in Chapter 3, page 32.

The low number of births in Robson group 3 that ended in an emergency caesarean section means that the variation between hospital referral areas is strongly influenced by random variation. The interpretation of these results is associated with so much uncertainty that we have decided not to show results broken down by hospital referral area for births in Robson group 3.

Comments

Norway's rate of caesarean delivery has been comparable to those of the other Scandinavian countries, and is low compared with most other European countries (OECD 2009). The rates for emergency caesarean sections were particularly low in Diakonhjemmet, Bergen and Fonna hospital referral areas. If this finding is seen in conjunction with the results for operative vaginal delivery (forceps delivery or vacuum extraction) (Figure 4.25 and Figure 4.26), the overall variation is low. The hospital referral areas where caesarean section was least used had the highest rates for forceps and vacuum-assisted delivery. This indicates that the indications for operative intervention to deliver a baby are reasonably evenly distributed, but that different and sometimes strong preferences as regards the choice of method prevail in different geographical areas.

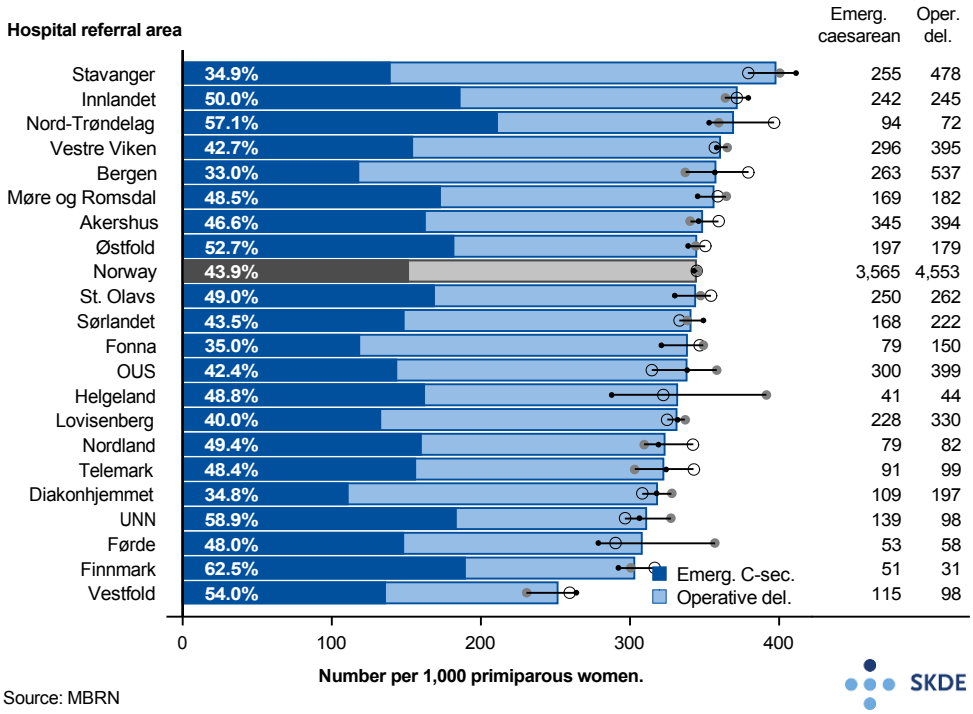


Figure 4.25: Operative deliveries. Number of primiparous women who underwent an emergency caesarean section or operative vaginal delivery per 1,000 births (excluding planned caesarean section), adjusted for age. Number of births with emergency caesarean section/operative delivery on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

For primiparous women in Robson group 1, variation between hospital referral areas roughly corresponded to the variation for all types of births that ended in an emergency caesarean section. The geographical variation in the proportion of births with one or more material risk factors present (births in Robson groups 4-10) was low (see Figure 3.11 and Figure 3.12 in Chapter 3). This indicates that some of the variation in the use of caesarean section is due to variations in practice.

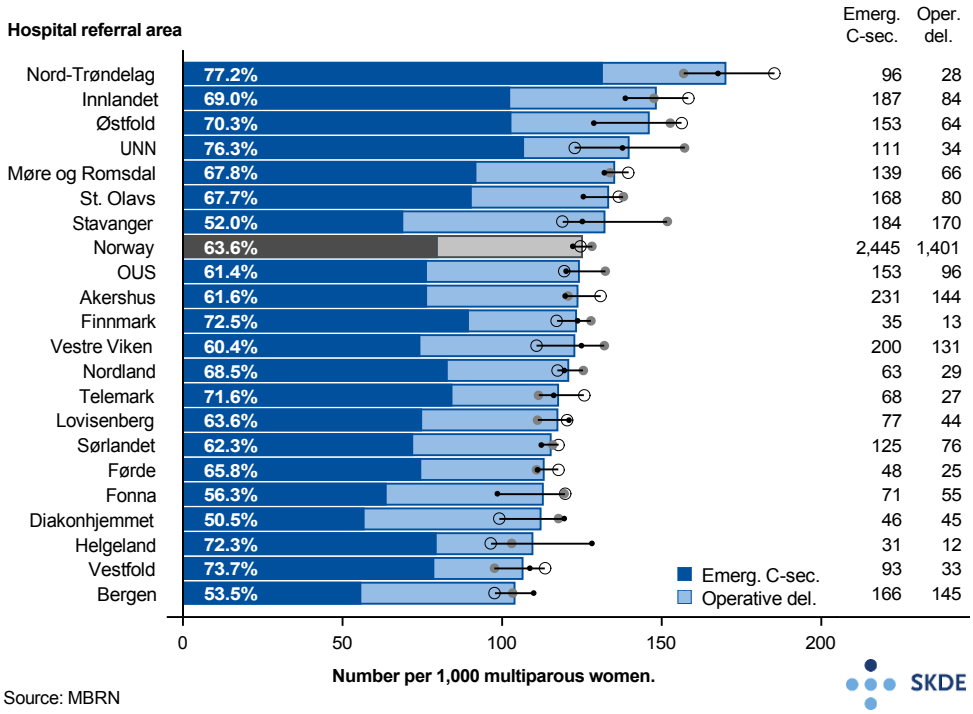


Figure 4.26: Operative deliveries. Number of multiparous women who underwent an emergency caesarean section or operative vaginal delivery per 1,000 births (excluding planned caesarean section), adjusted for age. Number of births with emergency caesarean section/operative delivery on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

There was a striking difference in the emergency caesarean section rates for primiparous and multiparous women. Around 140 out of 1,000 primiparous women had an emergency caesarean section, compared with only approx. 70 out of 1,000 multiparous women. The overall rate for caesarean sections did not differ significantly between primiparous and multiparous women. Based on experience, we know that a previous caesarean section often lowers the threshold for another one, which could explain the high proportion of planned caesarean sections among multiparous women.

4.8 Severe perineal tears (sphincter ruptures)

A serious complication of vaginal delivery is a third- or fourth-degree tear, meaning a tear that involves the anal sphincter (third-degree tear) or the anal sphincter and the anorectal mucosa (fourth-degree tear). Third-degree and fourth-degree tears are often called sphincter ruptures. It is uncertain whether episiotomy can prevent obstetric anal sphincter injuries (Stedenfeldt et al. 2012; Raisanen et al. 2014).

The proportion of women who give birth vaginally who suffer severe tears has been a national quality indicator since 2009. The proportion who tears has decreased steadily from more than 4% in 2004–2005 to 1.7% in 2017. There has been considerable variation between hospital referral areas, however, but less in recent years.[9]

The MBRN states that for the period 2015–2017, the proportion of forceps deliveries that ended in severe (third- and fourth-degree) tears was 6.3% for primiparous women and 5.2% for multiparous women. The proportion of vacuum-assisted deliveries that ended in severe tears during the same period was 5.0% for primiparous women and 3.8% for multiparous women.

A national action plan to reduce the incidence of obstetric anal sphincter injuries in Norway (*Sfinkterskade ved fødsel bør reduseres i Norge*) (Nasjonalt råd for fødselsomsorg 2006) was launched in 2006. One important aspect of this action plan was to learn from experience from Finland, which had a tradition of active perineal protection during the final stage of delivery using a technique known as the 'Finnish grip'. The 2014 obstetrics guide *Veileder for fødselshjelp* recommends always supporting the perineum/head during delivery. Episiotomy is only performed when it can reduce the risk of severe perineal tearing or when it is desirable to deliver the baby quickly (Veileder i fødselshjelp, kapittel 42 2014).

Findings

During the period 2015–2017, just under 600 primiparous women and approx. 250 multiparous women per year suffered a third- or fourth-degree perineal tear. This corresponds to approximately 2.9% of primiparous women and 0.9% of multiparous women who gave birth vaginally. The low number of tears means that the variation between hospital referral areas is strongly influenced by random variation. This is reflected in the high variation from year to year in the rates in Figure 4.27, which shows the number of births with severe perineal tearing per 1,000 primiparous women who gave birth vaginally.

For multiparous women, the numbers were so low and the interpretation of these results therefore associated with so much uncertainty that we have decided not to show results broken down by hospital referral area.

[9] Quality indicators at helsenorge.no: Incidence of perineal tears

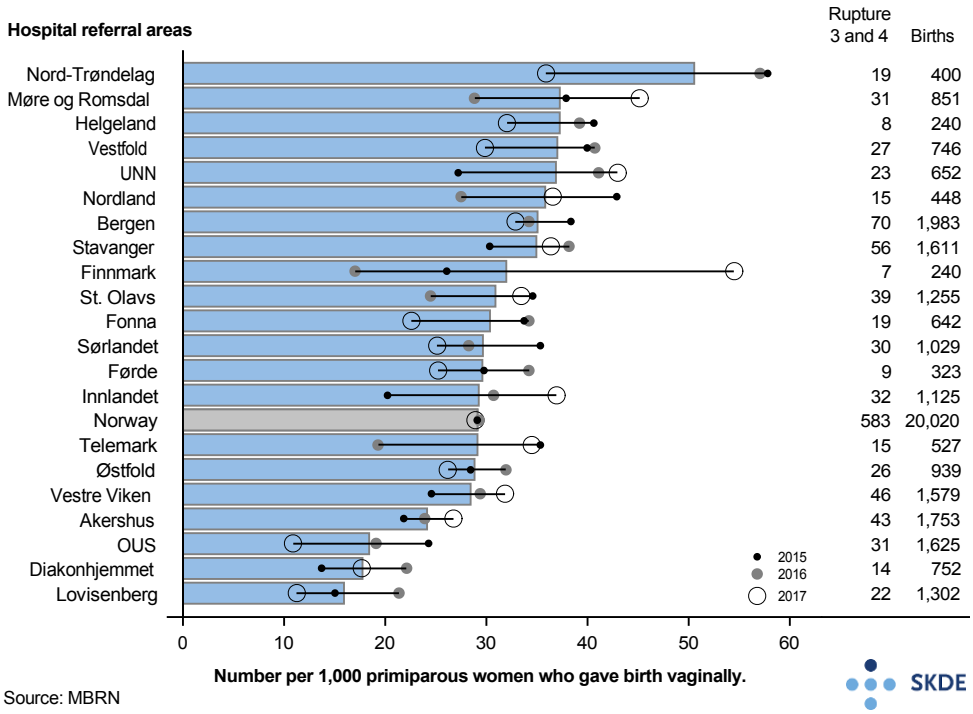


Figure 4.27: Sphincter rupture. Number of primiparous women who suffered sphincter ruptures (third- and fourth-degree tears) per 1,000 primiparous women who gave birth vaginally, adjusted for age. Number of primiparous women who suffered sphincter ruptures and all primiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

A sphincter rupture is a serious complication, and the goal is to keep the incidence as low as possible. It is difficult to quantify a target, but the fewer cases the better. The low number of cases results in high internal variation in individual hospital referral areas between years, which means that results are uncertain. Nevertheless we see that some hospital referral areas have rates below the national average for all three years during the period, while others consistently have rates above the national average. When the proportion of primiparous women who suffer a severe perineal tear varies between 1.7% and 4.8%, this indicates that there is a potential for improvement in the hospital referral areas with the highest percentages. We nevertheless have to conclude that the variation in the incidence of serious perineal tears is influenced by random variation and that this makes it impossible to identify any systematic geographical variation.

As regards sphincter ruptures resulting from vaginal deliveries where no forceps delivery or vacuum extraction was required, Norway is around the average level for OECD countries (1.4% in Norway, 1.5% average for OECD countries) (OECD 2017, *Obstetric trauma* page 118). The rupture percentages for Sweden and Denmark were 2.5% and 2.6%, respectively.

4.9 Bleeding after vaginal delivery (postpartum haemorrhage)

If a woman loses more than 500 ml of blood following a vaginal delivery, that is called postpartum haemorrhage. A blood loss of more than 1,500 ml is considered a major postpartum haemorrhage, and approx. 2.5% of women who give birth will experience this (Veileder i fødselshjelp, kapittel 43, 2014).

Major postpartum haemorrhage puts the woman at risk of injury and death, and is the cause of 30% of maternal deaths worldwide. It is difficult to determine the amount of blood lost, as it mixes with the amniotic fluid and can be hard to collect. The amount of blood is therefore determined by subjective assessment. Twin births, first birth, large baby, induced birth, epidural pain relief, operative vaginal delivery, episiotomy and rupture all increase the risk of haemorrhage. It is important to identify patients who are at increased risk of postpartum haemorrhage so that action can be taken at an early stage if necessary.

Measures such as the routine administration of oxytocin (a drug that makes the uterus contract) and active management of the third stage of labour are recommended in connection with all births and may reduce blood loss. The main causes of postpartum haemorrhage is that the uterus fails to contract (most frequent), that the placenta does not detach, and damage to the soft tissue of the birth canal. Coagulation disorders (coagulopathy) is a possible, but rare cause. Coagulation disorders (DIC - disseminated intravascular coagulation) can occur secondary to heavy bleeding.

A number of different measures may be required to stop the bleeding, depending on the blood loss and cause of bleeding. In addition to oxytocin and active management of the third stage of labour, it may become necessary to administer various other drugs and surgically repair injuries. Infusion of fluid and blood transfusions may be required. Ongoing bleeding in the birth canal must be treated surgically. In rare cases, a hysterectomy may be required to bring the bleeding under control.

Findings

During the period 2015–2017, just over 1,000 primiparous women per year lost more than 1,500 ml of blood after giving birth. Approx. 730 of them had given birth vaginally (corresponding to 3.7% of primiparous women who gave birth vaginally) and approx. 290 had undergone a caesarean section (corresponding to 6.5% of primiparous women who had a caesarean section).

The proportion of women who suffered major postpartum haemorrhage was lower for multiparous than for primiparous women. Each year, approx. 900 multiparous women lost more than 1,500 ml of blood after giving birth. Approx. 600 of them had given birth vaginally (corresponding to 2.2% of multiparous women who gave birth vaginally) and approx. 280 had undergone a caesarean section (corresponding to 5.8% of multiparous women who had a caesarean section).

Very few women suffered major postpartum haemorrhage in connection with caesarean sections, and the figures for each hospital referral area therefore have a strong element of random variation. For this reason, only results for major postpartum haemorrhage after vaginal delivery are presented broken down by hospital referral area.

Nord-Trøndelag hospital referral area had the highest rate of major postpartum haemorrhage after vaginal delivery for primiparous women, but the rate varied considerably between years (Figure 4.28). About twice as many women per 1,000 births suffered major postpartum haemorrhage after vaginal delivery among residents of Telemark hospital referral area, which had the second highest rate, compared with residents of Førde hospital referral area, which had the lowest rate.

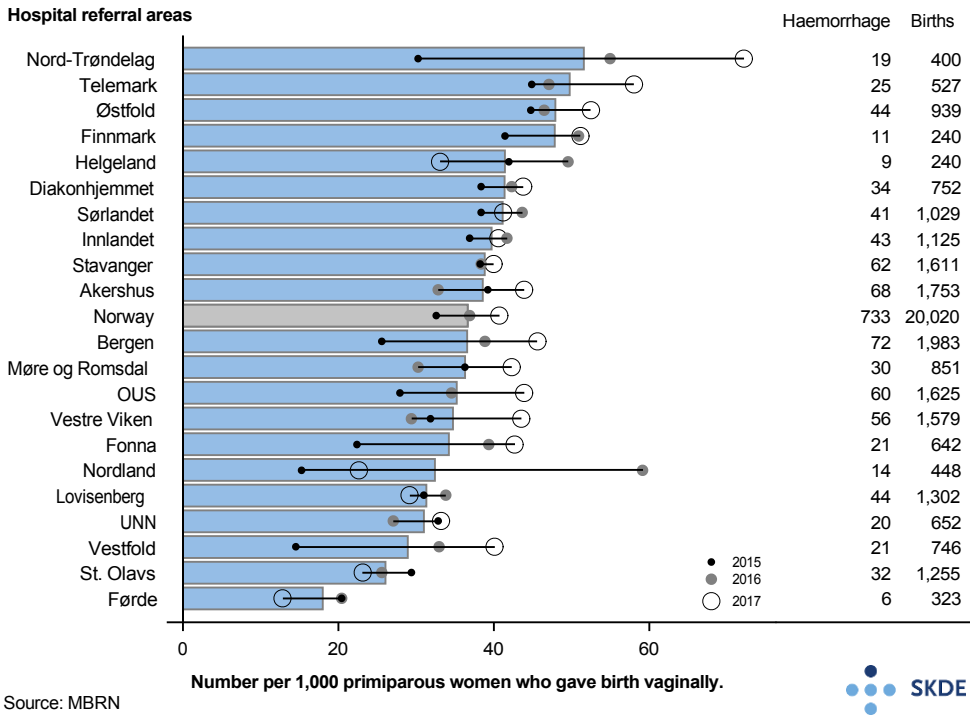


Figure 4.28: Haemorrhage. Number of women suffering major haemorrhage per 1,000 primiparous women who gave birth vaginally, adjusted for age. Number of women suffering major haemorrhage and all primiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Nearly three times as many multiparous women per 1,000 births suffered major postpartum haemorrhage after vaginal delivery among residents of Østfold hospital referral area compared with residents of the Førde area (Figure 4.29).

There was a certain correlation between the incidence of major postpartum haemorrhage in primiparous and multiparous women (see Appendix A for details).

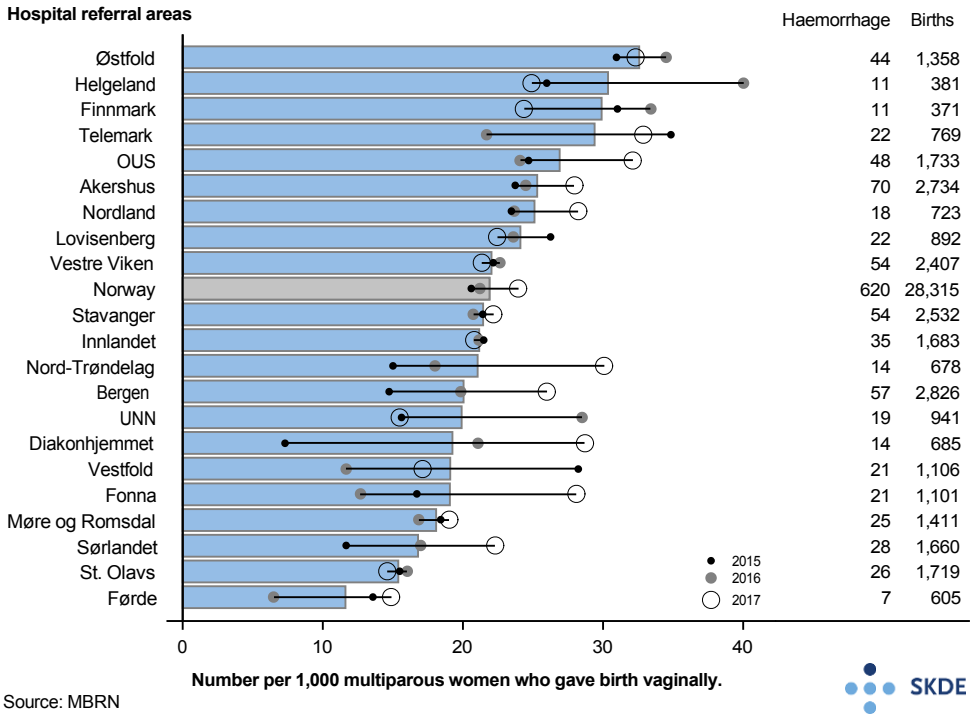


Figure 4.29: Haemorrhage. Number of women who lost more than 1,500 ml of blood per 1,000 multiparous women who gave birth vaginally, adjusted for age. Number of women who lost more than 1,500 ml of blood and all multiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

Nearly 4% of primiparous women and 2.2% of multiparous women suffered a major haemorrhage of more than 1,500 ml after giving birth vaginally.[10] The variation between the highest and lowest rates for primiparous and multiparous women was two and three, respectively. The number of events is low and the internal variations from year to year within each hospital referral area are relatively high. Consequently, there is some uncertainty about whether the observed variation can be ascribed to chance.

Some risk factors for haemorrhage are related to the woman giving birth and have nothing to do with decisions made during the birth. They include twin births, first birth, big baby, high age and obesity. Underlying conditions in the woman, such as pathological conditions of the uterus, coagulation disorders or hypertension, can lead to major postpartum haemorrhage. Other risk factors are linked to decisions made in connection with childbirth, such as induction, stimulating contractions during labour and operative delivery. We know the distribution of some of these risk factors, but not of others. The observed variation can hardly be explained by these factors.

[10] The MBRN states that for Norway as a whole, the number of women who have suffered postpartum haemorrhage in excess of 500 ml has increased steadily over the past decade. The registry suspects that the increase is due to changes in the registration practice, and a project is being planned to check whether this is actually the case. Based on the above, the MBRN believes that there is a certain uncertainty associated with the above figures.

4.10 The condition of the newborn (Apgar score)

The midwife assesses the baby's condition immediately after birth using the Apgar score method, named for the American anaesthetist Virginia Apgar, who worked at Columbia University College. If a paediatrician is present, he or she is responsible for the baby's condition and sets the Apgar score. The Apgar score comprises five variables, and a score of 0, 1 or 2 points is given for each of them:

- heart rate
- respiration
- muscle tone (floppiness)
- response to stimuli
- colour

The points are added up to give a total score between 0 and 10. This assessment is normally carried out two or three times: at 1 minute, 5 minutes and, if relevant, 10 minutes after birth. The proportion of newborns with an Apgar score below 7 at 5 minutes is a national quality indicator for which results are presented broken down by where the baby was born.[11] The Apgar score only measures the baby's condition immediately after birth, and is not a reliable indicator of future health. Babies with low Apgar scores are at increased risk of developing cerebral palsy, but 80–90% of those born with extremely low Apgar scores do not develop the disease (Lie et al. 2010). Scores between 7 and 10 are considered normal. Scores between 4 and 6 require immediate action, usually with supplemental oxygen and non-invasive ventilation support. Suctioning of the mouth and throat if they are obstructed by mucous or foetal stool (meconium). A newborn with an Apgar score of 0-3 will need resuscitation procedures.

Further examinations of newborns are described in Chapter 4.12 The postnatal period.

Findings

During the period 2015–2017, there were approximately 780 births per year where the newborn had an Apgar score below 7 at 5 minutes after birth. Approximately 450 of these births were to primiparous women, while around 330 were to multiparous women. This corresponds to 1.9% of all births to primiparous women and 1.0% of all births to multiparous women.

Figure 4.30 shows the number of births with low Apgar scores per 1,000 births for primiparous women. As a result of the low number of births with low Apgar scores, the observed variation between hospital referral areas is characterised by random variation. This is reflected in Figure 4.30 in that the rates vary a great deal from year to year. For multiparous women, the number of cases was so low and the interpretation of these results therefore associated with so much uncertainty that we have decided not to show results broken down by hospital referral area.

[11] Helsenorge.no, quality indicators: Condition of newborns.

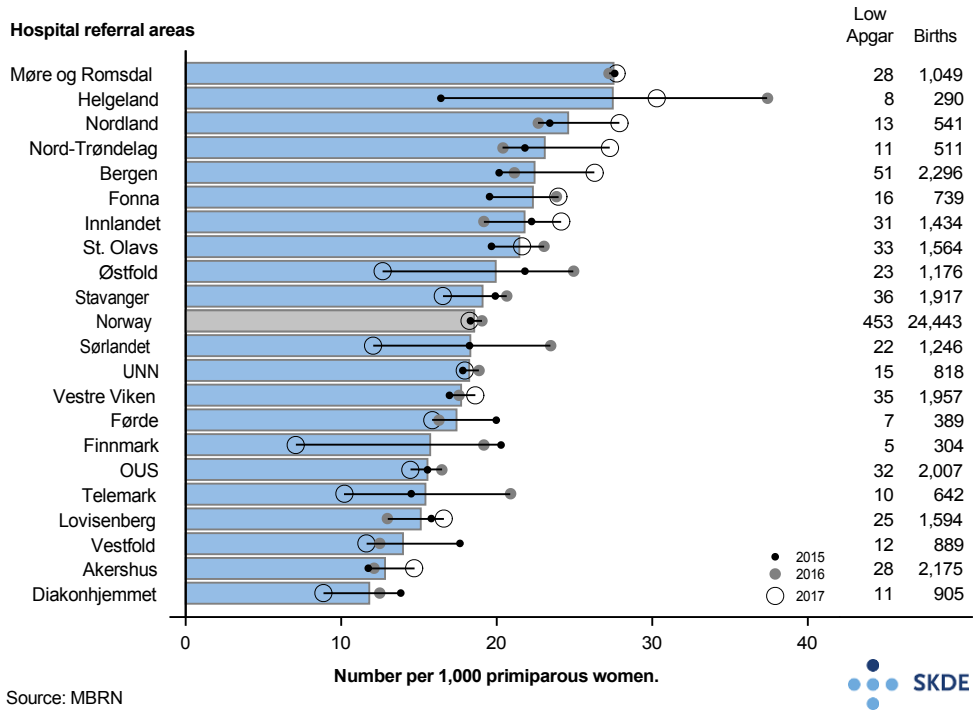


Figure 4.30: Apgar score. Number of births with Apgar score <7 at 5 minutes per 1,000 births to primiparous women, adjusted for age. Number of newborns with Apgar score <7 and all primiparous women on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Comments

Few newborns had an Apgar score below 7 at 5 minutes, and the proportion of newborns with low Apgar scores was higher for births to primiparous women than to multiparous women. Possible reasons for low Apgar scores include oxygen deprivation during parts of the birth, effects of medication or illness in the child such as an infection, a more serious congenital disease or an established brain injury. The geographical distribution of congenital diseases resulting in low Apgar scores is assumed to be more or less even across Norway.

Since the number of cases is so low, a high proportion of the observed variation in the number of newborns who have low Apgar scores will be random variation. Maternity units belonging to hospital referral areas that have consistently high rates over time should nevertheless consider introducing measures aimed at reducing birth complications that can lead to low Apgar scores in newborns.

4.11 Complications in women in Robson groups 1 and 3

From the onset of labour, women in Robson groups 1 and 3 are expected to have normal births based on their risk profile, but surgical procedures and complications may nevertheless occur. Since complications occur during so few births in Robson groups 1 and 3, we will consider the following complications together:

- Major haemorrhage (> 1,500 ml) after vaginal delivery
- Sphincter rupture (third-degree and fourth-degree tears)
- Apgar score < 7 at 5 minutes

Findings

Since one birth can involve one or more complications (for example the mother suffering a major postpartum haemorrhage and the baby having a low Apgar score), the number of complications will not equal the number of births with complications. During the period 2015–2017, approx. 1,000 complications per year occurred during births in Robson group 1 and approx. 500 complications during births in Robson group 3.

There was approx. 65 complications per 1,000 births per year in Robson group 1, which means that the rate is approx. 2.5 times that of Robson group 3. Residents of Nord-Trøndelag hospital referral areas had more than twice as many complications per 1,000 births as those resident in the Lovisenberg area (Figure 4.31).

There were few complications (26 per 1,000 births for Norway as a whole) in Robson group 3, and variation between hospital referral areas is therefore strongly influenced by random variation. This is reflected in Figure 4.32 in that the rates vary a great deal from year to year within hospital referral areas.

Comments

A higher proportion of births in Robson group 1 than in Robson group 3 involved complications such as major haemorrhage, sphincter rupture or low Apgar score. For women in Robson group 3, the volume was so low that random variation accounts for a considerable proportion of the observed variation. Therefore, we have no basis for assessing whether the observed variation is systematic.

Women in Robson group 1 resident in Nord-Trøndelag and Finnmark hospital referral areas had about twice as many complications per 1,000 births as those resident in the hospital referral areas in the Oslo region. Nord-Trøndelag hospital referral area had high haemorrhage and sphincter rupture rates for primiparous women regardless of Robson group (see Chapters 4.8 and 4.9). Maternity units belonging to hospital referral areas that have high rates over time should consider introducing measures aimed at reducing the number of birth complications.

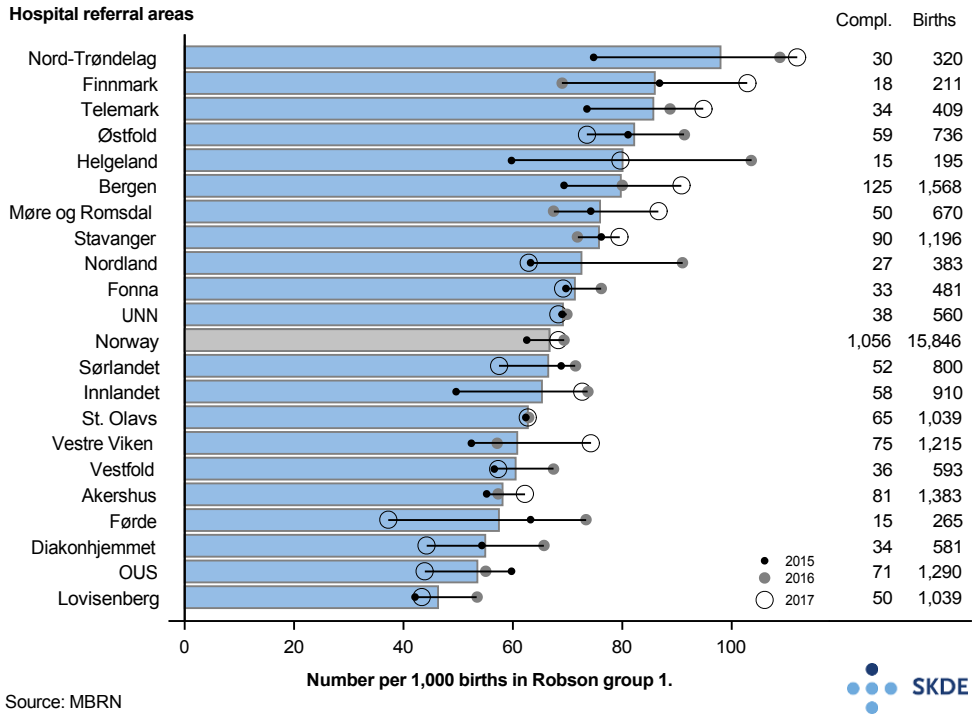


Figure 4.31: Robson group 1, births with complications. Number of complications per 1,000 births in Robson group 1, adjusted for age. Number of complications and number of births in Robson group 1 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

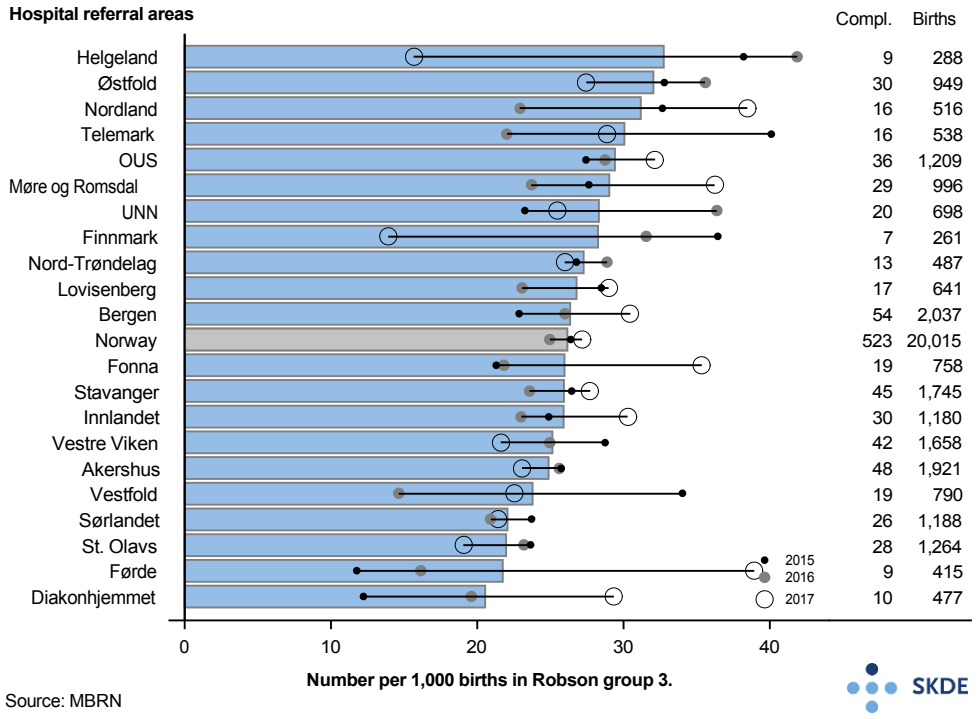


Figure 4.32: Robson group 3, births with complications. Number of complications per 1,000 births in Robson group 3, adjusted for age. Number of complications and number of births in Robson group 3 on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

4.12 The postnatal period

The postnatal period lasts for approximately six weeks from the birth. This is the period it will normally take for the body to adjust, physically and mentally, to the fact that the pregnancy is over and life as the mother of a small child has begun. Postpartum women, their newborns and family may need close follow-up during the first few days after birth. This is partly because the postpartum woman has medical needs and the baby is vulnerable while it adjusts to life outside the womb and stable feeding and growth is established. However, it is equally important to identify and offer assistance to women and families in cases where there is a risk that mental health issues, the family or care situation or other factors could pose a threat to stability and good development.

The first days after birth are normally spent in a hospital delivery and maternity unit. Some hospitals practise what is known as ambulant delivery, which means discharge from hospital a few hours after the birth with subsequent follow-up being provided as home-based and postnatal outpatient clinic services. The length of hospitals stays decreased from 4.1 to 3.1 days during the period from 1999 to 2008. Over the past years, from 2009 to 2017, the average length of stay has been further reduced to 2.8 days.[12] Primiparous women and women who have had a caesarean section stay longer.

In addition to the Apgar score immediately after birth (see Chapter 4.10), the midwife will carry out a more general examination of the newborn during the first couple of hours. The oxygen content in the baby's blood is measured to uncover any serious heart defects, and a routine injection of vitamin K is administered to prevent bleeding. A doctor will be called immediately if illness or abnormalities are suspected. All newborns are normally examined by a doctor within one to three days after birth. The doctor will examine the hips, listen for heart murmurs and test the baby's hearing. After 48–72 hours, what is known as the 'newborn blood spot screening' will be performed. This involves taking a blood sample from the baby's heel, and all newborns have this test. The purpose of the test is to detect certain rare, but serious congenital diseases that are treatable and where an early diagnosis is crucial to the baby's prognosis. The blood is tested for the metabolic disease phenylketonuria (Følling's disease) and congenital hypothyroidism, in addition to another 23 rare congenital hereditary diseases. Approximately one in one thousand children in Norway are born with one of the 25 conditions that the newborn screening tests for. If the mother and baby are discharged sooner than 48 hours after birth, they will usually return to the maternity unit for the screening test. In some areas, the test is conducted at home or by municipal health personnel.

The hospital is responsible for informing the public health clinic, regular GP and the municipal midwife service when mother and baby are discharged. The 2014 national guidelines for postnatal care (Helsedirektoratet 2014) recommends a home visit by a midwife one to three days after discharge. A health visitor should visit within seven to ten days. The public health clinic has a set follow-up programme, but also offers contact as needed.

The length of hospital stays has been reduced partly as a consequence of the Coordination Reform, which involved a transfer of responsibility from the specialist health service to the municipal health service. This may require an adjustment of the municipal services. Some municipalities experience a midwife shortage. In 2016, Norwegian municipalities employed midwives corresponding to about 300 full-time equivalents (Klassekampen 2015). Between 2014 and 2017, the number of municipal midwives increased by 120 among the just over 400 municipalities that make up Norway.[13]. These just over 400 midwives are responsible for

[12] Medical Birth Registry of Norway, Norwegian Institute of Public Health, 6 June 2018.

[13] Press release from the Norwegian Government. Stor vekst i jordmødre og helsesøstre i kommunene ('Strong

following up about 60,000 pregnant women and 60,000 postpartum women per year. There is an ongoing debate about whether the municipal health services can compensate for the shorter and shorter period of postnatal care provided by the specialist health service.

Three surveys of women's experience of delivery and maternity units were conducted under the auspices of the Norwegian Institute of Public Health (formerly the Norwegian Knowledge Centre for the Health Services). They took place in 2011, 2016 and 2017 (Sjetne, Kjøllesdal, et al. 2013; Sjetne and Holmboe 2017; Holmboe and Sjetne 2018). The results of these surveys were published as national quality indicators. The women's experiences of labour and delivery are more positive than their experiences of the postnatal stay, and this situation has changed little from the first to the last survey. A 2016 survey conducted by the voluntary peer breastfeeding support group Ammehjelpen[14] shows that the demand for Ammehjelpen's services is increasing.

Findings

Length of stay after birth

Figure 4.33 shows the average number of bed days per birth[15] for primiparous women who gave birth vaginally. Most hospital referral areas had a length of stay near the national average of approx. 3 days. The average length of stay for women resident in the hospital referral areas of Telemark and Nord-Trøndelag, which had the longest stays, was approx. 3.5 days. On average, primiparous women from these two areas stayed about a day longer in hospital than women from Østfold and Bergen hospital referral areas, which had the shortest stays.

The average length of stay was approx. 20 hours longer for primiparous women who gave birth vaginally (Figure 4.33) than for multiparous women who gave birth vaginally (Figure 4.34). In very many hospital referral areas, multiparous women were also close to the national average of just over two days. The average length of stay for women resident in the hospital referral areas of Nord-Trøndelag, Stavanger and Telemark was more than 2.5 days. On average, women from Nord-Trøndelag stayed for approx. 29 hours longer than women from Bergen hospital referral area, which had the shortest stays.

Primiparous women who had a caesarean section (Figure 4.35) stayed in hospital for an average of just over one day longer than women who gave birth vaginally. The average length of stay for women resident in the hospital referral areas of Nord-Trøndelag and Telemark, which had the longest stays, was approx. 5 days. On average, women from the Nord-Trøndelag area stayed for 38 hours longer than women from Østfold hospital referral area, which had the shortest stays.

growth in number of midwives and health visitors in municipalities' - in Norwegian only). 15 March 2018. https://www.regjeringen.no/no/aktuelt/stor-vekst-i-jordmodre-og-helsesostre-i-kommunene/id2593819/

[14] Jordmor hjem etter fødsel - skjer det? En undersøkelse av norske kommuners etterfølgelse av Helsedirektoratets anbefaling om hjemmebesøk av jordmor etter fødsel ('Midwife home visits after birth - do they take place? A survey of Norwegian municipalities' compliance with the Directorate of Health's recommendations regarding postnatal home visits by a midwife')

[15] Information about length of stay is not registered for all women who gave birth, and the number of births in the figures showing length of stay will therefore differ somewhat from the other chapters.

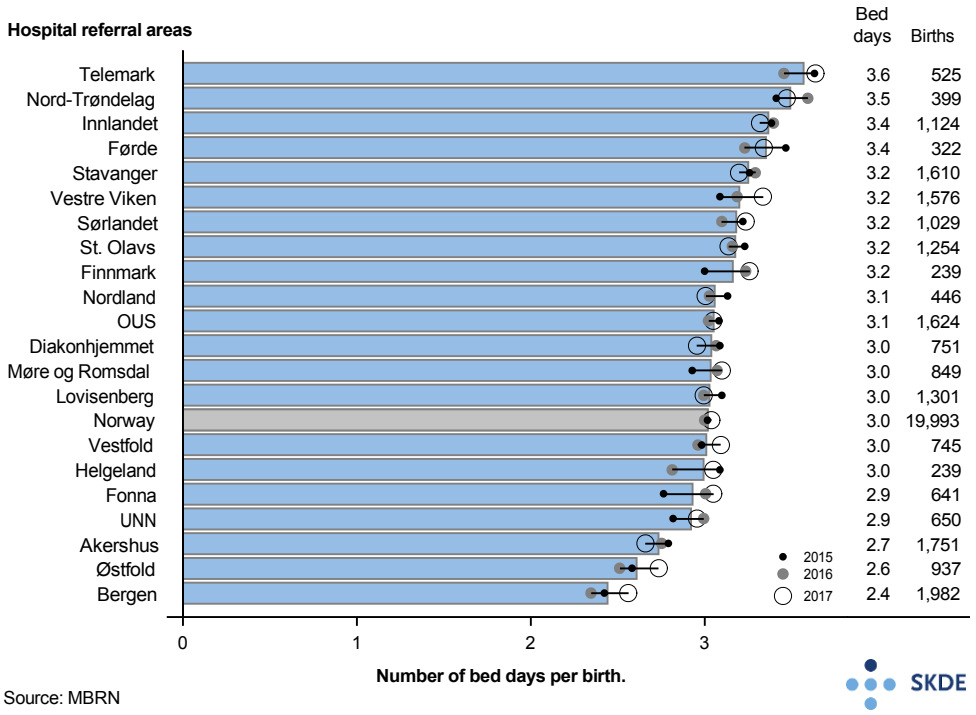


Figure 4.33: Number of bed days per birth for primiparous women who gave birth vaginally, adjusted for age. Number of bed days for primiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

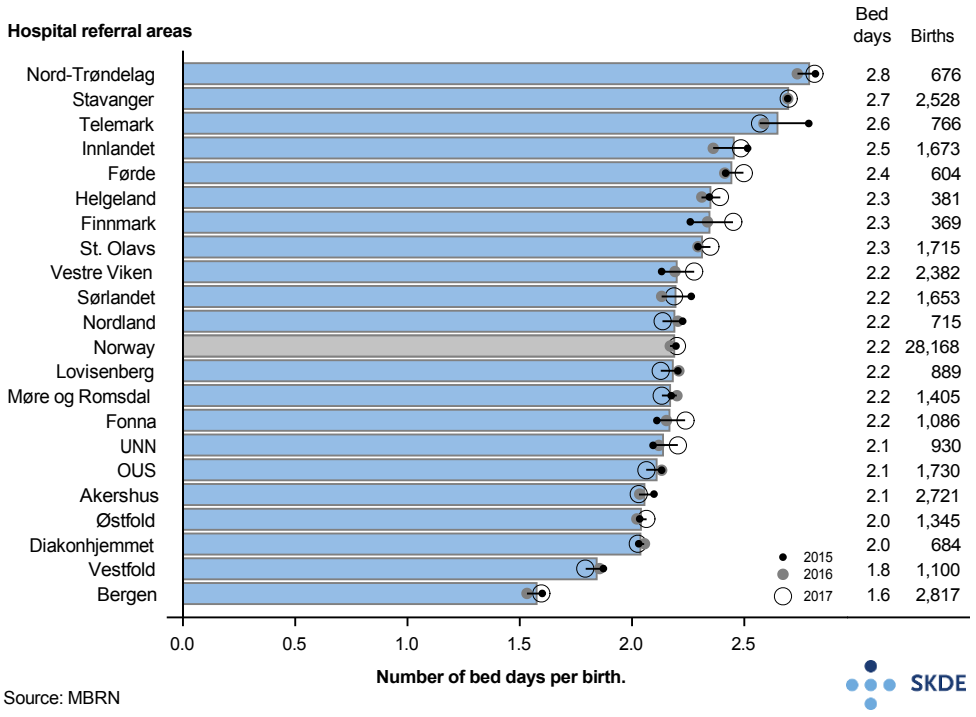


Figure 4.34: Number of bed days per birth for multiparous women who gave birth vaginally, adjusted for age. Number of bed days for multiparous women who gave birth vaginally on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

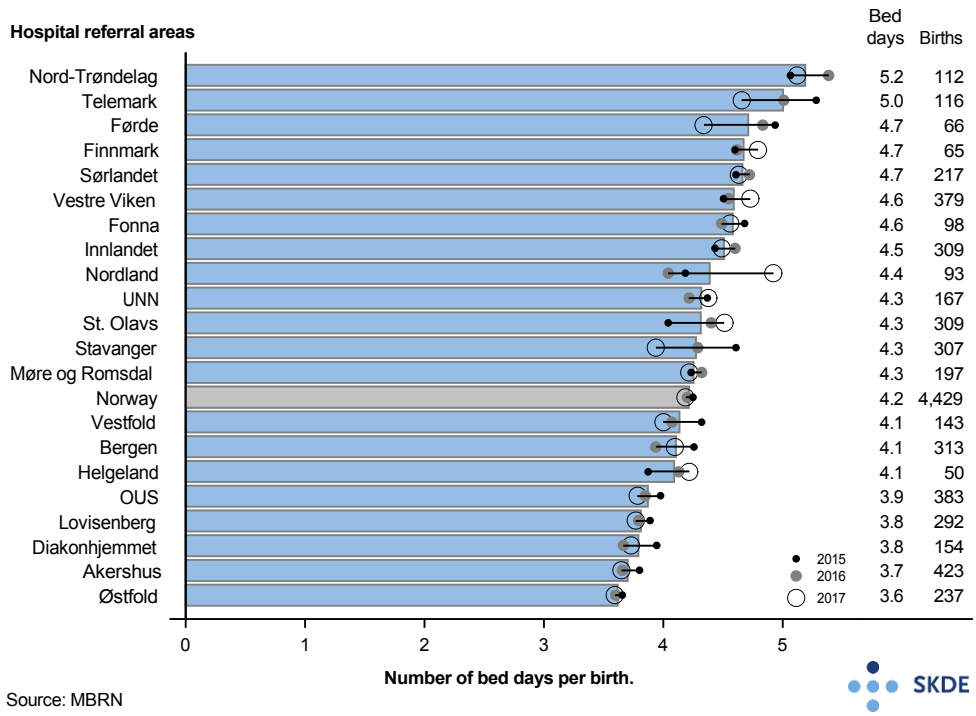


Figure 4.35: Number of bed days per birth for primiparous women who had a caesarean section, adjusted for age. Number of bed days for primiparous women who had a caesarean section on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Overall, there was little geographical variation in average lengths of stay for multiparous women who had a caesarean section (Figure 4.36). The three hospital referral areas of Telemark, Nord-Trøndelag and Fonna stand out with somewhat longer stays than other areas. Women resident in these areas had an average length of stay of more than 4 days. Otherwise, the average length of stay varied from 3.8 days for women resident in Sørlandet hospital referral area to 3.2 days for women from the Østfold area.

Mothers' use of health services during the postnatal period

During the period 2015–2017, nearly 16,000 postpartum women per year had one or more outpatient contacts during the first six weeks after birth, corresponding to 27% of all women who gave birth. The geographical variation in the number of postpartum women who used outpatient services was very high.

More than 600 per 1,000 postpartum women resident in Bergen hospital referral area had one or more outpatient contacts during the postnatal period, and 90% of them had at least one outpatient contact during the first week after giving birth (cf. Figure 4.37). In Stavanger hospital referral area, fewer than 100 per 1,000 postpartum women used outpatient services during the postnatal period, and 43% of these women had a contact during the first week.

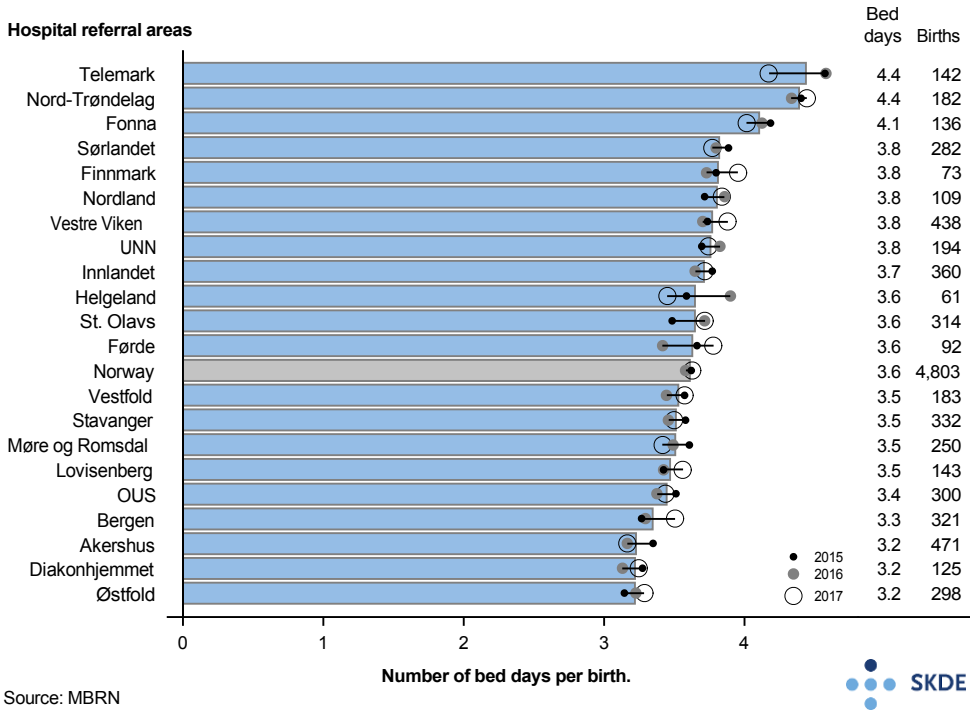


Figure 4.36: Number of bed days per birth for multiparous women who had a caesarean section, adjusted for age. Number of bed days for multiparous women who had a caesarean section on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

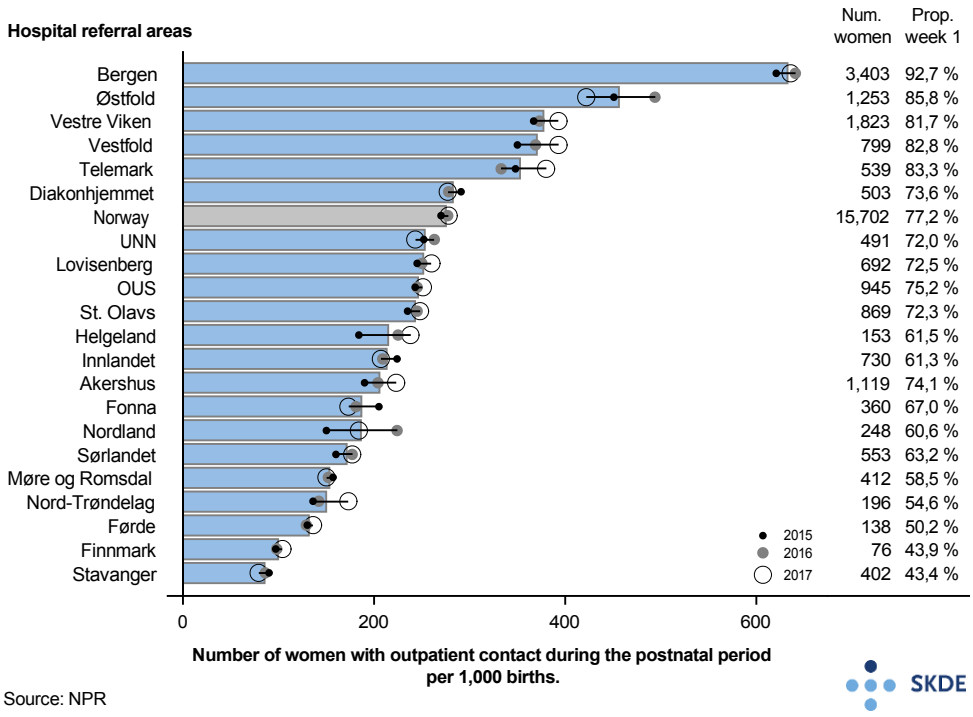


Figure 4.37: Number of postpartum women who had at least one outpatient contact during the postnatal period per 1,000 births, adjusted for age. Number of postpartum women who used outpatient services and the proportion who had one contact during the first week after being discharged from hospital on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Some of these outpatient contacts included home visits by a midwife employed by the hospital, particularly in Bergen hospital referral area. Healthy postpartum women with healthy newborns were discharged from hospital early (6-24 hours after birth) and visited by a midwife from the *Jordmor hjem* ('midwife home') team within 24 hours. Haukeland hospital started this project in 2007, and it has since grown. In recent years, Haukeland hospital has only offered this service to women living in the City of Bergen, and it has been a limited service even for them. The *Jordmor hjem* project in the City of Bergen cannot explain the high use of outpatient services by postpartum women resident in Bergen hospital referral area.

Beginning in 2017, Norwegian municipalities reported the number of home visits made by midwives within three days after discharge from a delivery and maternity unit. Figure 4.38 shows the number of home visits per 1,000 newborn for 2017 and 2018. The number of home visits increased considerably from 2017 to 2018 in the vast majority of hospital referral areas. The reason for this is probably that in 2017, the municipalities reported the number of home visits within one to two days, while in 2018, they reported home visits within three days. There was considerable geographical variation in the number of home visits. Women resident in Førde hospital referral area received five times as many visits from a municipal midwife per 1,000 babies born[16] as women resident in the Stavanger or UNN areas.

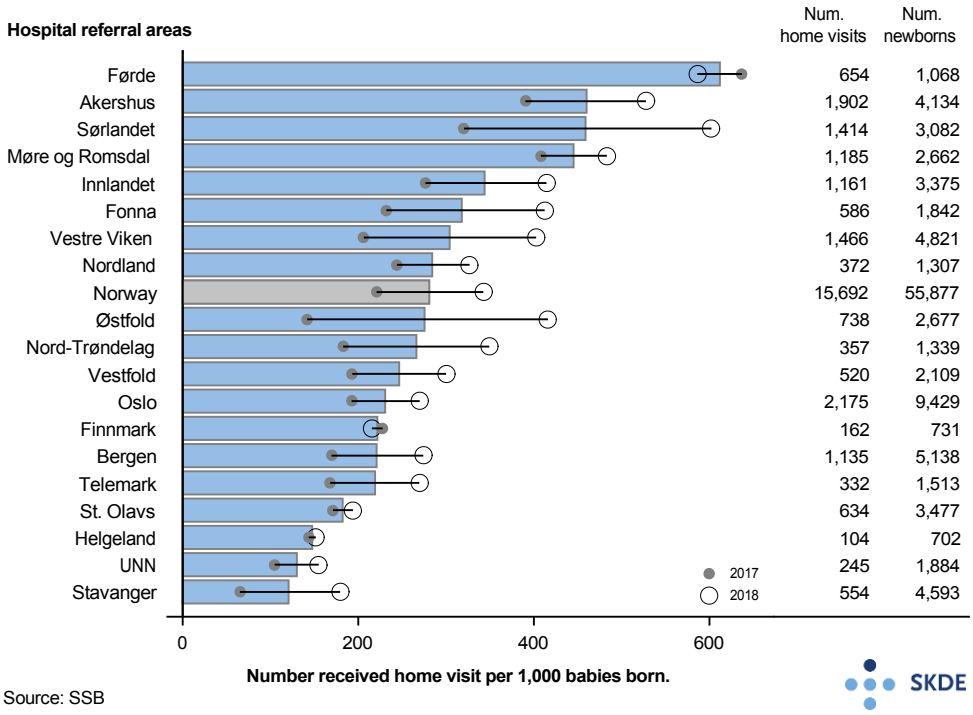


Figure 4.38: Number of home visits by municipal midwives within three days of discharge from hospital per 1,000 babies born. Number of home visits and number of newborns on the right. Average per year for the period 2017–2018, broken down by hospital referral area. The hospital referral areas Lovisenberg, Diakonhjemmet and OUS are combined under the name Oslo because information about city districts in the City of Oslo is missing.[17].

[16] Statistics Norway calculates the proportion who received home visits by dividing the number of home visits by midwives by the number of babies born during the year. We have chosen to use the same denominator as Statistics Norway uses in its calculation rather than using the number of births.

[17] Information about city districts for residents of Oslo was not available in Statistics Norway's data. This made it impossible to break down women resident in Oslo by the hospital referral areas Diakonhjemmet, Lovisenberg, OUS and Akershus. For this reason, all women from Oslo are combined in the 'hospital referral area' of Oslo.

During the period 2015–2017, approximately 1,700 postpartum women per year were readmitted during the first six weeks after giving birth. Figure 4.39 shows the number of readmissions of postpartum women per 1,000 births. In most hospital referral areas, the number of readmissions was very close to the national average of approximately 28 per 1,000 births, but some areas had somewhat higher readmission rates. There were twice as many readmissions per 1,000 births among postpartum women resident in Bergen hospital referral area, which had the highest readmission rate, as in Telemark, which had the lowest readmission rate.

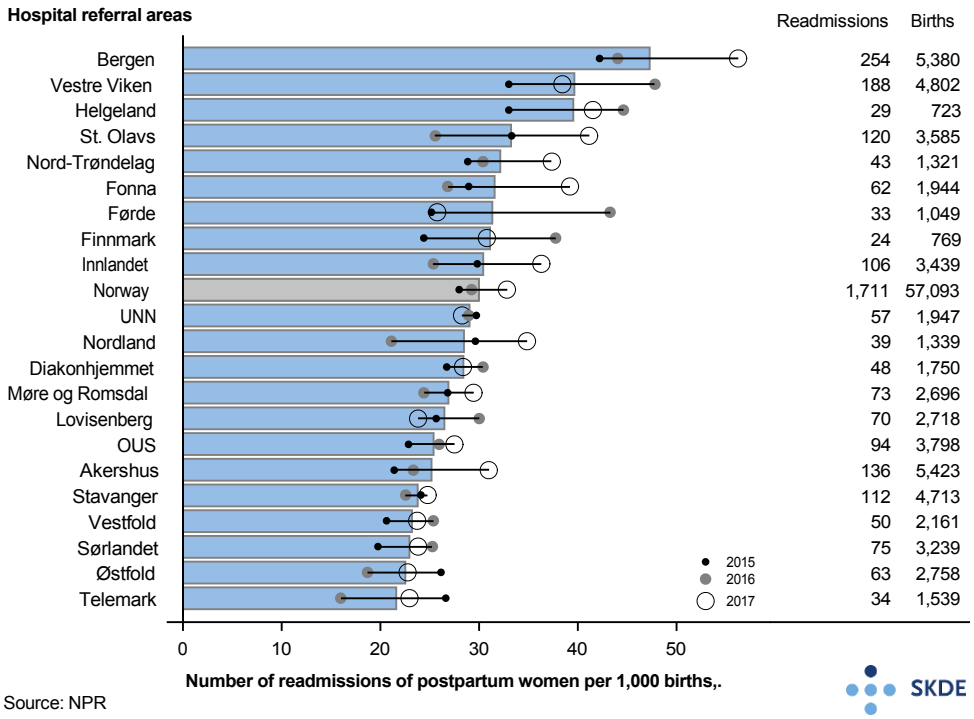


Figure 4.39: Number of readmissions of postpartum women per 1,000 births, adjusted for age. Number of readmissions on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

For Norway as a whole, approximately 8,000 postpartum women per year had one or more contacts with their RGP/the emergency primary healthcare service due to problems or illness relating to breastfeeding and the postnatal period. Figure 4.40 shows the number of postpartum women per 1,000 births who were in contact with their RGP/the emergency primary healthcare service broken down by hospital referral area. There was moderate geographical variation in the use of RGPs/the emergency primary healthcare service related to postpartum problems and illness. In Bergen hospital referral area, 70% more postpartum women per 1,000 births were in contact with their RGP/the emergency primary healthcare service compared with women resident in the Telemark area.

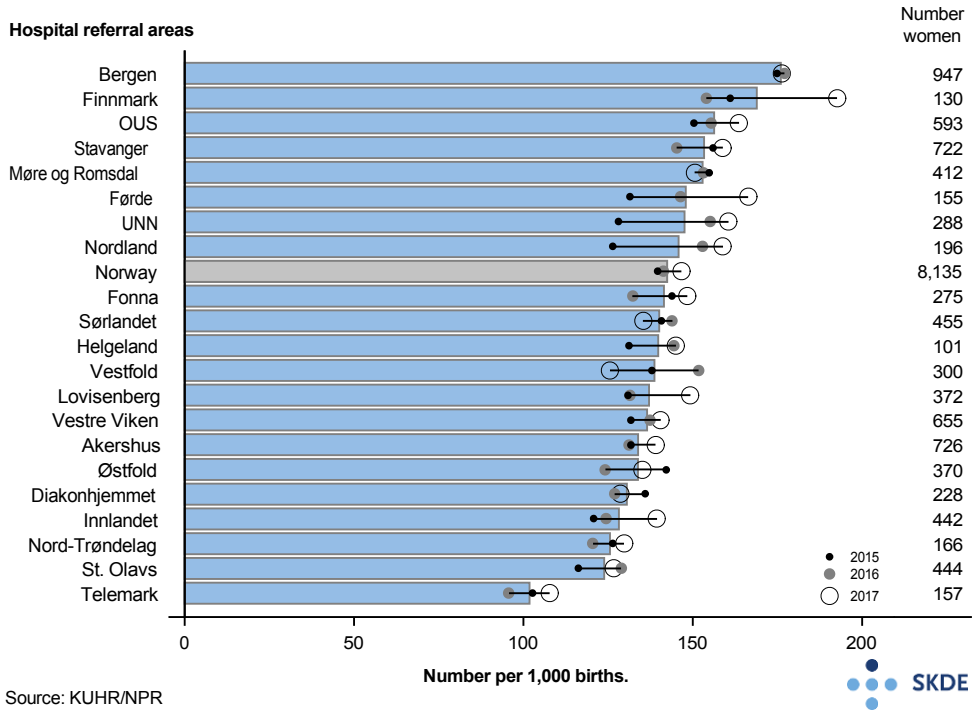


Figure 4.40: Number of postpartum women who had at least one contact with their RGP/the emergency primary healthcare service due to problems or illness relating to breastfeeding and the postnatal period per 1,000 births, adjusted for age. Number of postpartum women who had contact with their RGP/the emergency primary healthcare service on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Figure 4.41 shows the total number of contacts with RGPs/the emergency primary healthcare service and the specialist health service per 1,000 births, broken down by hospital referral area. The geographical variation was high. In total, postpartum women resident in Bergen hospital referral area had nearly four times as many contacts with their RGP/the emergency primary healthcare service and the specialist health service per 1,000 births as postpartum women from the Stavanger area. If we exclude the two hospital referral areas Bergen and Østfold, which had the highest number of contacts per 1,000 births, the variation is still high. Postpartum women resident in Vestre Viken hospital referral area had twice as many contacts during the postnatal period per 1,000 births as those resident in the Stavanger area.

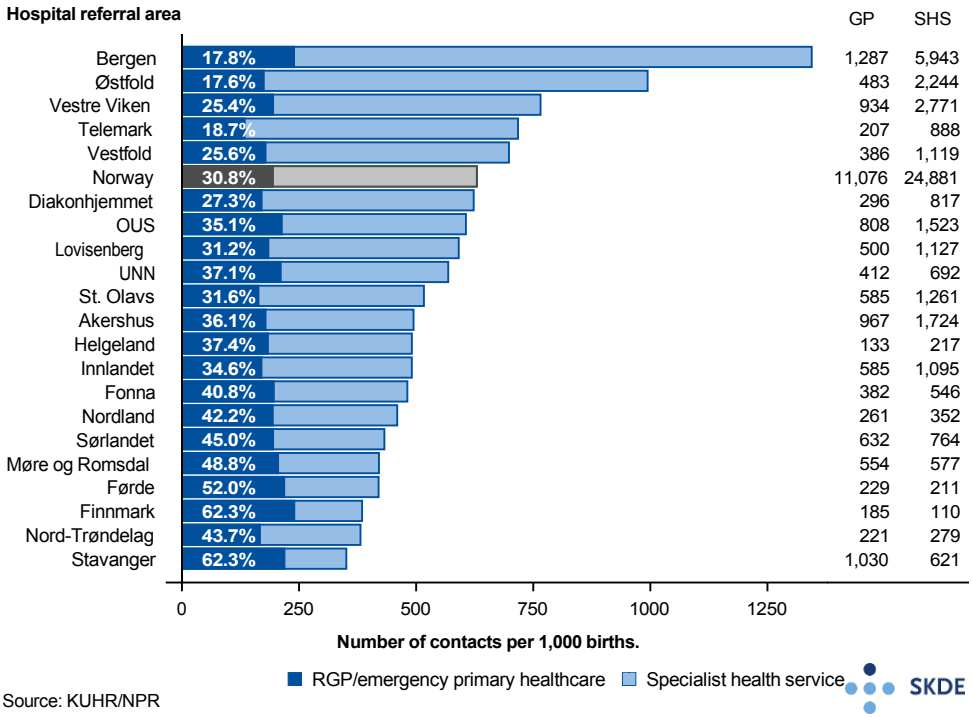


Figure 4.41: Number of contacts per 1,000 births broken down by contacts with RGPs/the emergency primary healthcare service (GP) and the specialist health service (SHS), adjusted for age. Number of contacts with RGPs/the emergency primary healthcare service and the specialist health service on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

Newborns' use of health services during the postnatal period

During the period 2015–2017, approximately 24,500 newborns per year, corresponding to 40% of all newborns, had one or more outpatient contacts during the first six weeks after birth. Figure 4.42 shows the number of newborns who used outpatient services per 1,000 births, broken down by hospital referral area.

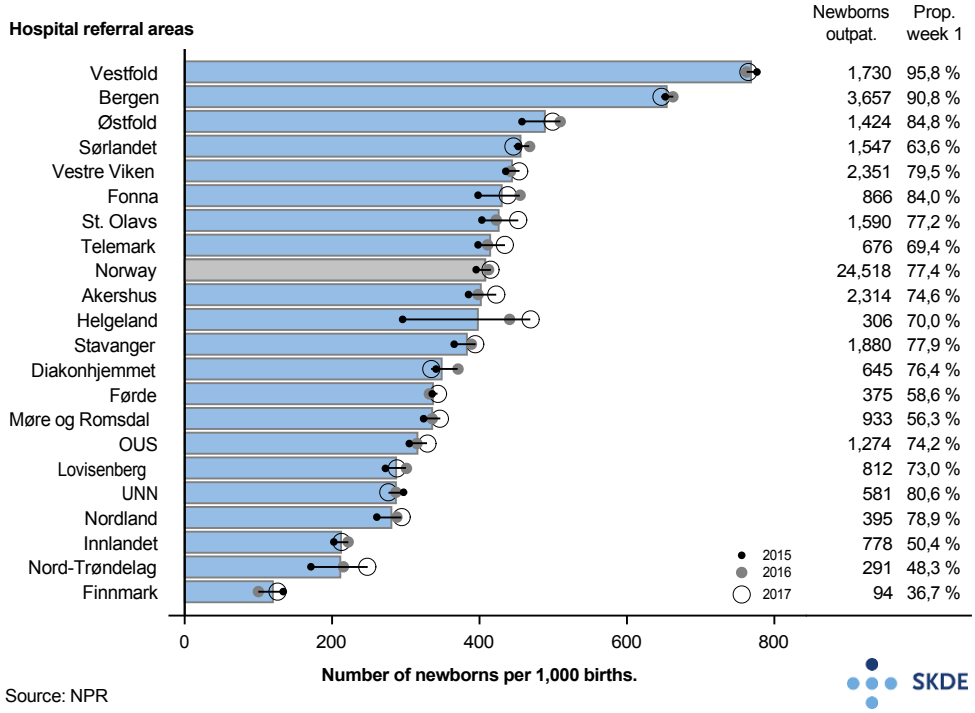


Figure 4.42: Number of newborns who had at least one outpatient contact during the postnatal period per 1,000 births. Number of newborns who used outpatient services and the proportion who had one contact during the first week after being discharged from hospital on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

The geographical variation in the use of outpatient contacts by newborns was very high. Of the newborns resident in Vestfold hospital referral area, more than six times as many per 1,000 used outpatient services during the postnatal period compared with newborns resident in the Finnmark area.

Figure 4.43 shows the number of newborns who received a home visit by a health visitor within two weeks of being discharged from hospital per 1,000 babies born. The vast majority of hospital referral areas are very close to the national average of 861 per 1,000 babies born. Some hospital referral areas have somewhat lower rates, but the Oslo area, where the lowest average proportion of newborns received home visits within two weeks, increased its rate significantly from 2015 to 2017. Finnmark hospital referral area also had a relatively low rate, but the variation from year to year was relatively high here too.

For Norway as a whole, approx. 3,000 newborns per year (approx. 5%) were readmitted during the first six weeks after birth (Figure 4.44). There was considerable geographical variation in the number of readmissions per 1,000 newborns. The number of readmissions during the postnatal period per 1,000 newborns was more than twice as high in Bergen hospital referral area as among newborns in the UNN area and the hospital referral areas in the Oslo region (Diakonhjemmet, Lovisenberg and OUS).

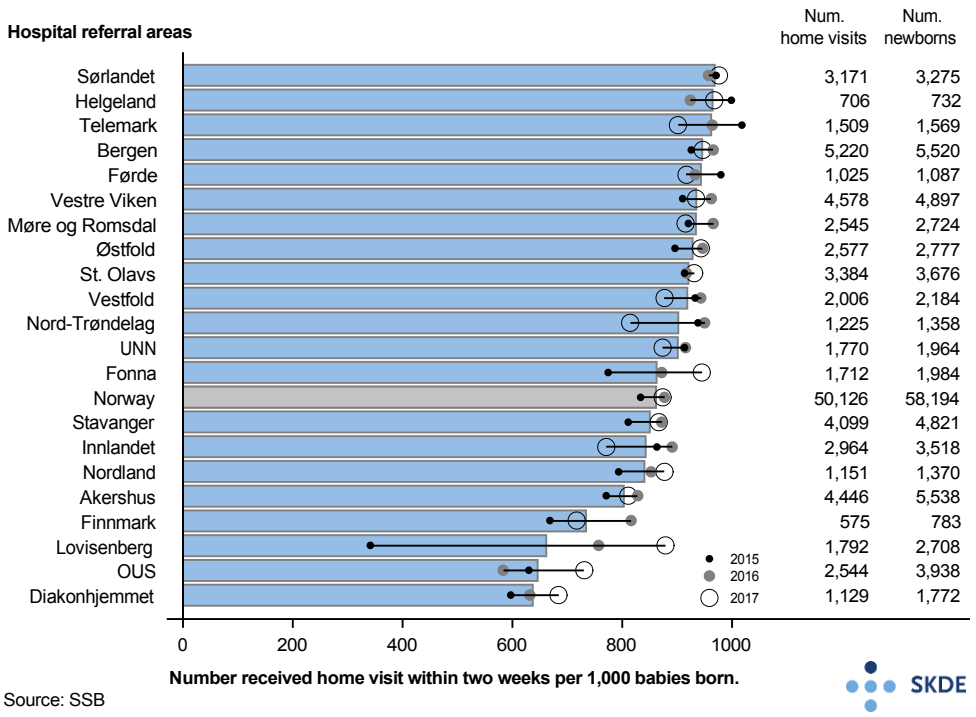


Figure 4.43: Number of newborns who received a home visit by a health visitor within two weeks of being discharged from hospital per 1,000 babies born. Number of home visits and number of newborns on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

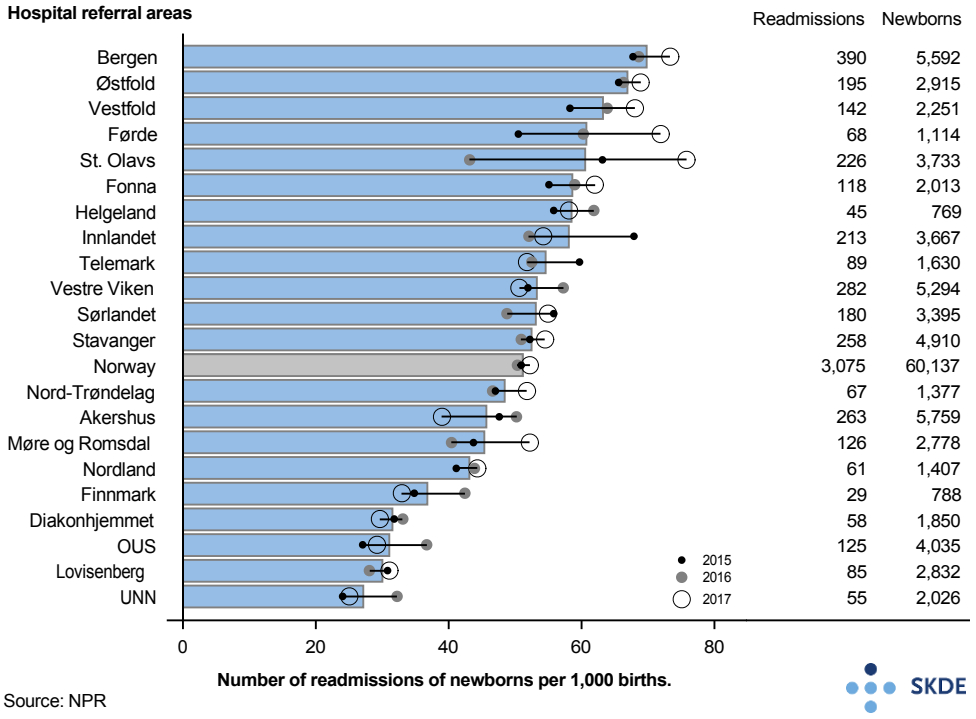


Figure 4.44: Number of readmissions of newborns during the postnatal period per 1,000 births. Number of readmissions and newborns on the right. Average per year for the period 2015–2017, broken down by hospital referral area.

The most common primary diagnoses (for 51% of admissions) were related to jaundice (21%), nutritional problems (12%) and upper respiratory tract infections (19%).

Comments

The geographical variation observed in lengths of stay after birth was moderate. The Medical Birth Registry of Norway states that it may vary somewhat between maternity units whether stays at a maternity hotel is included in the reported data. This could influence the average length of stay for residents of hospital referral areas where the local hospital has a maternity hotel.

The mother's length of stay after birth may be affected by birth complications. Norway has a very low incidence of serious birth complications, and it is not possible to identify any systematic geographical variation in the incidence of complications such as sphincter ruptures or postpartum haemorrhage during the period 2015–2017, cf. Chapters 4.8 and 4.9. The observed variation in average lengths of stay is probably a result of local practices and maternity unit/hotel capacity rather than of systematic variation in the incidence of birth complications or in reporting practices in connection with transfers to maternity hotels.

There was considerable geographical variation in the use of specialist health services by both mothers and babies during the first six weeks after birth. The observed variation is deemed to be unwarranted. The variation is particularly high for outpatient contacts, but the number of readmissions of newborns also varies greatly. The observed variation in average lengths of stay cannot explain the variation in the use of specialist health services after discharge from hospital. However, the use of outpatient services by postpartum women is strikingly high in Østfold and Bergen - both hospital referral areas with short stays for women who give birth vaginally.

The way in which local health services are organised may have a particularly strong impact on the use of outpatient contacts. The guidelines for postnatal care (Helsedirektoratet 2014) recommend facilitating local postnatal follow-up of mother and baby, in which home visits by health visitors and midwives should play an important role. Both midwives employed by hospitals and midwives employed by municipalities make home visits. However, data from Statistics Norway based on figures reported by the municipalities in 2017 and 2018 show that less than 40% of postpartum women received a home visit from a municipal midwife within the recommended three-day period after giving birth. There was high geographical variation in the number of postpartum women who received home visits, from under 20% for residents of Stavanger, UNN, Helgeland and St. Olavs hospital referral areas to around 60% in the Førde area. It is likely that this is also representative of the general situation during the period 2015–2016. The observed variation in the use of outpatient services cannot be explained by the variation in home visits by municipal midwives.

If the recommended home visits are not taking place, this could be a sign of insufficient capacity, but it could also indicate inadequate clarification of responsibilities between the specialist health service and the municipal level. Frequent visits to outpatient clinics could be a result of inadequate local follow-up of postpartum women.

Chapter 5

Discussion

Main findings

- On average, pregnant women had seven or eight contacts with a municipal midwife or their RGP/the emergency primary healthcare service and five contacts with the specialist health service during a pregnancy. There was little geographical variation in the number of contacts with the health service during pregnancies.
- Unwarranted geographical variation was found in the use of caesarean section, episiotomy, operative vaginal delivery and epidural anaesthesia.
- It was not possible to identify any systematic geographical variation in the number of complications (major postpartum haemorrhage, sphincter ruptures or low Apgar scores) in connection with childbirth, and there were very few such events.
- There was high and unwarranted geographical variation in the use of the specialist health service during the postnatal period, both for postpartum women and newborns.
- Taken together, the results may seem to indicate that follow-up of mother and baby during the postnatal period is not as highly prioritised or as well organised as their follow-up during pregnancy and childbirth.

Antenatal care

During the period 2015–2017, pregnant women on average had seven contacts with a municipal midwife or their RGP/the emergency primary healthcare service and five contacts with the specialist health service during their pregnancy. There was little geographical variation between the health trusts' hospital referral areas. The findings indicate that the guidelines are generally complied with in terms of midwife and GP contacts.

In this healthcare atlas, antenatal appointments with the specialist health service are defined as all contacts during the 8.5 months before childbirth for which one or more selected tariff codes from the normal tariff, diagnosis or procedure codes (see Appendix E) have been registered. This may be considered a rather broad definition of the term antenatal appointment, but it was necessary to use this definition in order to present comparable figures across treatment institutions. The figures should be interpreted with some caution since they include more than routine appointments.

There is reason to ask whether the high number of antenatal appointments with the specialist health service represents overuse.

There was considerable geographical variation in gestational diabetes, and the incidence was particularly high among women living in Førde hospital referral area. The report *Health Status in Norway 2018* describes Sogn og Fjordane, where Førde is located, as one of the counties in Norway where the lowest proportion of the population uses diabetes medication.[18]

Increasing age, overweight and being born outside Europe are factors that increase a woman's risk of developing gestational diabetes. The hospital referral areas with the highest and lowest incidence of gestational diabetes, which were Førde and UNN, respectively, were similar in terms of age composition, proportion of overweight women and the proportion of women who were themselves born outside Europe. The composition of the population of the two areas can therefore not explain the differences in the incidence of gestational diabetes. Possible explanations include differences in compliance with applicable national guidelines regarding oral glucose tolerance testing and variations in reporting to the MBRN.[19]

The birth

There was high or moderate geographical variation in the use of caesarean section, operative vaginal delivery, episiotomy and epidural anaesthesia. There was also a clear correlation between the rates for primiparous and multiparous women for all these interventions. This indicates that the observed variation is mostly due to differences in practice and not a result of random variation. The magnitude of the variation is about the same regardless of whether we look at all births or just women in Robson groups 1 and 3.

When the results for the use of emergency caesarean sections and operative vaginal delivery are compared, we find that the overall geographical variation in the use of caesarean section and operative vaginal delivery is low, and that the hospital referral areas with low emergency caesarean section rates have high operative vaginal delivery rates and vice versa. This indicates a relatively even distribution of the indications for operative intervention. The preferences for choice of delivery method in clinical situations with inadequate progress differ, and these preferences appear to be rooted in the specialist communities.

Episiotomy should only be performed if it can reduce the risk of serious perineal tears, and is most relevant in connection with use of forceps or breech delivery. Nevertheless, episiotomy is very widespread, also for women in Robson groups 1 and 3. It is not known how many perineal tears are prevented by episiotomies, but the considerable geographical variation observed in combination with the overall high volume give reason to ask whether overtreatment is taking place.

Complications of childbirth, such as serious perineal tears, major postpartum haemorrhage or babies with low Apgar scores, are very rare, and the observed variation has a strong element of random variation. It has therefore not been possible to identify any systematic geographical variation in the number of complications, nor any correlation between the use of different interventions during childbirth and the occurrence of complications. However, the practice

[18] https://www.fhi.no/nettpub/hin/ikke-smittsomme/diabetes/#antall-med-diabetes-i-norge

[19] Nasjonal retningslinje for svangerskapsdiabetes ('National guidelines for gestational diabetes' - in Norwegian only), page 10.

concerning use of different interventions during childbirth could have consequences for women's birth experience as well as for the postnatal period.

The postnatal period

The geographical variation in the use of outpatient contacts during the postnatal period, by both mothers and babies, was very high. The vast majority of those who used outpatient services during the postnatal period (77% for Norway as a whole, for both mothers and babies) had at least one contact during the first week after discharge from the maternity stay. Figures from Statistics Norway also show considerable geographical variation in how many new mothers received a home visit by a municipal midwife within three days after being discharged. The variation in home visits cannot explain the variation in the use of outpatient contacts, however.

The variation in length of stay after birth was relatively moderate and cannot explain the considerable differences in the use of outpatient contacts during the postnatal period either. However, the use of outpatient contacts by postpartum women is strikingly high in Østfold and Bergen hospital referral areas, where women who give birth vaginally have short stays. It is also conceivable that the variation in use of outpatient contacts could be partially due to circumstances relating to the stay at the delivery and maternity unit that make it necessary to return to the specialist health service within a short time in order to clarify issues.

There is some geographical variation in the way in which postnatal care is organised, including the division of responsibility between health trusts and municipalities. The Ministry of Health and Care Services has instructed the regional health authorities to draw up a multiannual plan, adapted to the local conditions, for antenatal, perinatal and postnatal care in the health regions in consultation with the affected municipalities.[20] The Health and Care Services Act requires municipalities and regional health authorities and health trusts to enter into binding cooperation agreements.[21] The agreements entered into stipulate minimum requirements for maternity care, midwife accompaniment during transport of women in labour and postnatal care. Differences in organisation and unclear division of responsibility between service levels probably explain some of the observed variation, particularly in the use of outpatient services during the postnatal period. Differences in capacity and hospitals' routines can also create geographical differences in the use of outpatient contacts. In hospital referral areas where there are few home visits by a municipal midwife after birth, it is possible that outpatient contacts with the specialist health service could in part compensate for a lack of follow-up by the municipal health service.

Do women receive good and equitable specialist health services during pregnancy, childbirth and the postnatal period regardless of where they live?

To summarise, the results in this healthcare atlas show that through pregnancy and childbirth, we found:

[20] Regional plan for uniform antenatal, perinatal and postnatal care for the South-Eastern Norway Regional Health Authority
Regional plan for antenatal, perinatal and postnatal care for the Central Norway Regional Health Authority 2015–2020
Regional plan for uniform antenatal, perinatal and postnatal care for the Northern Norway Regional Health Authority
Regional plan for antenatal, perinatal and postnatal care for the Western Norway Regional Health Authority

[21] Act relating to municipal health and care services etc. (Health and Care Services Act)

1. Close follow-up during pregnancy with many antenatal appointments with the specialist health service in accordance with the applicable guidelines and little geographical variation

2. Little geographical variation in the proportion of uncomplicated births

3. No identifiable systematic geographical variation in the number of birth complications, despite geographical variation in the use of different interventions during childbirth

These results support an overall impression that mothers and babies in Norway are followed up closely and receive excellent healthcare during pregnancy and childbirth, regardless of where in Norway they live. Nevertheless, some women do not receive adequate healthcare in connection with pregnancy and childbirth. A study of compensation claims considered by the Norwegian System of Patient Injury Compensation during the period from 1 January 1994 to 13 November 2008 (Andreasen 2015) found asphyxia to be the most common birth injury in babies, while the most common injuries to the mother in cases where patient injury compensation was awarded were sphincter injuries and infections. Human error, inadequate clinical skills and inadequate foetal monitoring were the most common reasons for injuries. According to the Norwegian System of Patient Injury Compensation,[22] compensation payments during the period 2015–2017 totalled NOK 235 million for injuries to babies and NOK 26 million for injuries suffered by mothers in connection with childbirth. This shows that there is still room for improvement.

Healthcare atlases are a form of analysis that is limited by the fact that it depends on describing patient groups of a certain size. Small, but nevertheless important groups will therefore 'fly under the radar'. One example is the fact that it has been impossible to confirm or disprove systematic geographical variation in the number of complications because of the high degree of uncertainty associated with low numbers. Nor has it been possible to assess the long-term outcomes for mothers or babies in cases where complications occur. Another example is births outside institutions (births during transport), a topic we have been unable to include in this atlas because there are too few such births per year.

The results for mothers and babies during the postnatal period are first and foremost characterised by considerable geographical variation. This applies to the use of the specialist health service and of the municipal midwife service in areas where such a service has been established. This could indicate that the division of responsibility between the health trusts and municipalities is not agreed and clear as required by the Health and Care Services Act. In user surveys carried out under the auspices of the Norwegian Institute of Public Health (Sjetne, Kjøllesdal, et al. 2013; Sjetne and Holmboe 2017; Holmboe and Sjetne 2018), women report more positive experiences of labour and delivery than of their postnatal stay. At the same time, the peer breastfeeding support group Ammehjelpen reported an increasing demand for volunteer breastfeeding support services in a survey from 2016.

Taken together, the results may seem to indicate that follow-up of mother and child during the postnatal period is not as highly prioritised nor as well organised as their follow-up during pregnancy and childbirth. The observed geographical variation is deemed to be unwarranted, and we believe that there is reason to question whether postpartum women have good and equitable access to health services regardless of where they live.

[22] Information received by email on 2 April 2019

Summary

The results show that pregnant women in Norway receive close and good follow-up during pregnancy and childbirth. The vast majority (86%) have two or more antenatal appointments with the specialist health service (including the ultrasound examination in week 17–19 of pregnancy). There is reason for the specialist community to question whether the high number of antenatal appointments with the specialist health service reflects an actual need or whether it might be a sign of overuse of services.

The results for the use of operative intervention indicate that the indications for operative intervention are reasonably uniformly practised, but that the preferences as regards the choice of method vary. This results in unwarranted geographical variation in the use of caesarean section and operative vaginal delivery. The use of episiotomy during childbirth is very common, and there is considerable variation between hospital referral areas. The results give reason to question whether the high volume reflects an actual need or whether it is a sign of overtreatment.

Despite sometimes great and unwarranted variation in the use of caesarean section, operative vaginal delivery, episiotomy and epidural anaesthesia, it has not been possible to identify any geographical variation in the incidence of serious complications in the mother or of babies with low Apgar scores.

The extent to which mothers and babies receive postnatal follow-up from the specialist health service varies a great deal between the health trusts' hospital referral areas. The observed variation is deemed to be unwarranted. These results, when seen in conjunction with the varying follow-up provided by the municipal midwife service, give reason to question whether postpartum women have equitable access to good health services regardless of where they live.

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Appendices

Appendix A

Correlation between rates for primiparous and multiparous women

Table A.1: Spearman's correlation coefficient for correlation between the age-adjusted rates for primiparous and multiparous women in 2015. 2016 and 2017. and the degree of correlation assessed as high. moderate or low.

Topic	2015	2016	2017	Grad
Induction	0.74**	0.80**	0.54**	High
Emergency caesarean section	0.70**	0.75**	0.68**	High
Planned caesarean section	0.75**	0.55*	0.53*	Moderate
Episiotomy	0.86**	0.92**	0.81**	High
Major haemorrhage	0.32	0.35	0.68*	Low
Operative vag. delivery	0.78**	0.71**	0.54*	High
Epidural	0.84**	0.90**	0.83**	High
Length of stay (vaginal delivery)	0.84**	0.81**	0.81**	High
Length of stay (caesarean section)	0.80**	0.68**	0.90**	High

* $P < 0.05$
** $P < 0.01$

Appendix B

Overview table

Patient sample, number in sample, relevant population, ratios[a], hospital referral area with the highest and lowest rate. Average per year for the period 2015–2017.

Antenatal care	Number	Population	FT[a]	FT2[a]	Highest	Rate high	Lowest	Rate low
Contacts with midwife	252,305	57,120	1.7	1.6	Førde	5.8	OUS	3.4
Contacts with RGPs/the emergency primary healthcare service	183,564	57,120	3.1	2.7	Diakonhjemmet	4.1	Finnmark	1.3
Contacts with the specialist health service	266,126	57,113	1.5	1.4	Helgeland	5.9	Bergen	3.9
Gestational diabetes, primiparous women	1,105	24,452	4.3	2.2	Førde	111.2	UNN	25.7
Gestational diabetes, multiparous women	1,727	33,120	3.6	2.1	Førde	115.1	UNN	32.0
Primiparous women								
Uncomplicated births	14,591	24,452	1.2	1.1	Vestfold	676.0	Stavanger	550.5
Induction	5,862	24,452	1.5	1.4	Stavanger	283.3	Nordland	192.3
Epidural, vaginal delivery	10,623	20,020	1.9	1.8	Diakonhjemmet	636.6	UNN	339.2
Episiotomy, vaginal delivery	7,320	20,020	1.9	1.9	Telemark	431.6	Førde	224.5
Operative vaginal delivery	4,553	20,020	2.2	1.9	Stavanger	300.3	Vestfold	134.1
Caesarean section, emergency	3,565	24,452	1.9	1.6	Nord-Trøndelag	201.7	Diakonhjemmet	106.2
Caesarean section, planned	862	24,452	2.3	1.9	Finnmark	51.0	Bergen	21.8
Multiparous women								
Uncomplicated births	26,032	33,120	1.2	1.1	Bergen	825.5	Nord-Trøndelag	718.8
Induction	6,587	33,120	1.4	1.3	Fonna	239.1	Lovisenberg	174.7
Epidural, vaginal delivery	7,239	28,315	2.8	2.1	Diakonhjemmet	368.1	UNN	129.7
Episiotomy, vaginal delivery	2,360	28,315	2.7	2.2	Møre og Romsdal	122.6	St. Olavs	46.3
Operative vaginal delivery	1,401	28,315	2.2	1.8	Stavanger	68.0	Vestfold	30.4
Caesarean section, emergency	2,445	33,120	2.3	1.9	Nord-Trøndelag	116.9	Diakonhjemmet	51.8
Caesarean section, planned	2,358	33,120	2.2	1.7	Nord-Trøndelag	108.7	Bergen	49.1
Postnatal period								
Length of stay, primiparous women (vaginal)	3.0[b]	19,993	1.5	1.3	Telemark	3.6[c]	Bergen	2.4[c]
Length of stay, primiparous women (caesarean)	4.2[b]	4,429	1.4	1.4	Nord-Trøndelag	5.2[c]	Østfold	3.6[c]
Length of stay, multiparous women (vaginal)	2.2[b]	28,168	1.8	1.5	Nord-Trøndelag	2.8[c]	Bergen	1.6[c]
Length of stay, multiparous women (caesarean)	3.6[b]	4,803	1.4	1.4	Telemark	4.4[c]	Østfold	3.2[c]
Outpatient services, mothers	15,702	57,110	7.4	4.6	Bergen	632.6	Stavanger	85.4
Outpatient services, newborns	24,518	60,137	6.4	3.1	Vestfold	768.3	Finnmark	119.7
Home visit by municipal midwife	15,692	55,877	5.1	3.5	Førde	611.9	Stavanger	120.6

[a] FT=highest rate/lowest rate, FT2=second highest rate/second lowest rate [b] average number of bed days for Norway as a whole [c] number of bed days

Appendix C

Hospital referral areas

Table C.1 shows which municipalities and city districts constitute the different health trusts' hospital referral areas. In 2013–2017, Rissa belonged to St. Olavs hospital referral area, while Leksvik belonged to Nord-Trøndelag. In the analyses that are based on data from the Medical Birth Registry of Norway (MBRN) and Control and payment of reimbursements to health service providers (KUHR), these municipalities belong to separate hospital referral areas.

In 2018, Rissa and Leksvik municipalities were merged to form Indre Fosen. In the analyses that are based on data from the Norwegian Patient Registry (NPR), the hospital referral areas are defined on the basis of the municipality structure for 2018 (Table C.1). That means that all of Indre Fosen belongs to St. Olavs hospital referral area. Health services used by the population of Leksvik will therefore be included under the St. Olavs area in these analyses, even though they technically belonged to Nord-Trøndelag hospital referral area during the period 2013–2017.

Table C.1: Hospital referral areas

Hospital referral area	Municipalities
Finnmark	2002 Vardø, 2003 Vadsø, 2004 Hammerfest, 2011 Kautokeino, 2012 Alta, 2014 Loppa, 2015 Hasvik, 2017 Kvalsund, 2018 Måsøy, 2019 Nordkapp, 2020 Porsanger, 2021 Karasjok, 2022 Lebesby, 2023 Gamvik, 2024 Berlevåg, 2025 Tana, 2027 Nesseby, 2028 Båtsfjord, 2030 Sør-Varanger
UNN	1805 Narvik, 1851 Lødingen, 1852 Tjeldsund, 1853 Evenes, 1854 Ballangen, 1902 Tromsø, 1903 Harstad, 1911 Kvæfjord, 1913 Skånland, 1917 Ibestad, 1919 Gratangen, 1920 Lavangen, 1922 Bardu, 1923 Salangen, 1924 Målselv, 1925 Sørreisa, 1926 Dyrøy, 1927 Tranøy, 1928 Torsken, 1929 Berg, 1931 Lenvik, 1933 Balsfjord, 1936 Karlsøy, 1938 Lyngen, 1939 Storfjord, 1940 Kåfjord, 1941 Skjervøy, 1942 Nordreisa, 1943 Kvænangen
Nordland	1804 Bodø, 1837 Meløy, 1838 Gildeskål, 1839 Beiarn, 1840 Saltdal, 1841 Fauske, 1845 Sørfold, 1848 Steigen, 1849 Hamarøy, 1850 Tysfjord, 1856 Røst, 1857 Værøy, 1859 Flakstad, 1860 Vestvågøy, 1865 Vågan, 1866 Hadsel, 1867 Bø, 1868 Øksnes, 1870 Sortland, 1871 Andøy, 1874 Moskenes
Helgeland	1811 Bindal, 1812 Sømna, 1813 Brønnøy, 1815 Vega, 1816 Vevelstad, 1818 Herøy, 1820 Alstahaug, 1822 Leirfjord, 1824 Vefsn, 1825 Grane, 1826 Hattfjelldal, 1827 Dønna, 1828 Nesna, 1832 Hemnes, 1833 Rana, 1834 Lurøy, 1835 Træna, 1836 Rødøy

Hospital referral area	Municipalities
Nord-Trøndelag	5004 Steinkjer, 5005 Namsos, 5019 Roan, 5020 Osen, 5034 Meråker, 5035 Stjørdal, 5036 Frosta, 5037 Levanger, 5038 Verdal, 5039 Verran, 5040 Namdalseid, 5041 Snåsa, 5042 Lierne, 5043 Røyrvik, 5044 Namsskogan, 5045 Grong, 5046 Høylandet, 5047 Overhalla, 5048 Fosnes, 5049 Flatanger, 5050 Vikna, 5051 Nærøy, 5052 Leka, 5053 Inderøy
St. Olavs	1567 Rindal, 5001 Trondheim, 5011 Hemne, 5012 Snillfjord, 5013 Hitra, 5014 Frøya, 5015 Ørland, 5016 Agdenes, 5017 Bjugn, 5018 Åfjord, 5021 Oppdal, 5022 Rennebu, 5023 Meldal, 5024 Orkdal, 5025 Røros, 5026 Holtålen, 5027 Midtre Gauldal, 5028 Melhus, 5029 Skaun, 5030 Klæbu, 5031 Malvik, 5032 Selbu, 5033 Tydal, 5054 Indre Fosen
Møre og Romsdal	1502 Molde, 1504 Ålesund, 1505 Kristiansund, 1511 Vanylven, 1514 Sande, 1515 Herøy, 1516 Ulstein, 1517 Hareid, 1519 Volda, 1520 Ørsta, 1523 Ørskog, 1524 Norddal, 1525 Stranda, 1526 Stordal, 1528 Sykkylven, 1529 Skodje, 1531 Sula, 1532 Giske, 1534 Haram, 1535 Vestnes, 1539 Rauma, 1543 Nesset, 1545 Midsund, 1546 Sandøy, 1547 Aukra, 1548 Fræna, 1551 Eide, 1554 Averøy, 1557 Gjemnes, 1560 Tingvoll, 1563 Sunndal, 1566 Surnadal, 1571 Halsa, 1573 Smøla, 1576 Aure
Førde	1401 Flora, 1411 Gulen, 1412 Solund, 1413 Hyllestad, 1416 Høyanger, 1417 Vik, 1418 Balestrand, 1419 Leikanger, 1420 Sogndal, 1421 Aurland, 1422 Lærdal, 1424 Årdal, 1426 Luster, 1428 Askvoll, 1429 Fjaler, 1430 Gaular, 1431 Jølster, 1432 Førde, 1433 Naustdal, 1438 Bremanger, 1439 Vågsøy, 1441 Selje, 1443 Eid, 1444 Hornindal, 1445 Gloppen, 1449 Stryn
Bergen	1201 Bergen, 1233 Ulvik, 1234 Granvin, 1235 Voss, 1238 Kvam, 1241 Fusa, 1242 Samnanger, 1243 Os, 1244 Austevoll, 1245 Sund, 1246 Fjell, 1247 Askøy, 1251 Vaksdal, 1252 Modalen, 1253 Osterøy, 1256 Meland, 1259 Øygarden, 1260 Radøy, 1263 Lindås, 1264 Austrheim, 1265 Fedje, 1266 Masfjorden
Fonna	1106 Haugesund, 1134 Suldal, 1135 Sauda, 1145 Bokn, 1146 Tysvær, 1149 Karmøy, 1151 Utsira, 1160 Vindafjord, 1211 Etne, 1216 Sveio, 1219 Bømlo, 1221 Stord, 1222 Fitjar, 1223 Tysnes, 1224 Kvinnherad, 1227 Jondal, 1228 Odda, 1231 Ullensvang, 1232 Eidfjord
Stavanger	1101 Eigersund, 1102 Sandnes, 1103 Stavanger, 1111 Sokndal, 1112 Lund, 1114 Bjerkreim, 1119 Hå, 1120 Klepp, 1121 Time, 1122 Gjesdal, 1124 Sola, 1127 Randaberg, 1129 Forsand, 1130 Strand, 1133 Hjelmeland, 1141 Finnøy, 1142 Rennesøy, 1144 Kvitsøy

Hospital referral area	Municipalities/city districts
Østfold	0101 Halden, 0104 Moss, 0105 Sarpsborg, 0106 Fredrikstad, 0111 Hvaler, 0118 Aremark, 0119 Marker, 0122 Trøgstad, 0123 Spydeberg, 0124 Askim, 0125 Eidsberg, 0127 Skiptvet, 0128 Rakkestad, 0135 Råde, 0136 Rygge, 0137 Våler, 0138 Hobøl
Akershus	0121 Rømskog, 0211 Vestby, 0213 Ski, 0214 Ås, 0215 Frogn, 0216 Nesodden, 0217 Oppegård, 0221 Aurskog-Høland, 0226 Sørum, 0227 Fet, 0228 Rælingen, 0229 Enebakk, 0230 Lørenskog, 0231 Skedsmo, 0233 Nittedal, 0234 Gjerdrum, 0235 Ullensaker, 0237 Eidsvoll, 0238 Nannestad, 0239 Hurdal, the following city districts in 0301 Oslo: 10 Grorud, 11 Stovner, 12 Alna
OUS	The following city districts in 0301 Oslo: 03 Sagene, 08 Nordre Aker, 09 Bjerke, 13 Østensjø, 14 Nordstrand, 15 Søndre Nordstrand, 17 Marka, unspecified district Oslo
Lovisenberg	The following city districts in 0301 Oslo: 01 Gamle Oslo, 02 Grünerløkka, 04 St. Hanshaugen, 16 Sentrum
Diakonhjemmet	The following city districts in 0301 Oslo: 05 Frogner, 06 Ullern, 07 Vestre Aker
Innlandet	0236 Nes, 0402 Kongsvinger, 0403 Hamar, 0412 Ringsaker, 0415 Løten, 0417 Stange, 0418 Nord-Odal, 0419 Sør-Odal, 0420 Eidskog, 0423 Grue, 0425 Åsnes, 0426 Våler, 0427 Elverum, 0428 Trysil, 0429 Åmot, 0430 Stor-Elvdal, 0432 Rendalen, 0434 Engerdal, 0436 Tolga, 0437 Tynset, 0438 Alvdal, 0439 Folldal, 0441 Os, 0501 Lillehammer, 0502 Gjøvik, 0511 Dovre, 0512 Lesja, 0513 Skjåk, 0514 Lom, 0515 Vågå, 0516 Nord-Fron, 0517 Sel, 0519 Sør-Fron, 0520 Ringebu, 0521 Øyer, 0522 Gausdal, 0528 Østre Toten, 0529 Vestre Toten, 0533 Lunner, 0534 Gran, 0536 Søndre Land, 0538 Nordre Land, 0540 Sør-Aurdal, 0541 Etnedal, 0542 Nord-Aurdal, 0543 Vestre Slidre, 0544 Øystre Slidre, 0545 Vang
Vestre Viken	0219 Bærum, 0220 Asker, 0532 Jevnaker, 0602 Drammen, 0604 Kongsberg, 0605 Ringerike, 0612 Hole, 0615 Flå, 0616 Nes, 0617 Gol, 0618 Hemsedal, 0619 Ål, 0620 Hol, 0621 Sigdal, 0622 Krødsherad, 0623 Modum, 0624 Øvre Eiker, 0625 Nedre Eiker, 0626 Lier, 0627 Røyken, 0628 Hurum, 0631 Flesberg, 0632 Rollag, 0633 Nore og Uvdal, 0711 Svelvik, 0713 Sande
Vestfold	0701 Horten, 0704 Tønsberg, 0710 Sandefjord, 0712 Larvik, 0715 Holmestrand, 0716 Re, 0729 Færder
Telemark	0805 Porsgrunn, 0806 Skien, 0807 Notodden, 0811 Siljan, 0814 Bamble, 0815 Kragerø, 0817 Drangedal, 0819 Nome, 0821 Bø, 0822 Sauherad, 0826 Tinn, 0827 Hjartdal, 0828 Seljord, 0829 Kviteseid, 0830 Nissedal, 0831 Fyresdal, 0833 Tokke, 0834 Vinje
Sørlandet	0901 Risør, 0904 Grimstad, 0906 Arendal, 0911 Gjerstad, 0912 Vegårshei, 0914 Tvedestrand, 0919 Froland, 0926 Lillesand, 0928 Birkenes, 0929 Åmli, 0935 Iveland, 0937 Evje og Hornnes, 0938 Bygland, 0940 Valle, 0941 Bykle, 1001 Kristiansand, 1002 Mandal, 1003 Farsund, 1004 Flekkefjord, 1014 Vennesla, 1017 Songdalen, 1018 Søgne, 1021 Marnardal, 1026 Åseral, 1027 Audnedal, 1029 Lindesnes, 1032 Lyngdal, 1034 Hægebostad, 1037 Kvinesdal, 1046 Sirdal

Appendix D

Reference group

The reference group for the Obstetrics Healthcare Atlas comprised:

- **Pål Øian**, Adjunct Professor, Department of Clinical Medicine at UiT Arctic University of Norway, formerly senior consultant at the Women's Clinic, University Hospital of Northern Norway
- **Jörg Kessler**, senior consultant, Women's Clinic, Haukeland University Hospital
- **Nina Schmidt**, midwife, assistant head of the Women's Clinic at Akershus University Hospital
- **Olaug Margrete Askeland**, statistician, Medical Birth Registry of Norway
- **Kristine Marie Stangenes**, senior consultant, Medical Birth Registry of Norway
- **Stine Andreasen**, senior consultant, head of section, Women and children's clinic, Nordland Hospital Trust

Appendix E

Challenges and limitations in the data

Antenatal care

It is demanding, perhaps impossible, to select a set of tariff codes, diagnosis and procedure codes that will identify all pregnancy-related contacts while excluding all contacts not related to the pregnancy. In addition, there will always be some uncertainty associated with incorrect coding.

We believe that the codes that we have selected as inclusion criteria for the analyses will include the vast majority of pregnant women's pregnancy-related contacts. Some pregnancy-related contacts will probably be missed in our sample, but if we were to include even more codes in the sample, we would run the risk of including a greater number of non-pregnancy-related contacts. Generally speaking, there is greater uncertainty associated with patient samples based on diagnosis codes in KUHR data compared with NPR data. The level of uncertainty is therefore somewhat higher in relation to the inclusion criteria for calculating the number of antenatal appointments per pregnancy with RGPs/the emergency primary healthcare service and midwives. However, the overall uncertainty in the analyses related to code selection and incorrect coding is deemed to be so modest that is not expected to have any material impact on the results.

Antenatal appointments with the specialist health service (NPR data)

It is a weakness in the analysis that we do not have information about the due date of the individual pregnant women. The analysis is therefore based on a standard pregnancy length of 283 days. Consequently, it is possible that the atlas includes too many (contacts before pregnancy in cases of premature birth) or too few (contacts at the beginning of pregnancy in cases of postterm birth) contacts for some pregnancies. However, the effect of different lengths of pregnancy is assumed to be relatively evenly distributed between hospital referral areas and should not constitute a material source of error in terms of geographical variation.

Antenatal appointments with RGPs/the emergency primary healthcare service and midwives (KUHR data)

In addition to the general uncertainty about coding quality and inclusion criteria, one fairly common (approx. 30,000 per year during the period 2015–2017) diagnosis code, namely 'W99 Disorder pregnancy/delivery, other', has been excluded from the sample because it is not possible to determine whether the contacts for which this code is used took place before or after birth. However, the total volume of contacts with RGPs/the emergency primary healthcare service and midwives (approx. 435,000 per year during the period 2015–2017) is so high that even if all these contacts took place before birth and should have been included, that would not have any material effect on the results.

Moreover, some of the contacts included in the KUHR data concern pregnancies that did not result in one or more liveborn infants (for example contacts at an early stage of pregnancies that ended in a spontaneous abortion). However, we have used the same denominator to calculate the number of appointments per pregnancy with RGPs/the emergency primary healthcare service and midwives as we use to calculate the number of antenatal appointments with the specialist health service per pregnancy, i.e. the total number of pregnancies/births registered in NPR.

The estimated number of antenatal appointments per pregnancy with RGPs/the emergency primary healthcare service and midwives will therefore be somewhat overestimated in relation to the number of antenatal appointments per pregnancy with the specialist health service (where we follow each patient through pregnancy and only include pregnancies that result in one or more liveborn infants). However, there is no reason to expect geographical variation in the degree of overestimation, and it should therefore not constitute a material source of error in terms of geographical variation.

The birth

In analyses of the use of (emergency) caesarean section, outcome for the baby (Apgar score) or complications in the mother (such as sphincter ruptures or major haemorrhage), Robson's Ten Group Classification System is often used to identify results for comparable groups of women. In Norway, emergency caesarean sections, low Apgar scores at birth and serious complications in the mother are so rare that we generally cannot show results broken down by hospital referral area and Robson group. This, together with the fact that the different Robson groups make up about the same percentage of women giving birth in all the hospital referral areas, is why we have chosen to primarily present results broken down by primiparous and multiparous women rather than different Robson groups in this healthcare atlas.

Uncertainty relating to missing information about the mother's municipality of residence

Information about the mother's municipality of residence is missing for nearly 1,100 births in the Medical Birth Registry of Norway's data for 2017. The number of births for which this information is missing was considerably lower in 2014, 2015 and 2016 (a total of 232 births during the period 2014–2016) than in 2017.

We have compared the results for the period 2014–2016 with the results for the period 2015–2017 to find out whether the relatively high number of births for which information about the mother's

municipality of residence was missing in 2017 (nearly 2% of all births in 2017) would cause any systematic errors. We found no systematic differences. We therefore consider it extremely unlikely that the results will be significantly affected if we exclude these approx. 1,100 births in 2017 from our analyses.

Limitations when using aggregate data

The Medical Birth Registry of Norway has disclosed aggregate data about births for use in our analyses in the Obstetric Healthcare Atlas. Unlike for the analyses of pregnancy and the postnatal period, where we have used data unique to individuals from the Norwegian Patient Registry (NPR), we cannot follow individual patients or present results for sub-samples of patients when we use these aggregate data. This is also true of aggregate data from the Control and payment of reimbursements to health service providers (KUHR) system, which are used together with data from NPR in the chapters on antenatal care and the postnatal period. As a result of the above, we are unable to shed light on certain issues in this healthcare atlas, for example the link between episiotomies and the incidence of sphincter ruptures.

The postnatal period

Contacts with the specialist health service during the postnatal period (NPR data)

Uncertain coding quality makes it impossible to use diagnosis or procedure codes to select only the contacts with the mother that are related to childbirth and the postnatal period. Therefore, all outpatient contacts with the specialist health service during the first six weeks after childbirth have been included in the analysis. This means that some contacts not related to childbirth and the postnatal period will also be included. They are assumed to be relatively few in number and evenly distributed between hospital referral areas, and should therefore not constitute a material source of error in terms of geographical variation.

Contacts with RGPs/the emergency primary healthcare service during the postnatal period (KUHR)

When counting contacts with RGPs/the emergency primary healthcare service related to the postnatal period, we have only included contacts for which one of the tariff codes in Table F1 is registered in combination with one or more of the diagnosis codes in Table F2, in Appendix F in the Norwegian version of the report. Contacts with RGPs/the emergency primary healthcare service are included regardless of when the contact took place, while contacts with the specialist health service are only included if they took place no later than 42 days (six weeks) after discharge from the maternity stay. This means that contacts with RGPs/the emergency primary healthcare service are not directly comparable with contacts with the specialist health service. However, we consider it likely that most of the contacts with RGPs/the emergency primary healthcare service for which one or more of the diagnosis codes listed in Table F.2 in the Norwegian version of the report are registered took place quite soon after the birth.

As described in section E on antenatal appointments with RGPs/the emergency primary healthcare service and midwives, in addition to the general uncertainty about coding quality and

inclusion criteria of KUHR data, one fairly common diagnosis code, namely 'W99 Disorder pregnancy/delivery, other', has been excluded from the sample because it is not possible to determine whether the contacts for which this code is used took place before or after the birth.

Unlike before birth, the total number of contacts with RGPs/the emergency primary healthcare service for which one or more of the diagnosis codes in Table F.2 in Appendix F in the Norwegian version of the report (approx. 11,000 per year) are registered, is much lower than the number of contacts with diagnosis code W 99 (approx. 30,000 per year). It would have a material impact on the results for use of RGPs/the emergency primary healthcare service if all contacts for which diagnosis code W 99 is registered took place after birth, but we consider it highly unlikely that this is the case.

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