Day surgery in Norway 2011 - 2013

A selection of procedures

Helseatlas

SKDE

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Foreword

It is important for a regional health authority, which has a responsibility to provide health services to the region's population, to have knowledge about the content and distribution of the health services delivered. Much of the available information has been linked to institutions, while little has been known about the population's access to and use of health services. It has not been possible to form an impression of whether services have been equitable and fairly distributed or prioritised correctly. This has in turn made it difficult to implement rational planning of service delivery.

The issues of overtreatment, variation in clinical practices and prioritisation attract a great deal of attention both nationally and internationally. This perspective highlighted the lack of Norwegian analyses of the scope and distribution of health services. Other countries have long since established functions to attend to such analyses.

In March 2014, the undersigned therefore tasked the Northern Norway Regional Health Authority's Centre for Clinical Documentation and Evaluation (SKDE) with establishing a function corresponding to England's Right Care, which is a leading institution in this field. In spring 2014, we were also visited by a representative of Right Care, and this visit provided inspiration and impetus for the work.

It is with great pleasure that I now present a pilot version of a healthcare atlas that shows the use and distribution of the most commonly performed day surgery procedures. Together, these procedures account for about half of all day surgery in Norway. Hopefully, this atlas will be useful both to healthcare management and professionals in the sector and in turn also benefit the patients.

Bodø, 7 January 2015

Lars Vorland
Managing Director,
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Summary

On variation

In principle, each patient and each population is unique. Variation in health services is therefore necessary in order to adapt and quality-assure services in relation to individual patients as well as to the type and scope of morbidity in the population. In these contexts, variation is to be expected and is considered a sign of quality.

In addition to the warranted variation in health services, analyses of such variation will always encounter coincidences of a statistical nature. If the services are rare and the populations studied small, there will often be a big element of statistical coincidence. Most of the variation can in such case be explained as random.

If, however, services of a certain scope are studied in big population groups in Norway, variation and marked contrasts could be an indication of differences in practice, differences in service provision and thereby a breach of the goal of providing equitable services. Norway is a homogenous country, both in terms of population and morbidity. Variation that cannot be explained by differences in morbidity or patient preferences is often called unexplained or unwarranted.

What has been done

All patient contacts with the Norwegian specialist health service and specialists in private practice under public funding contracts are registered in the Norwegian Patient Registry, with information about the condition treated and the services provided.

Twelve surgical procedures that are usually performed as day patient treatment, i.e. without hospital admission, have been identified from this registry with the help of experts in the field. These procedures account for about half of the day surgery volume in Norway. They are all publicly funded, even though a significant proportion of them were performed by private service providers, both private hospitals and specialists in private practice under public funding contracts.

The analyses are approached from a population perspective. This means that they highlight the various procedures that the population of different hospital referral areas have undergone, regardless of where in Norway the procedures were performed. We have used residents of the health trust's hospital referral areas as our unit of analysis, i.e. the population of the municipalities that are deemed to constitute the catchment area of the different health trusts in Norway. In order to make the figures comparable, the scope of services, expressed as the number of procedures per 100,000 population (rates), has

been adjusted for age and sex distribution in the hospital referral areas. This means that the rates given for a hospital referral area is the rate that the area would have had if its population had had the same age and sex distribution as the country as a whole.

This pilot version of the healthcare atlas consists of:

1. an interactive atlas (www.helseatlas.no) with pertaining fact sheets for each procedure, and
2. this report, which explains the method used and provides more detailed information about each condition and procedure.

What do the analyses show?

The analyses of the twelve day surgery procedures show that the use of health services varies, sometimes a great deal, between the populations of different hospital referral areas. For nine of the twelve procedures, the usage rates of the areas with the highest use is more than double that of the areas with the lowest usage rates. In the absence of any known variation in morbidity, such variation must be considered inexplicable, and thus as an indication that these procedures are not equitably distributed in the population. The variation must therefore also be called unwarranted. The ratio is as high as 4.13 for meniscal surgery, while for inguinal hernia operations, which is very equitably distributed, the ratio is 1.24.

Table 1: Variation in the use of twelve day surgery procedures between the populations of different hospital referral areas

Procedure	Highest rate	Lowest rate	ratio
Meniscus surgery	Møre og Romsdal (491)	Stavanger (119)	4.13
Shoulder surgery (acromion resection)	Møre og Romsdal (285)	Stavanger (74)	3.85
Haemorrhoid operations	Innlandet (338)	Nord-Trøndelag (92)	3.67
Aural ventilation tube	Nord-Trøndelag (263)	Bergen (88)	2.99
Droopy eyelid surgery	Nord-Trøndelag (245)	Førde (85)	2.88
Varicose vein surgery	Bergen (188)	Finnmark (75)	2.51
Tonsillectomy	Finnmark (487)	St.Olavs (212)	2.30
Surgery for hallux valgus and hammer toe	Vestre Viken (138)	Bergen (62)	2.23
Carpal tunnel syndrome surgery	Innlandet (179)	Bergen (87)	2.06
Selected hand surgery	Møre og Romsdal (104)	Oslo (56)	1.86
Cataract surgery	Stavanger (945)	Østfold (562)	1.68
Inguinal hernia surgery	Innlandet (138)	Helgelandssykehuset (111)	1.24

How to continue documenting unwarranted variation

One of the main reasons why the use of health services varies between population areas can be ascribed to differences in practice between healthcare professionals. Therefore,

the relevant specialist communities will be an important target group in the further work on the identified unwarranted variation. National guidelines have not been prepared for most of the day surgery procedures, but the Norwegian prioritisation guides contain clear criteria for several of them regarding how severe a condition must be in order for patients to be entitled to treatment. The lack of national guidelines increases the possibility of differences in practice. Close professional networks and relevant guidelines based on scientific documentation could harmonise practices, thereby improving equity in access to health services.

Another measure that could reduce variation is rational planning of service delivery. Health services have largely been governed by queues and demand, and it is pertinent to question whether service provision should to a greater extent be planned on the basis of identified variation in use, documentation of benefit and national averages. Prioritisation work and work on quality in the health service can also benefit from analyses of variation in use. This challenge is addressed not only to healthcare professionals, but also to the management level of local health trusts and regional health authorities.

Chapter 1

Background

1.1 Why a healthcare atlas?

It is an overriding goal in Norway that health services should be equitably distributed across geographical areas and ethnic and social groups (Ministry of Health and Care Services 2010). However, only in recent years have analyses been carried out that compare the use of health services in different geographical areas. Such comparison arose from a tradition in health services research called 'small area analysis', a tradition that began in the USA during the 1970s (Wennberg and Gittelsohn 1973). In connection with this, a web-based series of maps and a cube function was produced and made generally available so that interested parties could present and compare geographical areas' usage rates in map format[1]. These atlases have been controversial, but have made important contributions to health policy debate in the USA (Rosenthal 2012). Other countries have also developed such atlases (OECD 2014), and a similar system was established in England in 2010[2].

The need for systematic analyses of contrasts in health service use and practice is also now recognised in Norway. The Northern Norway Regional Health Authority's Centre for Clinical Documentation and Evaluation (SKDE) has therefore developed the atlas function helseatlas.no as a website for this purpose[3]. Helseatlas.no displays maps of Norway with information about the use of health services in geographical areas, with pertaining fact sheets. This first version of the healthcare atlas concerns day surgery services and is considered a pilot version with a potential for development. After the evaluation of this pilot version, the service will be continued to include information about other health services and patient groups.

1.2 Why was day surgery chosen?

The term day surgery covers surgical procedures that can normally be performed without the patient being admitted or staying overnight in hospital. They thus constitute 'minor'

[1] See www.dartmouthatlas.org/
[2] See www.england.nhs.uk/rightcare/
[3] See www.helseatlas.no

surgery that does not require monitoring or treatment of the patient after the actual procedure.

There are several reasons why SKDE focused on day surgery in this pilot project to develop an atlas service for the Norwegian health service:

Day surgery services generate considerable waiting lists and dominate the waiting list statistics. Several forms of adaptation have been introduced to deal with the waiting lists, including the Norwegian Labour and Welfare Administration's (NAV) Faster Return to Work scheme to prevent long-term sickness absence and a growth in private health insurance. The focus on these topics in public debate on health policy makes it important to map the geographical distribution of day surgery services.

It is also the case that there are differences in opinion among healthcare professionals about the need and indications for some day surgery procedures, guidelines are absent or imprecise, and the pertaining knowledge base is weak. It is therefore important to ascertain whether this results in great variation in the use of day surgery across Norway.

The healthcare atlas presents data from the Norwegian Patient Registry (NPR), which is based on the specialist health service's own information. It is challenging to identify particular groups of patients or health services in this vast data material, however. The quality of data varies and depends on, among other things, coding practices, the extent of incorrect coding and/or system errors in the reporting from the specialist health service to the NPR. However, the quality of data is generally better for surgical procedures than in other areas, not least because this often concerns 'one-off' events that are registered using specific procedure codes.

The above-mentioned factors were important considerations when day surgery was chosen as the pilot project for an atlas service.

1.3 Variation in use of health services

There could be many reasons why the use of health services varies between geographical areas. The variation can be due to factors such as differences in morbidity or the population's composition, differences in medical practice and service provision, or differences in patient preferences. The scope of random variation will be considerable for areas with small populations or in analyses of less common health services. Such random variation is natural and expected.

However, there is little reason to believe that morbidity differs significantly for ordinary day surgery conditions in Norway. When figures are adjusted for differences in the population's composition, there is therefore no reason to expect a systematically skewed distribution of this type of health services. The variations identified here cannot be explained by variation in needs or morbidity or patient preferences, which means that it is what we call unwarranted variation (Wennberg 2002).

It is difficult to calculate how much of the variation in use of health services is random and how much is due to systematic differences. However, one must take into consider-

ation that there will always be an element of random variation, and that it will often be greater than expected[4]. Several statistical methods exist for measuring the element of random variation, but there are no generally recognised or consistently used statistical measurements.

Statistical measurements of variation are in principle used to measure the uncertainty that arises when a sample is used as an estimate for the population as a whole. Data from the NPR includes all publicly funded contact with the specialist health service. There is therefore no need to generalise these results for a bigger population. The bar charts in the healthcare atlas include confidence intervals to give an indication of the uncertainty attached to internal variation in hospital referral areas. In addition, the factsheets show annual rates for the period to illustrate the stability of rates over time.

1.4 The population perspective

When interpreting the analyses in this pilot project, it is important to be aware that the usage rates measure the population of a hospital referral area's total use of health services, regardless of where the services were provided. What this means is that the rates include all relevant events (the operations in question) for the relevant population, including operations performed at hospitals outside the hospital referral area, outside the region or by private service providers that receive public funding.

The reason why we have chosen to use hospital referral areas as the geographical limitation of the populations we compare is that the services provided and practices at a health trust's hospital(s) have a marked effect on usage rates. There is to a certain extent a deliberate division of work between hospitals. In addition, it is very often the case that the variation reflects supply and practice rather than morbidity or the patients' wishes (Wennberg 2002). There are few known contrasts in morbidity between hospital referral areas in Norway. In an international perspective, Norway is a homogenous country in terms of health service needs, and there is therefore little reason to assume that differences in morbidity have any significant effect on usage patterns.

[4]For further discussion of the statistical approaches to random variation, see Walnum (2013).

Chapter 2

Results

2.1 Shoulder surgery (acromion resection)

Shoulder conditions are painful disorders related to the muscles, tendons, bursae, joint and skeleton of the shoulder. A lack of space can cause acute shoulder pain and impair muscular function (impingement syndrome). This, together with muscular pain, is the most common cause of shoulder pain.

Shoulder conditions are the third most common cause of muscular and skeletal pain, behind back and neck pain, and they become more common with age and cause a considerable amount of sickness absence and disability.

It can often be challenging to make a precise diagnosis because different conditions may present with the same findings on clinical examination. Ultrasound and MR have become important diagnostic tools despite the fact that, for the majority of patients, diagnostic imaging findings have no significant bearing on their prognosis. Diagnostic imaging can nevertheless help to clarify complicated cases. Shoulder conditions are often treated with different forms of physiotherapy or local injections (particularly cortisone injections). The treatment effect of therapeutic exercise is well documented, but documentation for other forms of physiotherapy is weak (Marinko et al. 2011). Steroid injections have good short-term effect, but no long-term effect. Surgery is only considered if physiotherapy does not result in satisfactory improvement of function.

The goal of surgery for impingement syndrome is to widen the narrow space by removing part of the acromion bone and, if relevant, parts of the acromioclavicular joint (acromion resection). Comparison with non-surgical treatment in three randomised studies have shown that physiotherapy is as effective as surgery (Diercks et al. 2014), and the specialists communities are discussing whether too many such operations are performed.

Sample

In this analysis, we have studied traditional shoulder surgery in the form of acromion resections. Acromion resection is defined by a primary or secondary diagnosis (ICD-10) in code blocks M19 or M75 in combination with procedure codes (NCSP) NBK12 or

NBK13 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis codes apply in combination with tariff code K05c.

Findings

An average of about 7,200 such procedures were performed in Norway each year. The number has increased somewhat towards the end of the period due to a near doubling from 2012 to 2013 of the number of procedures performed by private treatment providers.

Table 2: Acromion resection, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	4,908	98	4,716	93	4,355	85	4,660	92
Private	2,006	40	1,965	39	3,716	72	2,562	51
Total	6,914	139	6,681	132	8,071	157	7,222	143
Private (%)	29	29	29	29	46	46	35	35

Most hospital referral areas have little variation from year to year. The use increased considerably in the last year of the period for Bergen hospital referral area, and in Førde hospital referral area there was a marked drop in 2012. For the period overall, Møre og Romsdal hospital referral area (highest) stands out with a usage rate almost four times as high as that of Stavanger hospital referral area (lowest), while the usage rate in the area with the second highest usage rate (Finnmark) was 3.4 times higher than that of the second lowest (Oslo).

More than one third of procedures performed in Norway were carried out by private treatment providers under contracts with the public authorities. In four hospital referral areas, Møre og Romsdal, UNN, Østfold and Akershus, private providers performed more than half of all the procedures, and Akershus had the highest proportion of procedures by private providers (61%).

Interpretation

There is a striking difference in the use of acromion resections between the populations of the different hospital referral areas. The prioritisation guide in orthopaedics emphasise pain, loss of function, conservative treatment being ineffective, age and comorbidity as factors that entitle patients to prioritised health care. The guide recommends that the complexity of shoulder conditions should be taken into consideration, and also leaves room for clinical judgement to be exercised. Nevertheless, the variation identified between hospital referral areas is so great that there is every reason to ask whether this service is equitably distributed in the population. Since it is disputed how beneficial

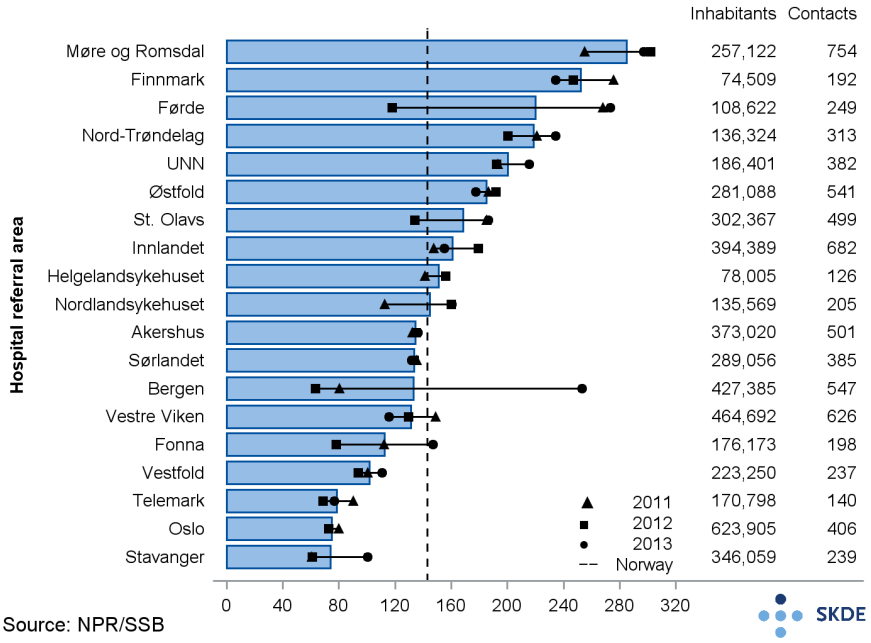

Figure 1: Acromion resection, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

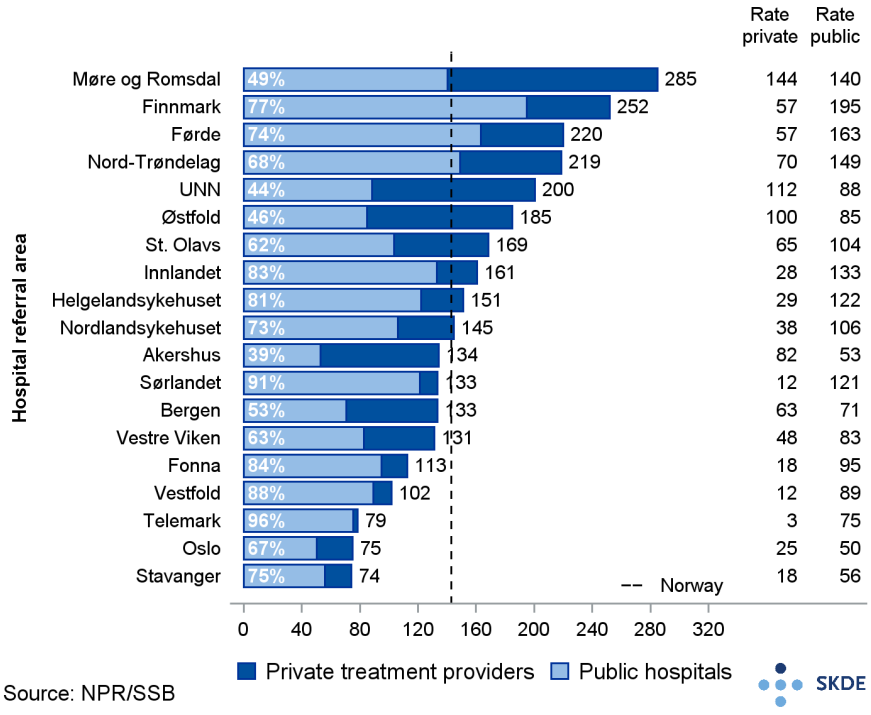

Figure 2: Acromion resection, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

such shoulder operations are, it is conceivable that there is overuse in parts of the population. At the national level, we see a decrease in such procedures at public hospitals during the three-year period, while the proportion of procedures performed by private

treatment providers has increased. In recent years, a corresponding trend has also been identified in Finland (Paloneva et al. 2015).

2.2 Menisci

The menisci are fibrocartilage that protect the cartilage in the joint and help to stabilise the knee. The menisci can be damaged by partial or complete tearing, either as an acute injury through a combination of twisting and bending of the knee or as part of the development of arthrosis caused by age-related changes. Meniscus injuries are diagnosed on the basis of the case history, clinical tests and MR examination. Only rarely is a keyhole examination of the knee joint (diagnostic arthroscopy) required.

Traumatic knee injuries require early assessment to see whether the meniscus can be repaired by suturing. Acute knee injuries also require assessment of whether early surgical intervention is required in relation to other structures (for example complete tearing of the lateral collateral ligament, which requires surgery). Treatment of acute injuries has good effect in the short term, but people who have had their meniscus removed at an early age have been found to be susceptible to developing early cartilage wear and arthrosis in later life.

Meniscus repairs carry a higher risk of early relapse than surgery where part of the meniscus is removed. However, the long-term prognosis is better for repairs, which cause less cartilage changes than partial removal. There is a clear link between the risk of arthrosis and how big a part of the meniscus has been removed. The medial (inner) meniscus is more important to stability, while both menisci are important to the function of the cartilage. Removing the lateral (outer) meniscus increases the long-term risk of arthrosis more than removing the medial meniscus.

Minor meniscus injuries are treated with physiotherapy. Bigger tears and patients with persistent symptoms are treated with surgery to repair or partly remove the meniscus as described above. Complications in the form of damage to local nerves and blood vessels are rare.

The benefits of meniscus surgery are disputed. Meniscus conditions in people over 40 who have not sustained an injury are often due to age-related changes in the knee joint. These patients experience short-term improvement following surgery, but have been found to be at risk of subsequent worsening of arthrosis and pain. A recent trial from Finland indicates that this group is overtreated (Sihvonen et al. 2013). Physiotherapy is therefore the primary recommendation for these patients. In this age group, surgery is only recommended for patients experiencing mechanical symptoms in the form of complete or partial locking of the joint or for patients who has not benefitted from long-term physiotherapy.

Sample

Meniscus surgery is defined by a primary or secondary diagnosis (ICD-10) of M23.2, M23.3 or S83.2 in combination with procedure codes (NCSP) in the code block NGD for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis codes apply in combination with tariff code K05b.

Findings

On average, nearly 13,200 such procedures were performed in Norway each year, of which the number performed by private treatment providers increased markedly in the last year. On average, about one third of procedures performed in Norway in the period 2011–2013 were carried out by private treatment providers under contracts with the public authorities.

Table 3: Meniscus surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	8,974	180	8,855	175	8,094	158	8,641	171
Private	3,823	77	3,433	68	6,398	125	4,551	90
Total	12,797	257	12,288	243	14,492	283	13,192	261
Private (%)	30	30	28	28	44	44	34	34

Most hospital referral areas have little variation from year to year. However, there was significant variation between the three years for the two hospital referral areas of St. Olavs and Førde, and there was a marked increase for the Bergen area from 2012 to 2013. Møre og Romsdal stands out with a usage rate more than four times as high as Stavanger's. More moderate variation is observed between the other hospital referral areas.

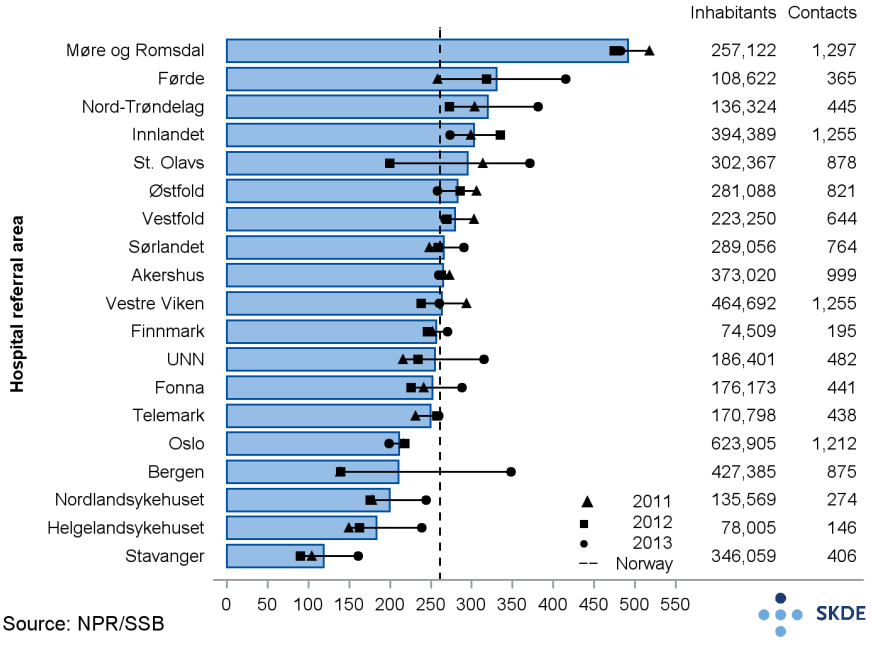

Figure 3: Meniscus surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Private treatment providers performed about half of the procedures in the areas of Møre

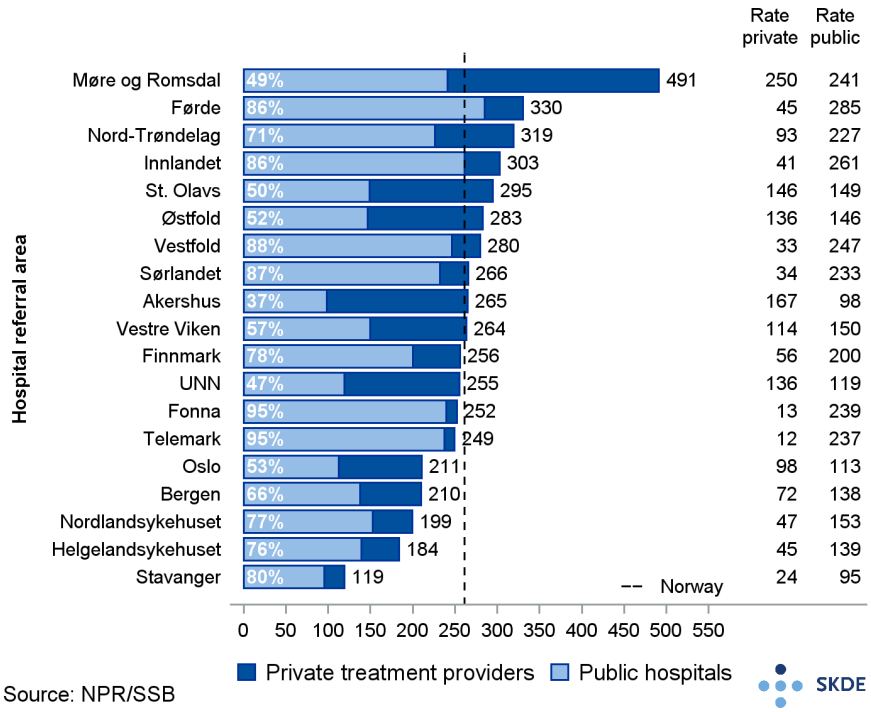

Figure 4: Meniscus surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

og Romsdal, St Olavs, Østfold and UNN, while the proportion for the Akershus area was as high as 63%. In Fonna and Telemark hospital referral areas, 95% of the operations were carried out at public hospitals.

Interpretation

The analyses show great contrast in rates between Møre og Romsdal and Stavanger, although the rate of the latter increased in the last year. If we consider the variations in usage rate between the other hospital referral areas, we find a more moderate variation with a ratio between the extremes of 1.8. The prioritisation guide in orthopaedics emphasises acute locking of the joint, repeated episodes of swelling, intense pain and additional injuries to ligaments and cartilage as factors that entitle patients to prioritised health care. There are no national guidelines in this area. The benefits of meniscus surgery are disputed. Leading specialists argue that it is especially middle-aged and older patients without a preceding injury who are being overtreated, since these patients have in increased risk of arthrosis and pain worsening after a short-term improvement.

2.3 Hallux valgus and hammer toe

Hallux valgus is a deformation of the big toe, which is angled towards the little toe. Hallux means the big toe, and valgus means that the toe is angled outwards. Often, a bony protuberance (exostosis) develops on the inside of the foot at the base joint of the big toe. The joint swells, and the patient experiences pain on the inside of the foot. The changes can make it difficult to find shoes that fit the foot comfortably.

Hallux valgus often occurs in combination with 'hammer toe' deformity of the smaller toes. Hammer toe is a foot condition where a toe is in a hammer-like position because the innermost joint is bent upwards and the outermost downwards. This results in pressure on the middle joint. A corn will often form, and the joint eventually becomes stiff and tender.

It is not clear what causes hallux valgus, but it is assumed that tight-fitting shoes, particularly if they are high-heeled and push all the body weight onto the forefoot, is a potential cause. Hammer toe can be caused by the toe being too long, by a joint disease or by ill-fitting shoes. These are relatively common conditions, and far more common in women than in men.

Both conditions are treated surgically by cutting through and removing part of the bone near the bent joint. The angle is reduced and the toe straightened. Screws are often placed in the big toe and metal pins in the smaller toes to ensure that they heal at the correct angle.

According to the priority guide in orthopaedics, patients with foot conditions that involve considerable pain and a reduced ability to walk in ordinary shoes are entitled to prioritised health care. There are no national guidelines.

Sample

Surgery for hallux valgus and hammer toe is defined by a primary or secondary diagnosis (ICD-10) of M20.1, M20.2, M20.3, M20.4, M20.5 or M20.6 in combination with procedure codes (NCSP) NHG09, NHG44, NHG46, NHG49, NHK17, NHK18, NHK57 or NHK58 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis codes apply in combination with tariff codes 134a, 134b or 140d.

Findings

During the period 2011–2013, an average of just under 5,000 surgical procedures for these conditions were performed each year at public hospitals or by private treatment providers with public reimbursement. The number of procedures per year has remained relatively constant during the period, but the proportion performed by private providers increased in 2013.

Table 4: Surgery for hallux valgus and hammer toe, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	3,870	78	3,728	74	3,585	70	3,728	74
Private	985	20	858	17	1,516	30	’1’120	22
Total	4,855	97	4,586	91	5,101	100	4,847	96
Private (%)	20	20	19	19	30	30	23	23

In some hospital referral areas, the frequency of procedures varied over the three years. The number of procedures per year has doubled for the population in Bergen hospital referral area, which has the lowest average use of this procedure. In Vestre Viken, which had the highest usage rate, there was a marked decrease from 2011 to 2012 and 2013, but use of this procedure remains high. The ratio between the hospital referral areas with the highest (Vestre Viken) and lowest (Bergen) usage rates is 2.2. This means that the population of Vestre Viken has 2.2 times as many procedures as Helse Bergen health trust’s population. The usage rates in the other hospital referral areas is relatively evenly distributed in the range between Helse Bergen and Vestre Viken.

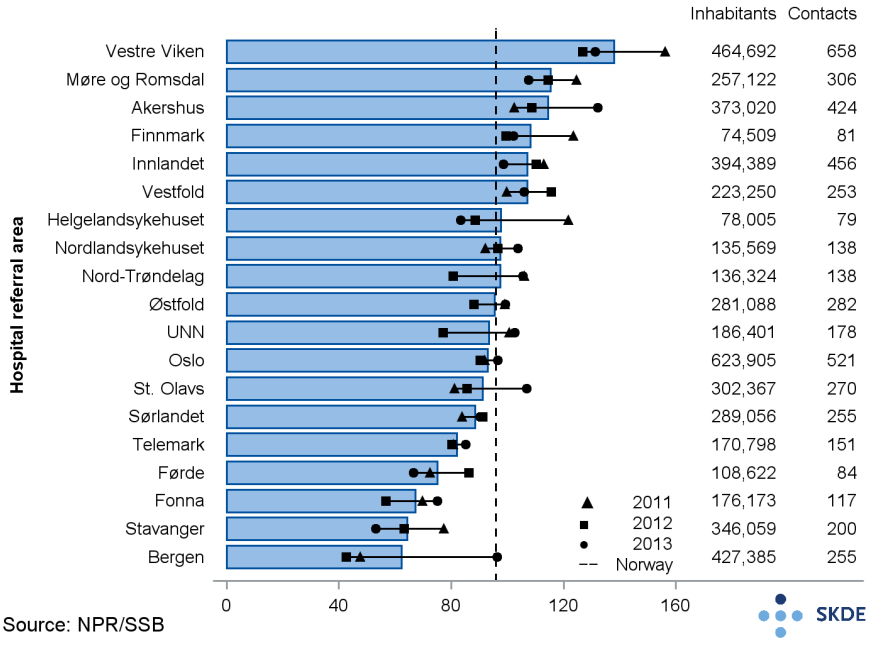

Figure 5: Surgery for hallux valgus and hammer toe, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

In Norway as a whole, 23% of the surgical procedures were performed by private treatment providers with public reimbursement. The hospital referral areas with the highest proportion of private treatment providers were located in the central part of Eastern Norway: Akershus (52%), Vestre Viken (41%) and Oslo (38%). Private services are little used in Northern Norway (Helgeland 2%, Nordlandssykehuset 4%) and Western Norway (Fonna 3%, Førde 4%).

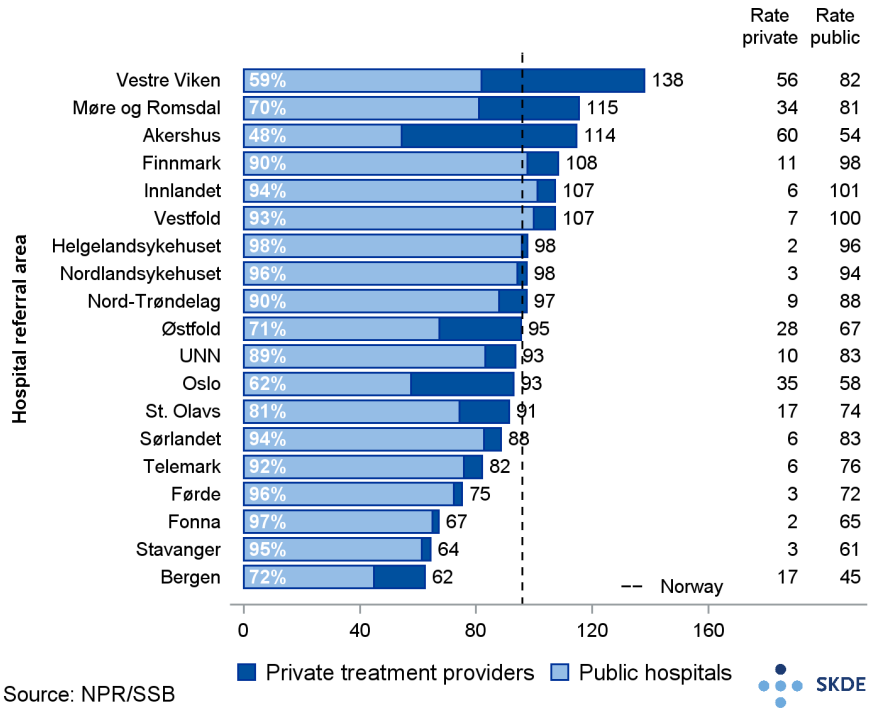

Figure 6: Surgery for hallux valgus and hammer toe, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Interpretation

There is little reason to believe that the conditions hallux valgus and hammer toe are unequally distributed in the population. Surgery for these conditions has been relatively stable in the different hospital referral areas over the three-year period, except in the Bergen area, where there has been an increase in 2013. However, a fairly high degree of variation has been observed between hospital referral areas. This variation is probably not random, and it seems reasonable to conclude that the provision of this procedure is not equitably distributed in the population.

2.4 Hand surgery: Dupuytren's contracture, trigger finger, ganglion and De Quervain

Dupuytren's contracture is a connective tissue formation (thickening) of the tendon sheath, which may eventually make it impossible to straighten out one or more fingers. In most patients, Dupuytren's contracture can be treated with stretching exercises. If the symptoms become severe, the condition is treated surgically.

Trigger finger is caused by the flexor tendon of a finger becoming irritated and swollen, which results in the finger becoming 'stuck' in a bent position. Surgery involves opening the first part of the tendon sheath. **Ganglion** is a cyst with jelly-like content. The ganglion presents as a swelling or lump, usually at the wrist. The lump is usually noticed because of its appearance, but can sometimes be painful if it is tense. Half of all ganglion cysts disappear without treatment, and half of all ganglion cysts treated surgically recidivate. Surgery involves removing the ganglion and repairing the defect that represents its connection with the tendon sheath or joint capsule.

De Quervain is one of the most common forms of tendonitis of the wrist, and affects the extensor tendons in the back of the hand on the thumb side. It is often caused by excessive strain. Treatment is first and foremost rest, alternatively cortisone injections. The tendon sheath can be widened surgically to make more room for the thickened tendon.

Operations for the four above-mentioned conditions are carried out under local anaesthesia and are normally carried out by orthopaedic specialists.

Sample

Trigger finger:

Trigger finger surgery is defined by a primary or secondary diagnosis (ICD-10) of M65.3 in combination with procedure codes (NCSP) NDE12 or NDM49 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code 140k.

Ganglion:

Ganglion surgery is defined by a primary or secondary diagnosis of M67.3 in combination with procedure codes NDM39 or NDR09 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code 140a.

Dupuytren's contracture:

Surgery for Dupuytren's contracture is defined by a primary or secondary diagnosis of M72.0 in combination with procedure codes NDM09, NDM19 or NDM49 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code 140c.

De Quervain's tendonitis:

Surgery for De Quervain's tendonitis is defined by a primary or secondary diagnosis of M65.4 in combination with procedure code NDM49 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code 140k.

These four procedures are merged into one group called selected hand surgery in all our analyses.

Findings

On average, just over 3,600 such procedures were performed each year, with a slight increase in the last year. Nearly 75% were performed at public hospitals/outpatient clinics, while the proportion performed by private treatment providers showed a slightly increasing trend over the three-year period. The proportion of private providers varies from 1% for the population of Fonna and Stavanger hospital referral areas to 69% in the Bergen area.

Table 5: Selected hand surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	2,777	56	2,635	52	2,658	52	2,690	53
Private	773	16	901	18	1,174	23	949	19
Total	3,550	71	3,536	70	3,832	75	3,639	72
Private (%)	22	22	25	25	31	31	26	26

The overall hand surgery rates for each hospital referral area remains stable, but the rates increased significantly in three of the areas over the last year (Østfold, St. Olavs and Akershus). The variation between areas is moderate, with a ratio of 1.9 dropping to 1.6 between the areas with the second highest (Nordlandssykehuset) and the second lowest (Akershus) rates.

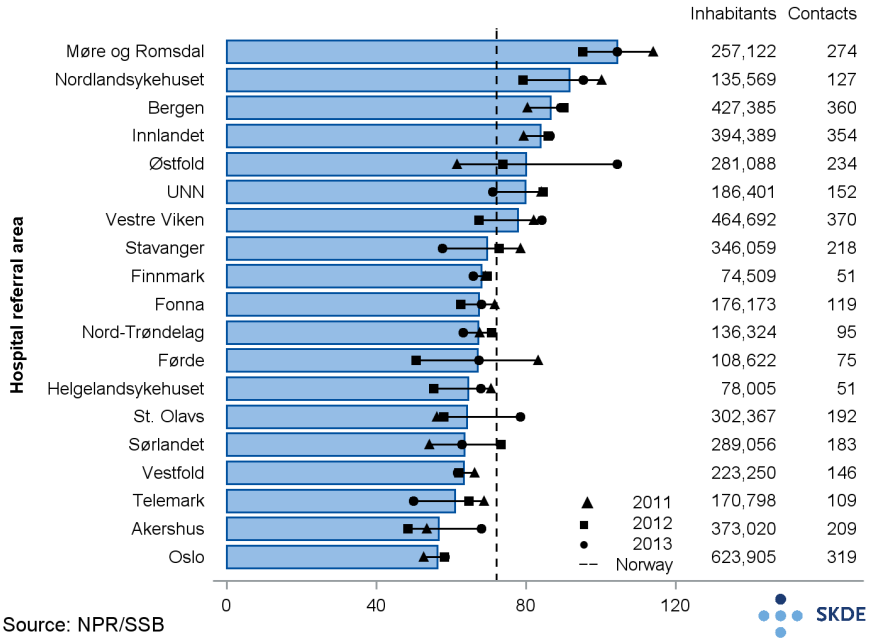

Figure 7: Selected hand surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

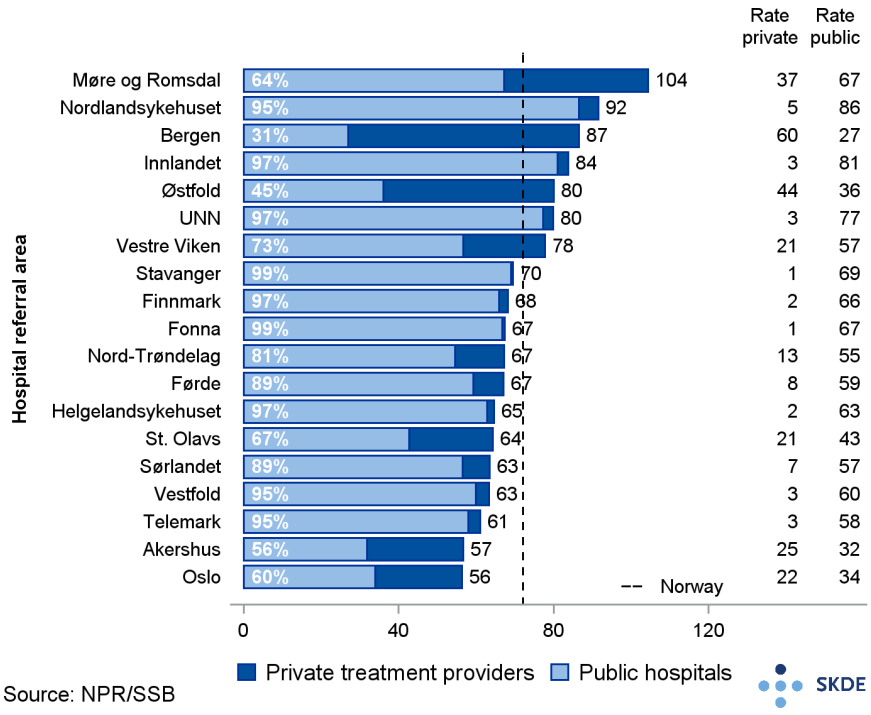

Figure 8: Selected hand surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Interpretation

The scope of hand surgery is relatively small and stable over time, and the area with the highest usage rate has barely twice the rate of the area with lowest usage rate. The

proportion of procedures performed by public and private treatment providers vary a great deal between hospital referral areas, however. Conservative or less invasive treatments are alternatives to surgery for all four conditions, which could explain some of the variation in overall rates. There are no national and very few international guidelines for these procedures. According to the national priority guide in orthopaedics, contractures, deformities and other soft tissue conditions in the wrist, carpus or finger joints do not as a rule entitle patients to prioritised healthcare.

2.5 Carpal tunnel syndrome

Carpal tunnel syndrome is the result of pressure on a nerve in the wrist caused by repetitive hand movements that create swelling in the tendons surrounding the nerve. Typical symptoms include pain, numbness and tingling in the palm and fingers. The condition can heal spontaneously, and conservative treatment is the preferred option. Surgery can be a good alternative for patients with serious symptoms and/or problems.

Two types of surgical procedures are performed to relieve pressure on the nerve. The procedure can be carried out as open surgery or keyhole surgery. Both procedures involve partly or completely cutting the ligament that arches over the carpal tunnel to release pressure. The operation takes place under local anaesthesia and takes about ten minutes.

Sample

Carpal tunnel syndrome surgery is defined by a primary or secondary diagnosis (ICD-10) of G56.0 in combination with procedure codes ACC51, NDE11, NDE12, NDM19, NDM49 or NDL50 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code 140i.

Findings

An average of about 6,500 such procedures were performed in Norway each year. The frequency has remained relatively constant throughout the period. On average, 17% of the procedures were carried out by private treatment providers, but this percentage varied between 13 and 21 during the period.

Table 6: Carpal tunnel syndrome, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	5,545	111	5,368	106	5,492	107	5,468	108
Private	1,022	20	824	16	1,472	29	1,106	22
Total	6,567	132	6,192	122	6,964	136	6,574	130
Private (%)	16	16	13	13	21	21	17	17

The surgery frequency was relatively stable within each hospital referral area during the three-year period. The analyses show that the ratio between the hospital referral area with the highest rate (Innlandet) and the one with the lowest rate (Bergen) is approx. 2.1. This means that the population of Innlandet has 2.1 times as many procedures as Helse Bergen health trust's population. The other hospital referral areas' rates are relatively evenly distributed in the range between the rates for Bergen and Innlandet.

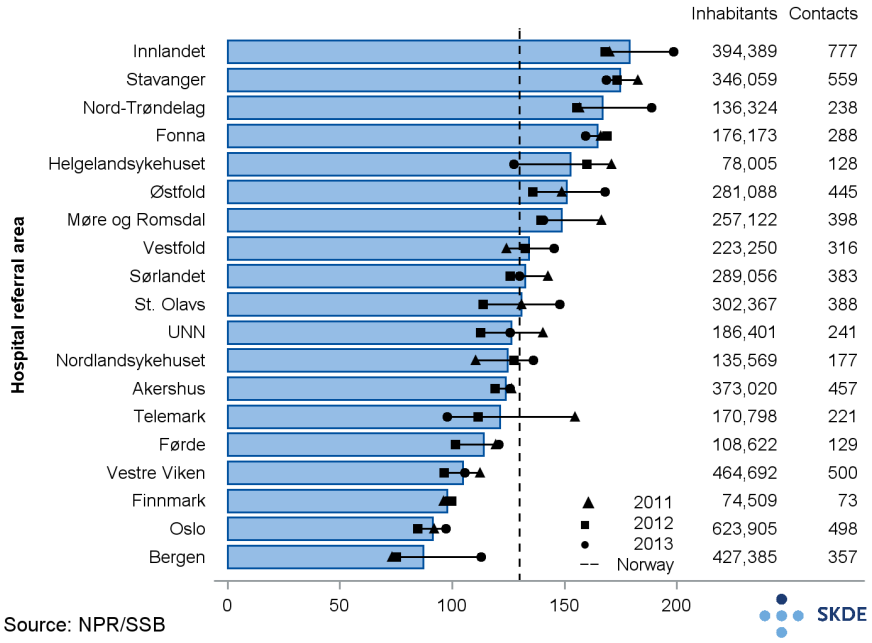

Figure 9: Carpal tunnel syndrome, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

The proportion of these procedures carried out by private treatment providers varies a great deal between hospital referral areas. The hospital referral areas with the highest proportion of private treatment providers were Østfold (45%), Akershus (41%), Vestre Viken (36%) and Oslo (35%).

Interpretation

The surgery frequency remained relatively stable within each hospital referral area during the three-year period, while the proportion performed by private treatment providers and the hospital referral areas' overall rates varied considerably. The analyses show that the ratio between the hospital referral area with the highest rate (Innlandet) and the one with the lowest rate (Bergen) is approx. 2.1. Since these differences are unlikely to be due to differences in morbidity or to pure coincidence, the findings suggest that the indications for this procedure, and referral practices, vary between hospital referral areas. There are no national guidelines in this area. According to the national priority guide in orthopaedics, decompression of the nerves of the hand and wrist do not as a rule entitle patients to prioritised healthcare.

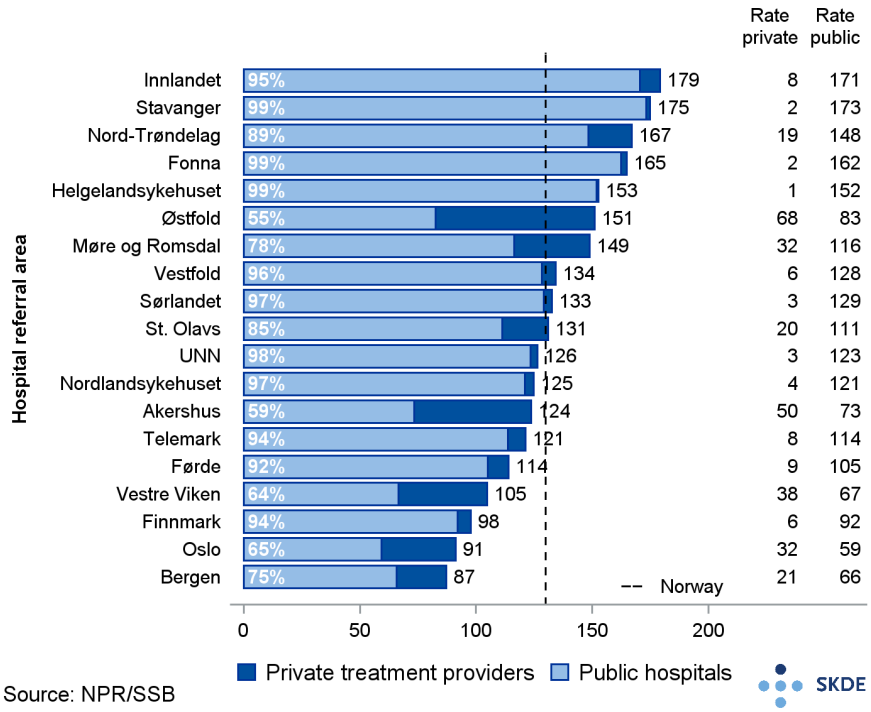

Figure 10: Carpal tunnel syndrome, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

2.6 Tonsillectomy

Tonsillectomy is one of the most commonly performed operations, particularly on children. The procedure is carried out by ear, nose and throat (ENT) specialists. The basis for this operation is often recurring throat infections up to three or four times a year for at least two years. Chronic middle ear infection can also be a reason for removing the tonsils. Big tonsils that make it difficult for children to breathe and swallow can also be removed, and in such cases, the adenoids are also removed (adenoidectomy). Despite the high frequency of such procedures, no national guidelines have been established. According to the national priority guide for ear, nose and throat diseases, head and throat surgery, patients may be entitled to prioritised healthcare for recurring throat infections, depending on age (children), and comorbidity.

Sample

Tonsillectomy is defined by a primary or secondary diagnosis (ICD-10) in code block J35 or a diagnosis of H65.2 or H65.3, in combination with procedure codes (NCSP) EMB10, EMB12, EMB15, EMB20, EMB30 or EMB99 for hospitals with activity-based funding. Specialists in private practice under public funding contracts use the same diagnosis codes in combination with tariff codes K02a, K02b, K02d, K02e, K02f or K02g.

Findings

Just under 14,000 tonsillectomies were performed each year by public hospitals or private treatment providers with public reimbursement. On average, about 20% of operations were performed by private treatment providers. The national frequency has remained relatively stable, but the proportion of patients operated on by private treatment providers increased from 19% in 2011 to 25% in 2013.

Table 7: Tonsillectomy, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	11,181	224	11,082	220	10,720	211	10,994	219
Private	2,580	52	2,204	44	3,638	72	2,807	56
Total	13,761	276	13,286	264	14,358	283	13,802	274
Private (%)	19	19	17	17	25	25	20	20

The number of operations per 100,000 population per year (the surgery rate) varies between different parts of the country. For people living in the hospital referral areas of Helgelandssykehuset and Fonna, the surgery rates have increased steadily from 2011 to

2013, while they remained completely stable for the populations of Akershus and Innlandet. For people in the Bergen area, the number of operations per 100,000 population varied from year to year.

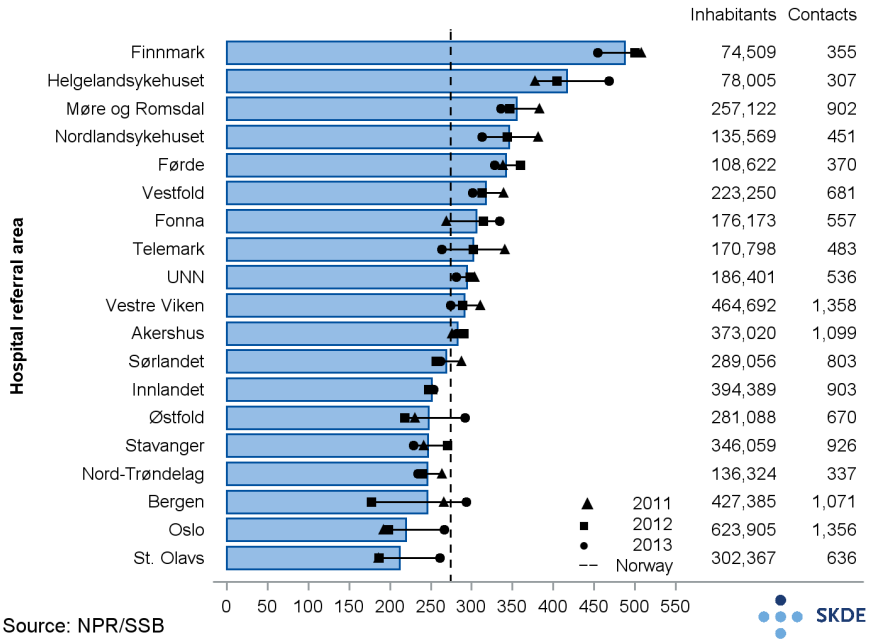

Figure 11: Tonsillectomy, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Tonsillectomies are performed more than twice as often in the population of Finnmark as in the population of St. Olavs hospital's catchment area (ratio 2.3), and Helgelandssykehuset hospital referral area has the second highest frequency of tonsillectomies. If the areas of Finnmark and Helgelandssykehuset are excluded, tonsillectomies are quite evenly distributed across the remaining hospital referral areas.

There is considerable variation in the population as regards how big a proportion of procedures is performed by private providers. Between 40% and 50% of such operations in the population of the hospital referral areas of Bergen and Oslo are performed by private treatment providers, while the corresponding figures for the hospital referral areas of Helgelandssykehuset, Nordlandssykehuset, Vestfold and Telemark are 1% or less.

Interpretation

There is considerable geographical variation both in how many tonsillectomies are performed and in the proportion performed by private treatment providers. The number of procedures per 100,000 population was more than twice as high in Finnmark as in St. Olavs hospital referral area. However, there is no known geographical variation in the underlying conditions (recurring throat and ear infections). The variation in use of this procedure can therefore be interpreted as expressing a combination of differences in medical practice as regards the referral, assessment and prioritisation of patients with these conditions.

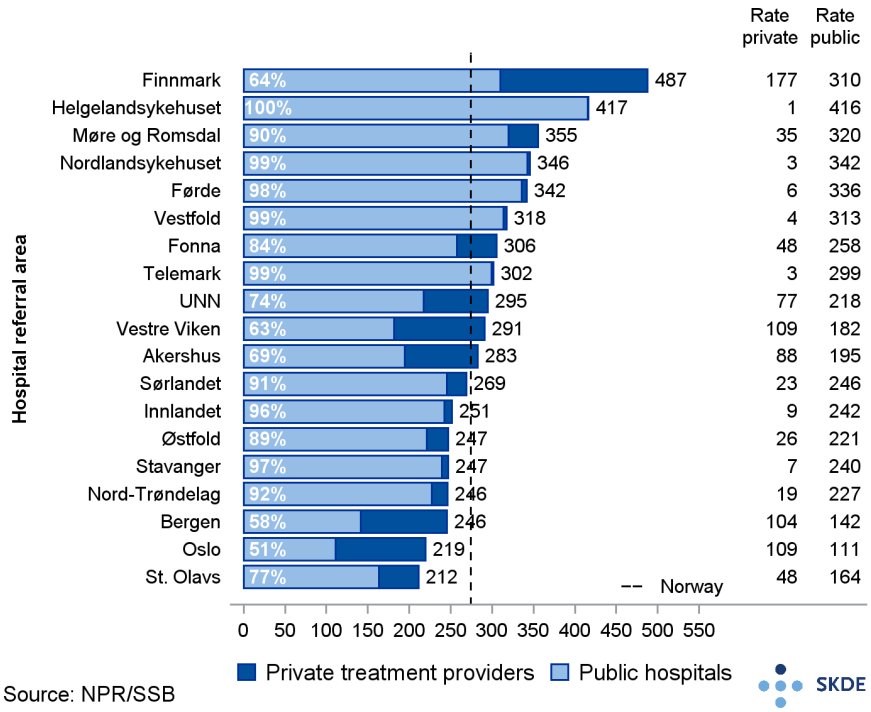

Figure 12: Tonsillectomy, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

2.7 Aural ventilation tube

Persistent fluid in the middle ear (secretory otitis media) can be highly problematic, especially in children. The condition may be a consequence of acute otitis media. Fluid in the middle ear restricts the movement of the eardrum. The condition is usually not accompanied by pain, fever or other signs of illness, but can result in hearing loss and delayed language development. In approximately 80% of cases, the build-up of fluid will resolve on its own with time. In cases where the condition results in hearing impairment or language problems of a certain duration, treatment is often attempted by inserting a ventilation tube (grommet) in the eardrum. The effect of the procedure is individual and not scientifically well-documented. The grommet will usually fall out on its own after 3–18 months. A complication may arise in the form of a hole in the eardrum, which will require another and more extensive procedure to close it.

These operations are carried out by ear, nose and throat (ENT) specialists. There are no national guidelines in this area. If the condition causes hearing impairment and delayed language development in children, they are entitled to necessary healthcare. According to the national priority guide for ear, nose and throat diseases, head and throat surgery, patients may be entitled to prioritised healthcare for chronic ear infection depending on their age (children), secretion and how much their hearing is affected.

Sample

Insertion of a ventilation tube in the eardrum is defined by the procedure code (NCSP) DCA20 for hospitals with activity-based funding. Specialists in private practice under public funding contracts use tariff codes K02c, K02d, K02e or K02g to define the procedure.

Findings

On average, 7,500 aural ventilation tube insertions were performed each year in the period 2011–2013. An average of about 70% of such procedures were performed in public hospitals. The proportion performed by private treatment providers increased from 25% in 2011 to 34% in 2013.

Table 8: Aural ventilation tube, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	5,533	111	5,492	109	4,986	98	5,337	106
Private	1,867	37	1,997	39	2,576	51	2,147	43
Total	7,400	148	7,489	148	7,562	148	7,484	148
Private (%)	25	25	27	27	34	34	29	29

Aural ventilation tubes are used to a varying extent in the population in different parts of the country, and are on average three times as frequent among the population in Nord-Trøndelag hospital referral area as in Oslo and Bergen. At the national level, the frequency of use has remained stable. However, the frequency of this procedure in the population of the hospital referral areas of Nord-Trøndelag, St. Olavs and Oslo has increased from 2011 to 2013, while the opposite trend has been observed in Nordlandssykehuset and Telemark hospital referral areas.

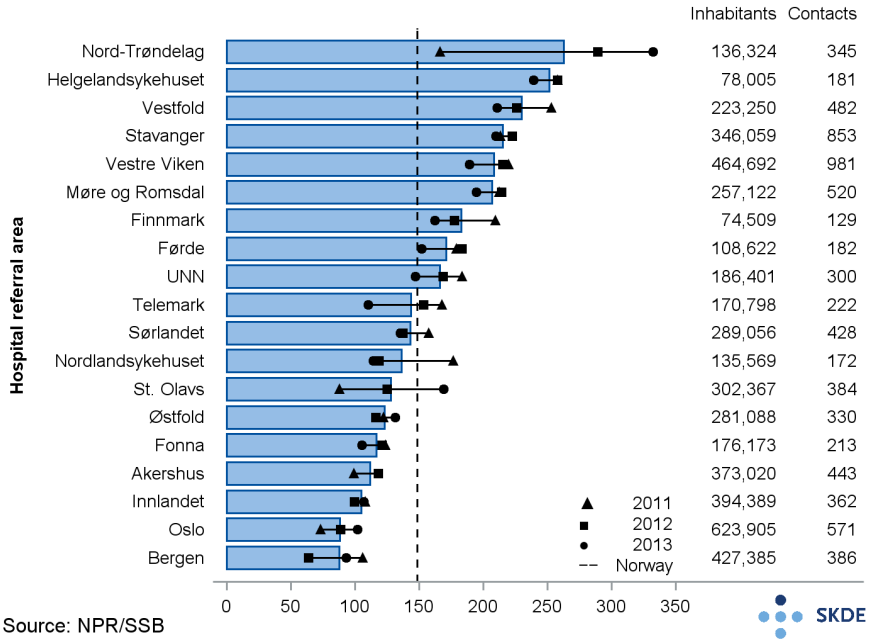

Figure 13: Aural ventilation tube, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

There is great geographical variation in the availability of private treatment providers. In Oslo hospital referral area, 75% were treated privately, and the corresponding figure for Vestre Viken was 61%. No patients received private treatment in Stavanger and Nordlandssykehuset hospital referral areas. This procedure is performed on relatively young children; the median age in our material is four years.

Interpretation

There is no known geographical variation in the prevalence of fluid in the middle ear (secretory otitis media). At the same time, there is considerable geographical variation in aural ventilation tube insertion in children. People living in Nord-Trøndelag hospital referral area received such treatment three times as often as those living in Oslo and Bergen, and there is an even geographical gradient between the two extremes. There are no national guidelines for this treatment, and the documentation of its benefits is weak. The variation observed is thus probably due to differences in medical practice both in primary healthcare services and the specialist health service, in combination with different priorities and elements of random variation.

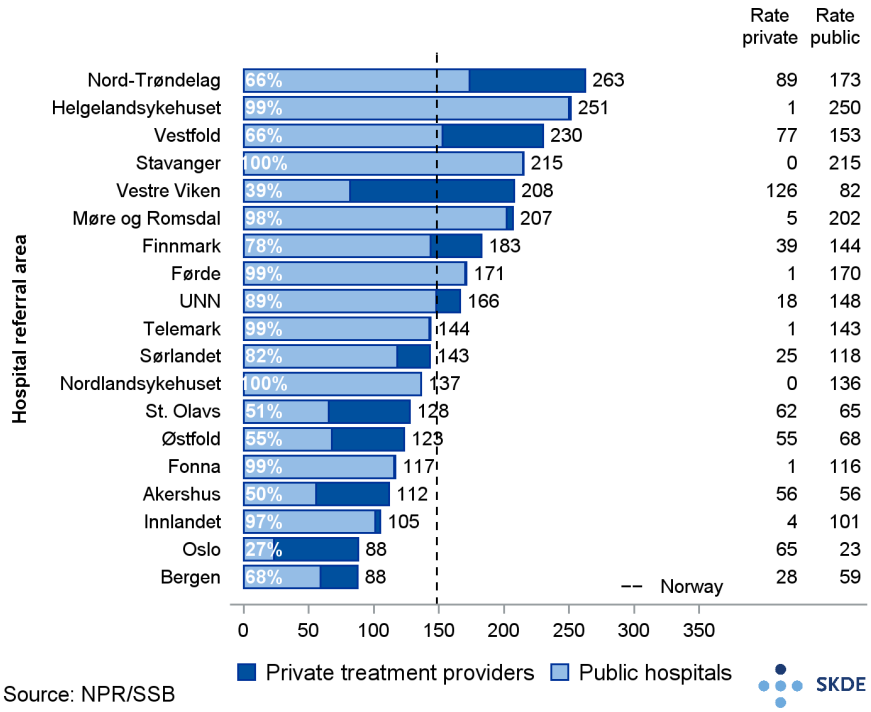

Figure 14: Aural ventilation tube, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

2.8 Age-related cataracts

Cataracts are opacities in the lens of the eye that cause visual impairment and, if left untreated, blindness. The visual impairment usually develops slowly over a period of years, on one or both sides, and is most noticeable when looking at things from a distance. Most patients develop cataracts as part of the aging process, but there are also hereditary and congenital conditions. In Europe, cataracts are the third most common cause of blindness and the second most common cause of visual impairment (Bourne et al. 2014). Globally, age-related cataracts are believed to be the leading cause of blindness (Brian and Taylor 2001). The condition's prevalence in the population is expected to increase as the number of elderly people grows. Current medical science cannot prevent, delay or avert this condition.

The most important symptom is visual impairment, but symptoms also include problems with glare and double vision. The treatment consists of removing the old lens and inserting an artificial one. There is general agreement that treatment is warranted when the patient's visual function impairs the activities of daily living. Surgery is performed by a specialist in diseases of the eye. There are no established national guidelines. The national priority guide for eye diseases entitles patients to prioritised healthcare for cataracts when vision in the patient's best eye is poorer than 0.5 (normal vision is 1).

Sample

Cataract surgery is defined by a primary or secondary diagnosis (ICD-10) in code block H52 in combination with procedure code (NCSP) CJE 20 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis codes apply in combination with tariff code K01a.

Findings

Approx. 36,000 operations for age-related cataracts are performed each year by public hospitals or private treatment providers with public reimbursement, and this is the most common type of surgery in Norway today. Seven per cent (2,300) more surgeries were performed in 2013 than in 2011, and, on average, just under half were performed by private treatment providers. For Norway as a whole, the proportion operated on by private treatment providers increased from 48% in 2011 to 52% in 2013.

The frequency of cataracts surgery varies between hospital referral areas, from an average of 945 operations per 100,000 population per year in Stavanger hospital referral area to 562 operations per 100,000 population per year in Østfold. The ratio is 1.7, which means that elderly people living in the Stavanger area have cataract surgery 1.7 times more often than elderly people living in Østfold. The frequency increased by about 50% in Bergen and Førde hospital referral areas from 2011 to 2013. It remained stable for people living in UNN hospital referral area, while it decreased by between 11% and 16% in the areas of Vestfold, Telemark and Helgelandssykehuset.

Table 9: Cataract surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	18,310	367	19,192	379	18,283	355	18,595	367
Private	17,231	346	15,640	308	19,593	378	17,488	344
Total	35,541	713	34,832	688	37,876	733	36,083	711
Private (%)	48	48	45	45	52	52	48	48

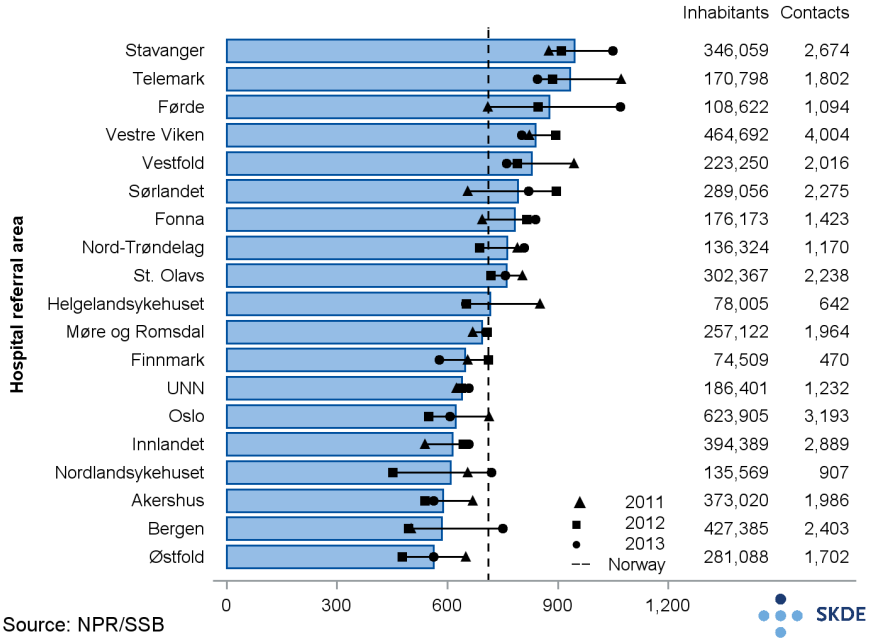

Figure 15: Cataract surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

There is considerable geographical variation in the proportion of operations carried out by private treatment providers. People living in Vestfold and Oslo hospital referral areas use private treatment providers in more than 70% of cases, while the proportions for people living in Førde, Finnmark and Telemark are below 20%. The number of operations for age-related cataracts performed at public hospitals has remained stable during the period, while the number performed by private treatment providers increased by 14%.

Interpretation

Cataract surgery is performed to remedy age-related visual impairment and blindness. It is therefore a very important treatment when it comes to preserving quality of life as well as function in old age, and represents a service that is expected to have equitable accessibility throughout the population. There is no known variation in prevalence, but nevertheless geographical variation is observed in the population's use of or access to

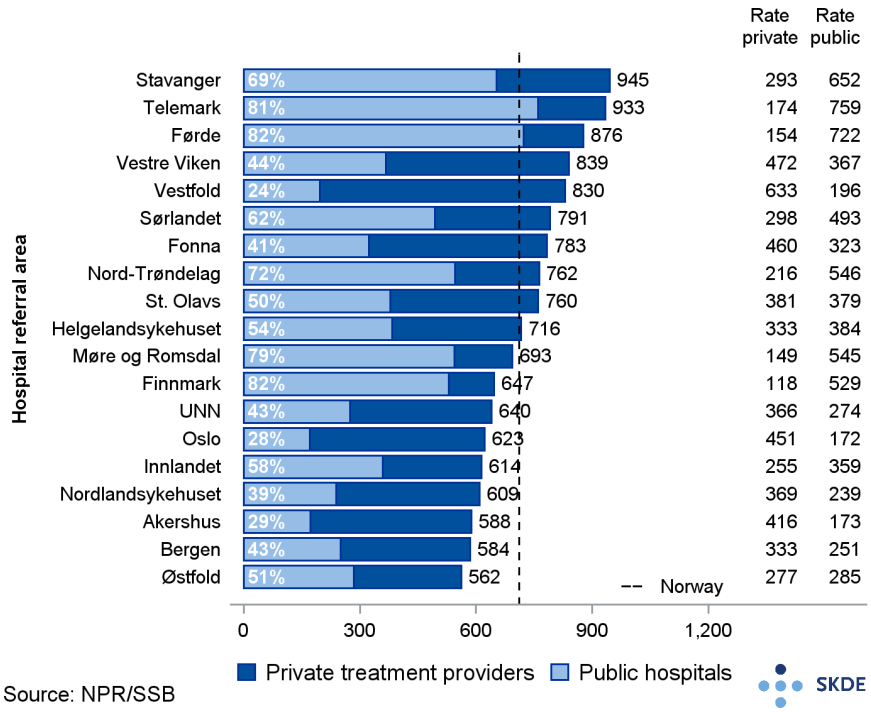

Figure 16: Cataract surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

this form of treatment.

The variation must be considered to be moderate, but it is consistent over several years. Although some of this variation is random, it represents a difference in treatment provision by population area for a service that is deemed to greatly benefit the right patients.

2.9 Droopy eyelids

The condition known as droopy eyelids is usually due to excess skin. With age, the skin becomes less elastic, fat deposits around the eyes become more prominent, and the eyebrows sag. The forehead will also sag with age, and the skin of the upper eyelids droops towards the edge of the eyelid. Excess skin on the upper eyelids can interfere with peripheral vision, and in extreme cases even forward vision can become impaired. Many compensate for droopy eyelids by raising their eyebrows. This can cause headaches and deep wrinkles on the forehead. There is often familial aggregation of droopy eyelids with a lot of skin, and the condition therefore also affects some young people. What is known as 'bags under the eyes' is also operated on, but there are rarely any medical indications for this procedure, and it is therefore not publicly funded.

The surgical procedure is normally carried out under local anaesthesia by an ophthalmologist. Excess skin and underlying fat is usually removed from the upper eyelid by means of laser or radiofrequency surgery. The wound is then sutured. The national priority guide for eye diseases entitles patients to prioritised healthcare for droopy eyelids that have a significant effect on a patient's vision and/or field of vision. There are no national guidelines in this area.

Sample

Droopy eyelid surgery is defined by a primary or secondary diagnosis (ICD-10) of H02.3 in combination with procedure codes (NCSP) CBB10 or CBB20 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis code applies in combination with tariff code K01d or K01e.

Findings

On average, just over 7,300 surgical procedures for droopy eyelids were performed each year at public hospitals or by private treatment providers with public reimbursement each year. The number of procedures per year has remained relatively stable throughout the period.

Table 10: Droopy eyelid surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	2,089	42	1,715	34	1,876	36	1,893	37
Private	5,264	106	5,593	110	5,517	107	5,458	108
Total	7,353	147	7,308	144	7,393	144	7,351	145
Private (%)	72	72	77	77	75	75	74	74

Several hospital referral areas showed relatively high variation in the number of procedures from year to year. This applies particularly to the hospital referral areas of Nord-Trøndelag, Sørlandet, Helgelandssykehuset, Nordlandssykehuset and Møre og Romsdal. The ratio between the hospital referral areas with the highest (Nord-Trøndelag) and lowest (Førde) rates is 2.9. This means that the population of Nord-Trøndelag has 2.9 times as many procedures as Helse Førde health trust's population. The other hospital referral areas are relatively evenly distributed in the range between Helse Førde and Nord-Trøndelag.

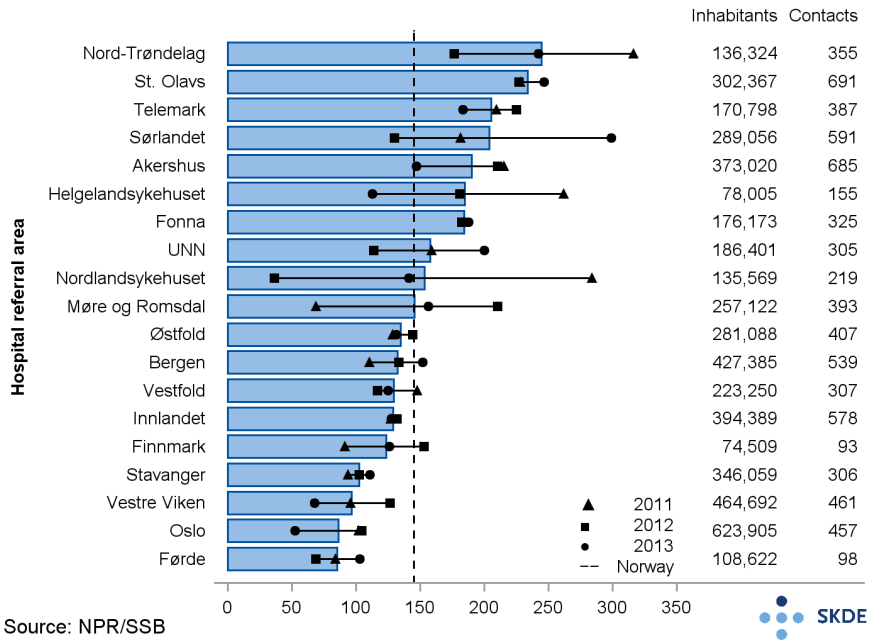

Figure 17: Droopy eyelid surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

In Norway as a whole, 74% of the procedures were performed by private treatment providers with public reimbursement. This treatment is usually carried out by ophthalmologists, who are established over most of Norway with agreements with the regional health authorities. The hospital referral areas with the highest proportion of procedures performed by private treatment providers were Akershus and St. Olavs, at 92%. The lowest usage rates for private services were found in the hospital referral areas of Telemark (26%) and Innlandet (33%).

Interpretation

Droopy eyelids is a condition that is probably evenly distributed in the population. The findings show that the service provision has varied considerably from year to year in some areas. There could be different reasons for this. The understanding of when droopy eyelids have a significant effect on vision and/or field of vision is probably not uniform, neither among those who assess the need for surgery nor among patients. The annual variation may be the result of deliberate activity relating to long waiting lists. New

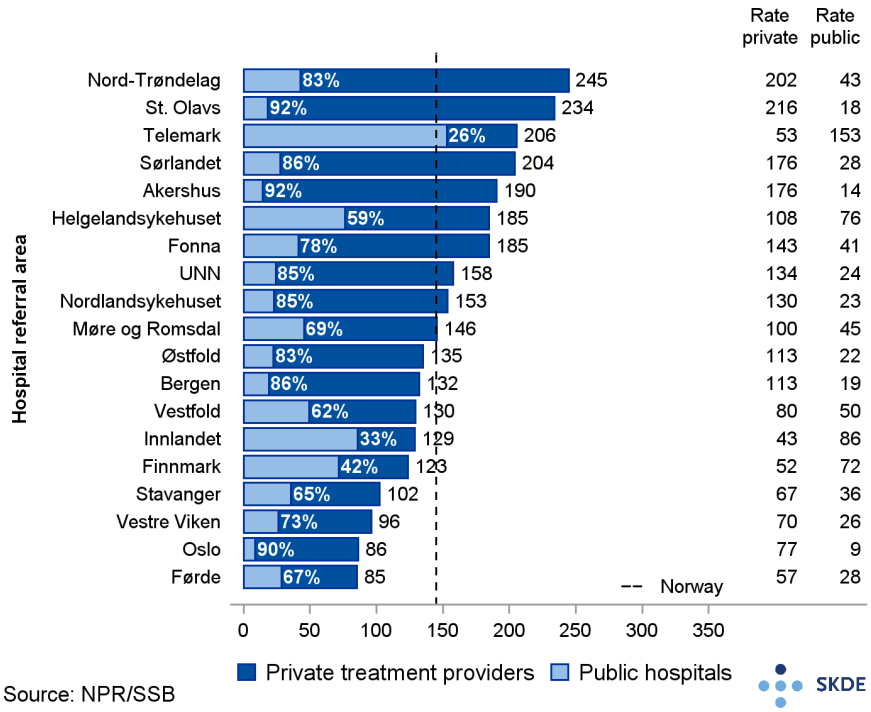

Figure 18: Droopy eyelid surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

service providers, or service providers discontinuing their services, may also have an effect. The observed variation of 2.9 between the top and bottom of the list is probably not random, and it seems reasonable to conclude that the provision of this procedure is not equitably distributed in the population.

2.10 Inguinal hernia

An inguinal hernia is a protrusion in the groin area where internal structures can bulge through a weak point in the abdominal wall. Symptoms such as burning and discomfort may sometimes start some time before the hernia becomes visible. A heavy sensation is also common. Inguinal hernias are more common in men.

Virtually all planned first-time inguinal hernia repairs performed on young people and adults are carried out as under local anaesthesia, either as open surgery or keyhole surgery. Children's hernias are often repaired by open surgery under light general anaesthesia. According to the national priority guide for gastroenterological surgery, adult inguinal hernia patients are normally not entitled to prioritised healthcare. Children and young adults are entitled to prioritised healthcare under the prioritisation guide for paediatric surgery.

Sample

Inguinal hernia surgery is defined by a primary or secondary diagnosis (ICD-10) in code block K40 in combination with procedure codes (NCSP) JAB00, JAB10, JAB11 or JAB30 for hospitals with activity-based funding. For specialists in private practice under public funding contracts, the same diagnosis codes apply in combination with tariff code 140e.

Findings

An average of about 6,300 inguinal hernia surgeries were performed each year in the period, with a certain increase in the last two years. Most such procedures are carried out by the public health system (95%). St. Olavs hospital referral area is an exception to this rule, with 26% of procedures performed by private service providers.

Table 11: Inguinal hernia surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	5,874	118	6,123	121	6,102	118	6,033	119
Private	229	5	310	6	371	7	303	6
Total	6,103	122	6,433	127	6,473	125	6,336	125
Private (%)	4	4	5	5	6	6	5	5

The surgery rates are highly stable from year to year, and for most hospital referral areas, the variation between years overlap with the national average for the period. The ratio between the areas with the highest and lowest rates is 1.2.

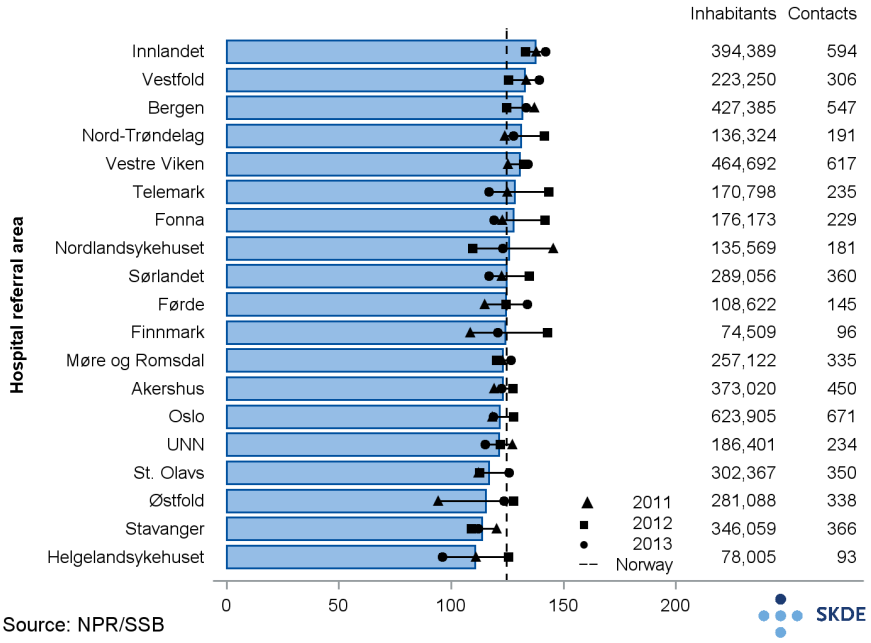

Figure 19: Inguinal hernia surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

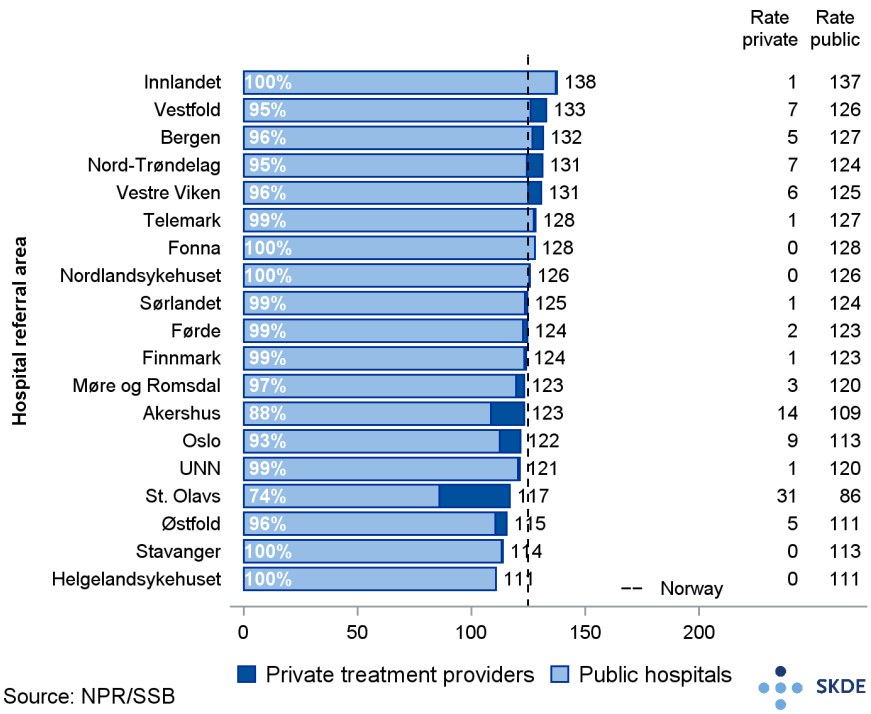

Figure 20: Inguinal hernia surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Interpretation

The use of inguinal hernia repairs is very evenly distributed in the Norwegian population, with near-equitable distribution of the service. It is a relatively frequently performed procedure, which reflects the fact that inguinal hernia is a fairly common condition in the population.

It is not clear what causes the low variation. One potential explanation is that inguinal hernias are reasonably easy to identify and that the indications for surgery are relatively clear.

2.11 Varicose veins

Varicose veins (varices) in the legs become more common with age. The condition is generally considered harmless, but may in rare cases be associated with serious complications. Varicose veins appear as twisted and bulging superficial veins, often located on the inside of the calf or thigh. Many find varicose veins cosmetically embarrassing, and they may cause concern.

Patients often experience vague discomfort, a heavy sensation, but in more severe cases symptoms may include swelling, pain and skin changes in the form of leg ulcers. Ultrasound examination can detect abnormal blood flow caused by poor venous valve function.

Varicose veins are classified by size, swelling, skin changes and leg ulcers. They are often divided into primary varicose veins, caused by weakening of the vein valves of superficial or tributary veins without underlying disease, and secondary varicose veins, which are caused by a known underlying condition.

Mild symptoms are treated with compression stockings, while patients with more serious problems or cosmetically unsightly varicose veins can have them removed.

Surgical removal of superficial veins (stripping) has been the preferred form of treatment, but is gradually being replaced by laser or radiofrequency treatment under local anaesthesia that collapses and seals the vein using heat. This procedure produces better results and fewer complications, but there is limited documentation of its long-time effectiveness and recurrence rates (Bos et al. 2009). A form of treatment whereby a local irritant is injected into the veins to close them (sclerotherapy) is used to some extent to treat small varicose veins and scars from previous surgery.

There are no national guidelines in this area. According to the national prioritisation guide for vascular surgery, adult varicose vein patients are normally not entitled to prioritised healthcare. It is nevertheless recommended that individual assessment should be made of patients with pronounced symptoms (oedema, incipient leg ulcer or leg ulcers).

Sample

Varicose vein surgery is defined by a primary or secondary diagnosis (ICD-10) in code block I83 or I87.2, in combination with procedure codes (NCSP) PHB10, PHB11, PHB12, PHD10, PHD11, PHD15, PHD99, PHV10, PHV12 or PHV99 for hospitals with activity-based funding, and the same diagnosis codes in combination with tariff code 145b for specialists in private practice under public funding contracts.

Findings

Nearly 6,400 such procedures were performed in Norway each year, with the highest number in 2013. The average for the period was about 14% of the procedures being

performed by private treatment providers. However, the proportion increased from 12% in 2011 and 2012 to 18% in 2013.

Table 12: Varicose vein surgery, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	5,481	110	5,335	106	5,605	110	5,474	108
Private	764	15	752	15	1,198	23	905	18
Total	6,245	125	6,087	121	6,803	133	6,378	126
Private (%)	12	12	12	12	18	18	14	14

There is relatively high variation in the frequency of varicose vein surgery between the populations of the different hospital referral areas. People living in the Bergen area, which had the highest usage rate, had 2.5 times more varicose vein surgeries than people living in Finnmark, which had the lowest usage rate. There was relatively high variation between the rates for different years of the period for most of the areas. However, the three hospital referral areas with the highest and the four areas with the lowest usage rates have rates above or below the national average, respectively, for all the years.

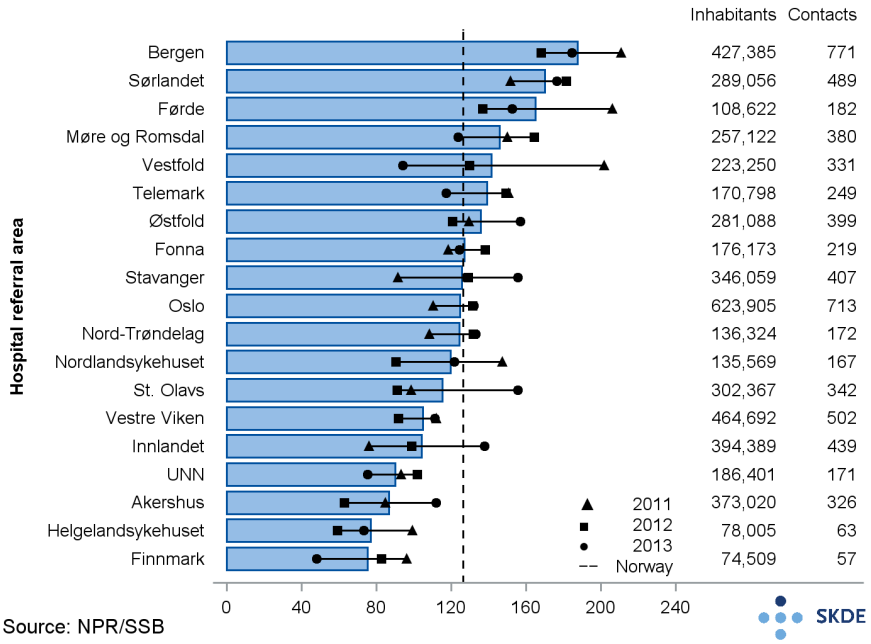

Figure 21: Varicose vein surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

For the hospital referral areas of Nord-Trøndelag, St. Olavs and Bergen, the proportion performed by private treatment providers is significantly higher than the national average, and the figure for St. Olavs is 63%. The lowest proportions of private treatment are found in the areas of Sørlandet (0%) and Finnmark (2%).

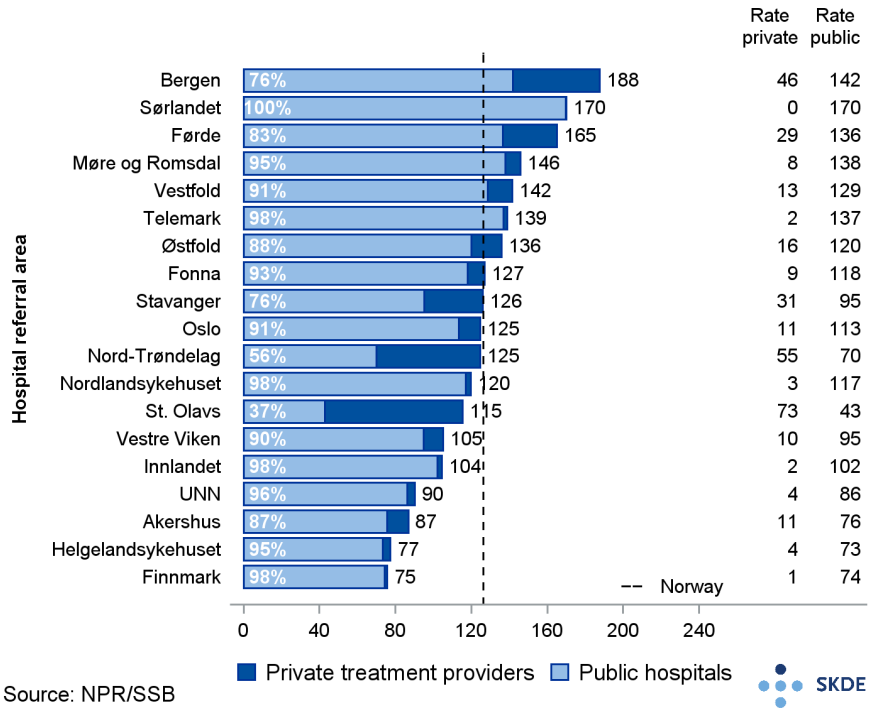

Figure 22: Varicose vein surgery, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Interpretation

There is relatively high variation between hospital referral areas, but also relatively big differences between from year to year for many of the areas. People's needs and wishes as regards varicose vein surgery probably vary considerably. Some feel the need to have cosmetically unsightly varicose veins on their thighs and calves removed, while for others, varicose veins can cause complicated leg ulcers that do not heal despite optimal care. It is nevertheless unlikely that the severity of varicose veins is unequally distributed in the population. It is more likely that the indications used differ, and that the service is not equitably distributed in the population.

2.12 Haemorrhoids

Haemorrhoids are protrusions in the anal canal consisting of swollen veins and surrounding connecting tissue. We distinguish between internal (true) and external (perianal) haemorrhoids. Internal haemorrhoids are covered in mucus membrane and have no pain receptors, while external haemorrhoids are covered in skin and have pain receptors. Internal haemorrhoids are classified into four degrees according to how much they protrude (prolapse) into the anal canal and become visible. First-degree haemorrhoids do not prolapse and are not visible, while fourth-degree haemorrhoids prolapse and cannot be moved back into the anal canal. Haemorrhoids is a relatively common condition that affects about one third of the adult population (Norwegian Electronic Medical Handbook, NEL).

Constipation, diarrhoea, standing up for long periods of time, pregnancy and hard physical work predispose people to this condition. First-degree haemorrhoids are treated with medication (creams and suppositories), while rubber band ligation is the common treatment for second-degree haemorrhoids. In recent years, third-degree and some second-degree cases have been treated with the technique known as HAL-RAR (Haemorrhoidal Artery Ligation and Recto-Anal Repair). The blood vessel that supplies the haemorrhoid is identified by means of an ultrasound probe. The vessel is tied off, and the haemorrhoid shrivels. This treatment is virtually pain-free, but unfortunately the haemorrhoids tend to recur. Tying off the veins, removing the swollen veins and leaving the wound open at the end of the procedure, the Milligan Morgan technique, produces a better long-term result with a lower recurrence rate. However, this technique is uncomfortable and sometimes painful for the patient for one to two weeks after surgery. It is most commonly used for fourth-degree, and sometimes third-degree, cases.

Haemorrhoid problems are not mentioned in the prioritisation guides, and there are no national guidelines.

Sample

Until and including 2012, ICD-10 classified haemorrhoids as a diagnosis under the category diseases of the circulatory system. The code was I84 with a fourth digit, I84.0–I84.9. From 2013, haemorrhoids were classified as a disease of the digestive system and given the code K64 with a fourth digit, K64.0–K64.9. The sample is defined by these diagnoses in combination with NCSP procedure codes JHA00, JHA20, JHA30, JHB00, JHB10, JHB30 or JHB96 for hospitals with activity-based funding, and these diagnoses in combination with tariff code 140l for specialists in private practice under public funding contracts. The most commonly used procedures are JHB00, JHB30 and JHB96.

Findings

On average, just over 8,300 surgical procedures for haemorrhoids were performed each year at public hospitals or by private treatment providers with public reimbursement. The number of procedures per year has remained relatively constant throughout the period. There was a slight increase in rubber band ligations, and a slight decrease in haemorrhoidectomies. The latter is practically never performed by private treatment providers.

Table 13: Haemorrhoid operations, number of procedures and age and gender adjusted rates per 100,000 population, divided into public hospitals and private treatment providers, per year and as an average for the period 2011–2013.

	2011		2012		2013		Aver. 2011–2013	
	Procedures	Rate	Procedures	Rate	Procedures	Rate	Procedures	Rate
Public	8,206	165	8,379	166	8,302	162	8,296	164
Private	6	0	34	1	48	1	29	1
Total	8,212	165	8,413	166	8,350	163	8,325	165
Private (%)	0	0	0	0	1	1	0	0

Most hospital referral areas showed relatively little variation in the number of procedures per year in the period 2011–2013. Innlandet and St. Olavs hospital referral areas have seen a steady increase, while the figures for UNN and Akershus have decreased steadily over the three-year period. Innlandet hospital referral area has a markedly higher usage rate for haemorrhoid surgery than the rest of Norway. Usage rates are also high in the northern and south-western parts of Norway. The ratio between the rates for the hospital referral areas with the highest (Innlandet) and lowest (Nord-Trøndelag) rates is approx. 3.7, while the ratio between the second highest (Finnmark) and second lowest rates is 2.6. This means that the population of Innlandet has 3.7 times as many procedures as the population of Nord-Trøndelag, and the population of Finnmark has 2.6 times more. The other hospital referral areas' rates are relatively evenly distributed in the range between Finnmark and Nord-Trøndelag.

On closer analysis, it was found that Innlandet hospital referral area's high usage rate may be due to the fact that rubber band ligation is used much more in Innlandet hospital trust than in the rest of the country. The same patients receive more treatments per year here than in other hospital referral areas.

Nearly all haemorrhoid operations performed in Norway in the period 2011–2013 took place at public hospitals.

Interpretation

Haemorrhoids are probably a condition that is evenly distributed in the Norwegian population. The use of surgical procedures for this condition is very unequally distributed, however. Innlandet hospital trust's referral area in particular stands out with the highest usage rate. If this area is excluded, the variation between the second highest and lowest usage rates is still 2.6. There are no national guidelines, and the condition does not

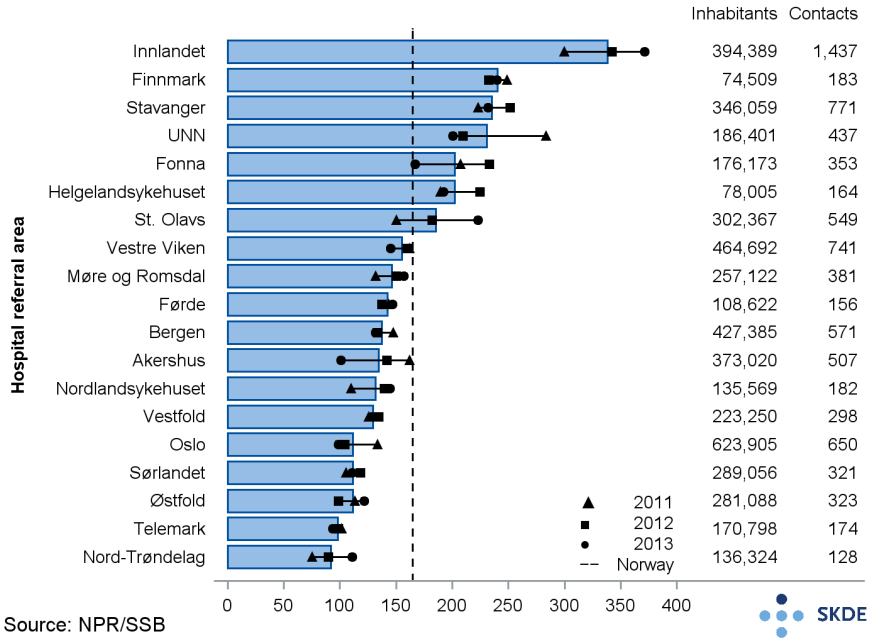

Figure 23: Haemorrhoid operations, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

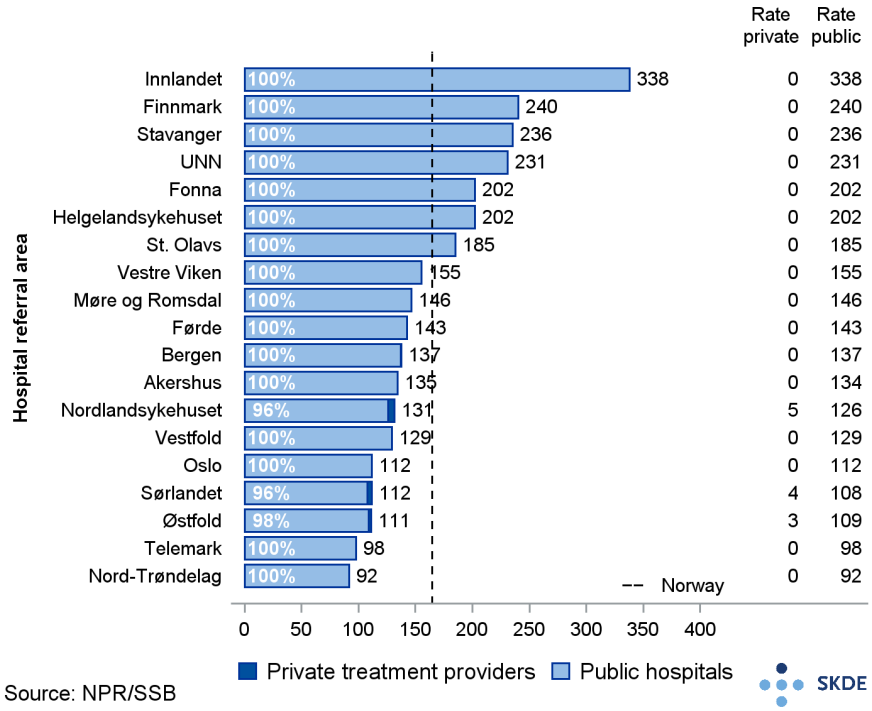

Figure 24: Haemorrhoid operations, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

entitle patients to prioritised health care. Perceptions of the severity of the condition and the patients' own perception of how troublesome it is probably differ. Differences in capacity can also be a contributory cause of the variation observed. However, there

is reason to conclude that the provision of this health service is not equitably distributed in the population.

2.13 Day surgery – all procedures

The total rates for all twelve day surgery procedures show that the population of Møre og Romsdal has the highest usage rate and the population of Oslo the lowest. The ratio is 1.56, which means that the population of Møre og Romsdal uses 56% more day surgery services than that of the population of Oslo.

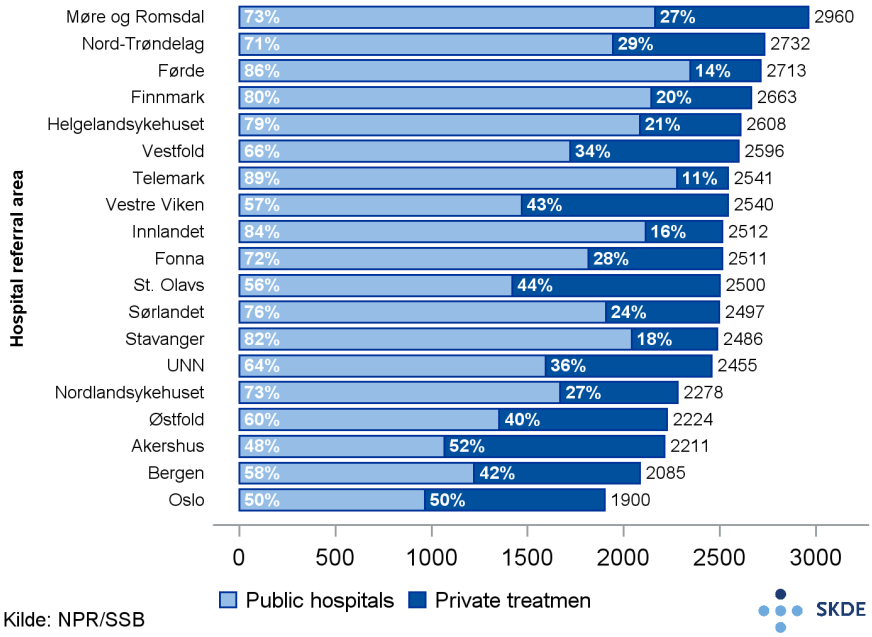

Figure 25: Total rate for all twelve selected day surgery procedures, rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

Age-related cataracts dominate the overall picture with its high figures, and when we look at the overall rates excluding this procedure, the population of Møre og Romsdal still has the highest usage rate and the population of Oslo the lowest. The resulting ratio is 1.77, which means that the usage rate in Møre og Romsdal is 77% higher than in Oslo. When all the procedures are considered together, the number is so high that the element of random variation is probably minimal. The variation therefore indicates that the Norwegian population does not have equitable access to the selected day surgery services.

The proportion of procedures performed by private service providers varies greatly between hospital referral areas. For all twelve procedures together, the proportion varies from 11% in Telemark to 52% in Akershus. If we exclude cataract surgery, Telemark and Akershus still represent the extremes, with 6% and 45%, respectively.

As expected, the highest proportions of privately performed procedures are found in central hospital referral areas with big municipalities, and since this analysis does not include information about wholly private use of health services, i.e. procedures that are paid for in their entirety by the patients themselves, there is reason to believe that this tendency is even more pronounced than shown in this report.

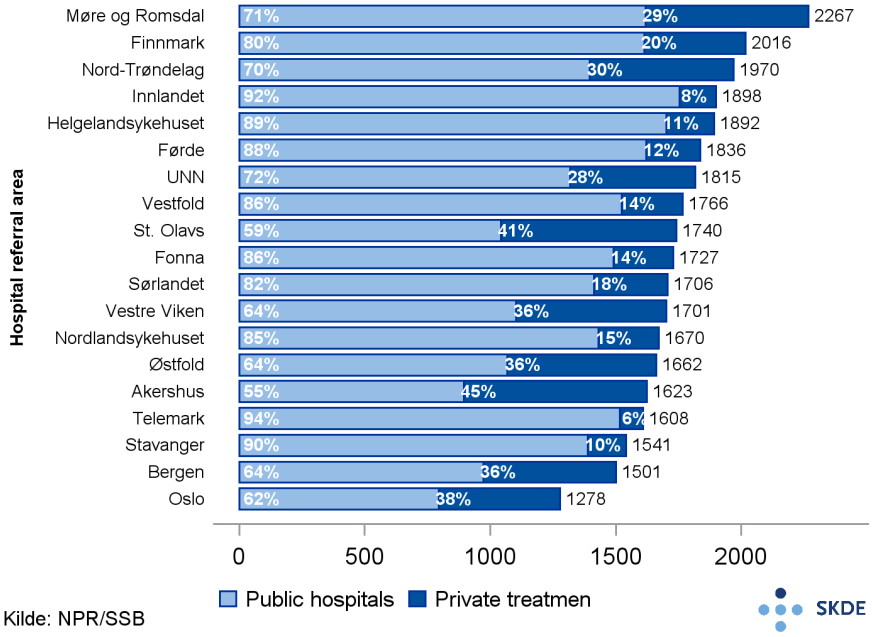

Figure 26: Total rate for eleven selected day surgery procedures (excluding cataract surgery), rates adjusted for gender and age per 100,000 population per hospital referral area, per year and as an average for the period 2011–2013.

We find no connection between the total use of health services and the proportion of private services in the 19 hospital referral areas, neither for all the procedures together nor for each individual procedure. This means that public funding of private treatment services does not result in an increase in total use of health services.

Overall, there is a statistical connection between the public and private treatment rates whereby areas with a high public treatment rate tend to have a low private treatment rate and vice versa. This applies to the following procedures in particular[5]: carpal tunnel syndrome, hand surgery, age-related cataracts, tonsillectomy and droopy eyelids. This may indicate that there is a certain division of work between public and private treatment providers for these procedures.

[5]With significant negative correlation coefficients.

Chapter 3

Data, samples, method and definitions

3.1 Data

SKDE holds a licence from the Norwegian Data Protection Authority and has been granted dispensation from the duty of confidentiality to analyse data unique to individuals from the Norwegian Patient Registry (NPR) for the period 2008–2013. Due to administrative changes such as changes to the code system, data will not be directly comparable over long periods. This atlas is therefore based on data for the period 2011–2013. Data are structured as hospital stays[6]. The choice of a three-year period produces more stable estimates of usage rates for the period and makes it possible to illustrate variation between years, especially for less frequently performed procedures.

Data received from the Norwegian Patient Registry has been subject to quality control by the registry following reporting from the institutions. SKDE carries out some further adaptation before conducting analyses. This adaptation involves re-coding invalid values on the basis of logical checks and establishing a number of derived variables.

Disclaimer

Data from the Norwegian Patient Register has been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Norwegian Patient Register is intended nor should be inferred.

[6]Most contacts with the specialist health service concerns a single department, but sometimes patients are treated by different departments during a hospital stay. When data are structured as hospital stays, contact with several departments for one person in the same period of time are merged into one hospital stay, which may mean that some medical information could be lost. The loss of information for the day surgery procedures concerned has been examined and found to be minimal. Since SKDE only has department-level data for 2012 and 2013, we chose to structure the data on the basis of hospital stays.

3.2 Sample

This analysis deals with patient groups that in Norway are normally treated as day surgery patients. It is nevertheless the case that a patient group that one institution treats as day patients can receive exactly the same treatment as inpatients or outpatients at another institution. Therefore, no requirements regarding patient administrative care level were set for the analysis, which means that the analyses also include procedures performed on inpatients and as outpatient treatment[7]. Some day surgery procedures with large volumes were excluded from the analysis from the outset. This applies to procedures relating to diseases of the female genitalia and diseases during pregnancy, childbirth and the puerperium, as well as orthopaedic procedures to remove fixation devices (osteosynthesis devices). The twelve most commonly performed day surgery procedures/conditions in Norway in the period 2011–2013 were selected on the basis of clinical judgement and volume. The sample includes half of all such procedures.

Each of the twelve procedures were defined using diagnosis codes and procedure codes. The codes were selected following discussion with specialists in the relevant fields.

In addition to treatment at hospitals with activity-based funding, these patient groups can also be treated by specialists in private practice under public funding contracts. They are usually paid in accordance with general and specific tariff codes from *Normaltariff for avtalespesialister* (The Norwegian Medical Association's normal tariff for specialists in private practice under public funding contracts). The combination of specific tariff codes from the normal tariff and the fact that the treatment was provided by a specialist in private practice under a public funding contract will identify these procedures as performed by private healthcare providers with public reimbursement. Patients who are treated by specialists in private practice and pay the full cost of the treatment themselves, are not reported to NPR and are therefore not included in our sample.

The specific codes selected for the identification of each patient group are stated under the section on each of the different procedures.

3.3 Method

Since we want to compare the use of health services in geographical areas of different sizes and with different age compositions, we use rates adjusted for gender and age. The rates have been adjusted using the direct method, with the national population composition in to genders and five age groups[8] in 2011 as the reference population. The gender-adjusted and age-adjusted rates for the population areas will then be the rates that the area would have had if the composition of its population were identical to that of the country as a whole, given the actual distribution of rates in each gender and age group in the different geographical areas.

[7] For information about care level breakdown, see Appendix D.

[8] The age groups are defined in such a way that there is about the same number of events/procedures in each age group. The age group division will consequently vary between procedures.

Table 14: Selected day surgery patient groups treated by the Norwegian specialist health service and specialists in private practice under public funding contracts. Number of procedures, number of persons receiving treatment and number of procedures per person, for the years 2011, 2012 and 2013, are shown

	2011			2012			2013		
	Proc.	Pers.	$\frac{\text{Proc.}}{\text{Pers.}}$	Proc.	Pers.	$\frac{\text{Proc.}}{\text{Pers.}}$	Proc.	Pers.	$\frac{\text{Proc.}}{\text{Pers.}}$
Shoulder surgery (acromion resection)	6,914	6,743	1.03	6,681	6,510	1.03	8,071	7,847	1.03
Meniscus surgery	12,797	12,440	1.03	12,288	11,954	1.03	14,492	14,068	1.03
Surgery, hallux valgus and hammer toe	4,855	4,653	1.04	4,586	4,414	1.04	5,101	4,916	1.04
Selected hand surgery	3,550	3,423	1.04	3,536	3,425	1.03	3,832	3,684	1.04
Carpal tunnel syndrome surgery	6,567	5,854	1.12	6,192	5,548	1.12	6,964	6,207	1.12
Tonsillectomy	13,761	13,612	1.01	13,286	13,115	1.01	14,358	14,166	1.01
Aural ventilation tube	7,400	6,954	1.06	7,489	7,104	1.05	7,562	7,187	1.05
Cataract surgery	35,541	24,676	1.44	34,832	24,190	1.44	37,876	26,308	1.44
Droopy eyelid surgery	7,353	7,217	1.02	7,308	7,142	1.02	7,393	7,268	1.02
Inguinal hernia surgery	6,103	5,977	1.02	6,433	6,298	1.02	6,473	6,353	1.02
Varicose vein surgery	6,245	5,756	1.08	6,087	5,592	1.09	6,803	6,270	1.09
Haemorrhoid operations	8,212	7,003	1.17	8,413	7,201	1.17	8,350	6,931	1.20
Total	119,298	100,518	1.19	117,131	98,755	1.19	127,275	107,167	1.19

The rates' confidence intervals are calculated by assuming a normal distribution of events with a given average and variance. If the underlying data are Poisson/binomially distributed and we have a sufficiently big n ($n > 5$) in each gender and age group in each hospital referral area, it is a good approach to assume normal distribution (Lövkvist 1997).

3.4 Definitions

Population areas/hospital referral areas are defined by municipality on the basis of the patients' address and the health trusts' areas of responsibility/catchment areas. We have taken as our point of departure the division used in the Samdata report for 2013 (Huseby et al. 2014). However, we lack information about city districts in Oslo in our data set. Hospital referral areas are defined on the basis of municipalities, but the catchment areas of Akershus health trust and the areas of OUS, Lovisenberg and Diakonhjemmet Hospital's area deviate from this rule. In the Samdata definition, the city districts Grorud, Stovner and Alna form part of Akershus health trust's catchment area, while we have included them in Oslo hospital referral area. The city districts that make up the Lovisenberg area and Diakonhjemmet Hospital's area are here included in Oslo hospital referral area. The hospital referral areas are all defined in Appendix B. Short versions of the names of the hospital referral areas are used in the report, in the fact sheets and in the atlas. The table below shows the hospital referral areas and their short names.

Surgical procedures are defined on the basis of combinations of procedure codes (NCMP, NCSP), diagnosis codes (ICD-10) and tariff codes (*Normaltariff for privat spesialistpraksis*, The Norwegian Medical Association's normal tariff for specialists in private practice). The basis for the choice of code combinations was established by reviewing the coding practice in NPR and consulting specialists from both the private and public sector. The names, specialities and workplace of the specialists consulted are listed in Appendix 3.

Table 15: The hospital referral areas and their short names

Hospital referral areas	Short name
Finnmark Health Trust	Finnmark
University Hospital of North Norway Health Trust	UNN
Nordland Health Trust	Nordlandsykehuset
Helgeland Health Trust	Helgelandsykehuset
Nord-Trøndelag Health Trust	Nord-Trøndelag
St. Olavs hospital Health Trust	St. Olavs
Møre og Romsdal Health Trust	Møre og Romsdal
Førde Health Trust	Førde
Bergen Health Trust	Bergen
Fonna Health Trust	Fonna
Stavanger Health Trust	Stavanger
Østfold Health Trust	Østfold
Akershus Health Trust	Akershus
Oslo University Hospital Health Trust	Oslo
Innlandet Health Trust	Innlandet
Vestre Viken Health Trust	Vestre Viken
Vestfold Health Trust	Vestfold
Telemark Health Trust	Telemark
Sørlandet Health Trust	Sørlandet

In this report, **private treatment provider** is defined as all private hospitals with activity-based funding and all specialists in private practice under public funding contracts who provide treatment on behalf of one or more of the regional health authorities.

It is important to note that treatment and procedures performed outside contracts with the regional health authorities (performed by private hospitals and specialists in private practice and paid for in full by the patient) are not included in the figures we present.

Chapter 4

Discussion

4.1 Main findings

The present analysis of the most common day surgery procedures in Norway in a three-year period covers a total of 360,000 procedures performed during the period, about 120,000 procedures on about 100,000 patients each year. The fact that the number of patients is almost as high as the number of procedures indicates that the material is comprised of 'one-off conditions', meaning conditions that a patient will usually only experience once. Day surgery in this analysis covers conditions that are usually treated with relatively simple surgical procedures without the patient being admitted to hospital.

For nine out of the twelve procedures, the variation in how much of this type of health services the populations of the areas studied receive is so great that it can hardly be explained by contrasts in prevalence of disease. In light of the national objective of equitable health services, this variation must therefore be characterised as unwarranted.

There is no clear pattern showing that the population of some hospital referral areas receive more or less of everything, but it is nevertheless the case that the population of Møre og Romsdal receive approx. 55% more of such health services than the population of the Oslo area, for example.

Overall, we find that areas with a high public treatment rate tend to have a low private treatment rate and vice versa. This is particularly true of surgery for carpal tunnel syndrome, hand surgery, tonsillectomies, and surgery for age-related cataracts and droopy eyelids. Whether this is the result of agreed or established division of work, or whether the demand is automatically divided between public and private treatment providers, is uncertain, but those who expect there to be a clear division of work whereby private services replace inadequate public service provision will struggle to find such a clear pattern in our analyses. The overall results rather indicate the need to plan the provision of day surgery services.

4.2 Method

Population-based analyses of health services depend on reliable basic data. Even though the present analysis covers the parts of the Norwegian Patient Registry that are generally considered most reliable, namely surgical procedure codes, we cannot by any means rule out the possibility of errors affecting the analyses. This is because the coding procedures for diagnoses and procedures vary between specialists, departments and institutions. The choice of codes on which we have based our selection could thus naturally have had a bearing on the results. We have tried to compensate for this potential source of error by consulting specialists in the different fields, often from more than one hospital. Several code selections have been corrected based on these consultations, but we still cannot rule out the possibility that we may have overlooked and excluded more unorthodox coding cultures. However, we do not believe that any errors that may occur in our samples represent a threat to the main findings and conclusions in this report.

A methodological challenge associated with this type of analysis is being able to estimate random variation and distinguish it from systematic variation. There are several different approaches to this problem, but no generally recognised and commonly used method exists. In this report, we have used discretionary assessment of the combination of the scale of variation between three-year rates for the population areas and internal variation in rates for individual years for the same areas. The remaining analytical tools used, together with the demographics-related adjustment methods, are simple standard methods that are unlikely to involve material sources of error.

4.3 Assessment of results

The findings in this report in the field of small area analysis are not very surprising. The classic analysis from 1982 (McPherson et al. 1982) of the use of seven common surgical procedures in New England, the West Midlands in England and counties in southern Norway, includes three of these procedures. In Norway, it found the least variation in hernia repairs, then haemorrhoidectomy, and the highest variation for tonsillectomy. This corresponds completely with the findings of the present report (when the rubber band ligation method for haemorrhoids in Innlandet hospital referral area is excluded). The ratio between the county with the highest and lowest rate for tonsillectomies was 4.7 in the previous study, while it is 2.31 in our material. The work from 1982 found no connection between the national levels for surgery rates and internal variation in the countries. This means that there was as much variation in countries with low rates, where it would be natural to assume that stricter and more consistent indications were applied, as in countries with high usage rates. These variations were attributed to contrasts in indications for surgery among experts and access to specialists, in other words: the supply. This is probably the most important explanation for the variation observed in our analyses, too. RightCare in England has identified variation of at least the same level as that observed in our analyses.

In the above-mentioned 1982 study, which included figures for Norway, the high/low

rate ratio for hernia repairs was 1.3, nearly identical to the corresponding figure in our analysis. The reason why hernia repairs have by far the most equitable distribution is not intuitively obvious, as we have no national guidelines in this area either. The reason could be that inguinal hernia is a condition that is reasonably easy to identify and should be repaired surgically in children, and, if the condition is symptomatic, also in adult patients. There is also more or less general agreement on the surgical technique.

Seen in isolation, analyses of variation in health services say nothing about the optimal level for a certain supply and use of health services. The optimal level can only be identified by controlled studies or prospective studies, known as outcome studies. Therefore, analyses alone cannot be used to identify over- or underuse of services. If they are used in combination with other sources of information, however, indications of what would be the correct level can be identified. Not least, identifying major contrasts in practice and use of health services will be useful background information for reviews of medical practice in relation to established knowledge and evidence-based guidelines.

The absence of medical guidelines will usually be an important reason for variation. We have not been able to identify national guidelines for any of the procedures covered by this analysis. However, guidelines are available for several of the procedures at the international level, for example BMJ Best Practice[9] and NICE[10], both available to Norwegian professionals via the Norwegian Electronic Health Library.

Identifying variation can also be a useful tool in prioritisation work. Although contrasts in supply and use of health services do not directly say anything about the optimal service level, national averages can serve as a useful measurement in the work to promote equity in healthcare. The areas with the lowest usage rates can provide an indication of what service level a population appears to manage with, even though this cannot automatically be assumed to be the optimal level. In areas with usage rates that deviate significantly from the national average, the individual specialist communities should consider their own practice and prioritisation in relation to the assumed needs of the population.

Factors in the discussion about the significance of identified variation and potential over-, under- or incorrect treatment are not only linked to questions of resources and distribution, but also to quality issues. This means that there may be quality failures associated both with harming patients by providing treatment that is not associated with a probable health gain, and inflicting loss of health by failing to provide treatment that the patient would probably have benefitted from.

4.4 Practical consequences of the variation identified

Analyses of the type presented in this report are virtually worthless if they are not followed up in practice. This follow-up is a responsibility that first and foremost rests with healthcare professionals, discipline managers, professional networks and other health

[9] http://bestpractice.bmj.com/best-practice/welcome.html
[10] http://www.evidence.nhs.uk/

sector management. The preparation of medical guidelines to minimise variation and raise quality would be a natural next step. The identification of inequity in the supply of health services is a health policy challenge, at the same time as it highlights the need for rational planning of services, prioritisation and management through professional and health policy instruments.

4.5 The way forward

The Northern Norway Regional Health Authority and SKDE, together with the Western Norway Regional Health Authority and the Norwegian Directorate of Health, have been tasked with further developing the work on a national healthcare atlas based on, among other things, the pilot version launched here. We take this as a sign that the atlas and this report form a useful and practical tool in the efforts to improve the health service. In the time ahead, we will therefore expand the atlas with other analyses of health services and patient groups as far as access to data, basic data and our capacity will allow. A healthcare atlas has its strengths and weaknesses, but will be a powerful aid in the development of the health service. As RightCare says on its website:

> *"A good map is worth a thousand words, cartographers say, and they are right: because it produces a thousand words: it raises doubts, ideas. It poses new questions, and forces you to look for new answers."*
>
> Franco Moretti (1998)
> *Atlas of the European Novel 1800–1900*

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Norwegian Electronic Medical Handbook (NEL) has been used as a guide in the description of some of the procedures.

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Prioritisation guides

The national prioritisation guide in orthopaedics. URL: https://helsedirektoratet.no/retningslinjer/ortopedi.pdf.

The national priority guide for ear, nose and throat diseases, head and throat surgery. URL: https://helsedirektoratet.no/Retningslinjer/%C3%98re-nese-halssykdommer,%20hode-%20og%20halskirurgi.pdf.

The national priority guide for eye diseases. URL: https://helsedirektoratet.no/Retningslinjer/%C3%98yesykdommer.pdf.

The national priority guide for gastroenterological surgery. URL: https://helsedirektoratet.no/Retningslinjer/Gastroenterologisk%20kirurgi.pdf.

The national prioritisation guide for paediatric surgery. URL: https://helsedirektoratet.no/Retningslinjer/Barnekirurgi.pdf.

The national prioritisation guide for vascular surgery. URL: https://helsedirektoratet.no/Retningslinjer/Karkirurgi.pdf.

Appendices

Appendix A

Some things you should know about communicating statistics using maps

A map is a powerful communication tool that provides an intuitive and simplified picture of a set of figures. However, maps can also be seductive and highly misleading, and it is important for readers to be aware of some fundamental aspects. When choosing a cartographic form of expression, there are several choices to make that entail advantages as well as disadvantages. The most commonly used cartographic presentation is known as the choropleth map. In such maps, each area (the interactive atlas uses health trust areas) are assigned a shade of colour depending on which class the data value falls within. The advantage of this is that it is easy to identify the areas described, while the disadvantage is that large health trust areas will be visually dominant, while smaller areas get far less attention.

Classification is another factor that one should be aware of when interpreting maps. All the variables presented are in principle continuous variables (rates are at interval/ratio level). In order to present this in a meaningful form on a map, this information must be simplified - we need to classify (group) the information. It is an unfortunate effect of such generalisation that it may hide big differences between data values in the data set and/or emphasise minor differences between variable values on the map. In order to counteract this, the method known as Jenks natural breaks has been chosen for the interactive atlas, and four classes are used. This classification method uses an algorithm to maximise homogeneity within each class as well as heterogeneity between classes. It is recommended that maps produced using this method be supplemented by a frequency histogram where users can find the 'thresholds' in the distribution of data observations. The interactive atlas includes such a frequency histogram (bar chart) that is intended to be used alongside the map to interpret the variations observed.

Maps are intended to provide a simplified picture of reality, but maps are also produced on the basis of a number of subjective choices. These choices have a bearing on other people's perception of reality. Just as with figures and statistics, one should take a critical approach when interpreting maps. Therefore, be aware of the rhetorical possibilities of the map.

Appendix B

Definition of the Hospital referral areas

Hospital referral areas	Short name	Municipalities
Finnmark Health Trust	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
University Hospital of North Norway Health Trust	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 Health Trust	Nordlandsykehuset	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 Health Trust	Helgelandsykehuset	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
Nord-Trøndelag Health Trust	Nord-Trøndelag	1632 Roan 1633 Osen 1702 Steinkjer 1703 Namsos 1711 Meråker 1714 Stjørdal 1717 Frosta 1718 Leksvik 1719 Levanger 1721 Verdal 1724 Verran 1725 Namdalseid 1736 Snåsa 1738 Lierne 1739 Røyrvik 1740 Namsskogan 1742 Grong 1743 Høylandet 1744 Overhalla 1748 Fosnes 1749 Flatanger 1750 Vikna 1751 Nærøy 1755 Leka 1756 Inderøy
St. Olavs hospital Health Trust	St. Olavs	1567 Rindal 1601 Trondheim 1612 Hemne 1613 Snillfjord 1617 Hitra 1620 Frøya 1621 Ørland 1622 Agdenes

		1624 Rissa
		1627 Bjugn
		1630 Åfjord
		1634 Oppdal
		1635 Rennebu
		1636 Meldal
		1638 Orkdal
		1640 Røros
		1644 Holtålen
		1648 Midtre Gauldal
		1653 Melhus
		1657 Skaun
		1662 Klæbu
		1663 Malvik
		1664 Selbu
		1665 Tydal
Møre og Romsdal Health Trust	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 Health Trust	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 Health Trust	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 Health Trust	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 Health Trust	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

Østfold Health Trust	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 Health Trust	Akershus	0121 Rømskog 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 0211 Vestby 0213 Ski 0214 Ås 0215 Frogn 0216 Nesodden 0217 Oppegård
Oslo University Hospital Health Trust (has defined Oslo as catchment area, but this is not entirely correct. See page 59)	Oslo	0301 Oslo
Innlandet Health Trust	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 Health Trust	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 Health Trust	Vestfold	0701 Horten 0702 Holmestrand 0704 Tønsberg 0706 Sandefjord 0709 Larvik 0714 Hof 0716 Re 0719 Andebu 0720 Stokke 0722 Nøtterøy 0723 Tjøme 0728 Lardal
Telemark Health Trust	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 Health Trust	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 C

Consulted specialists

The following specialists has been consulted regarding defining patient samples

Trond Ellingsen, Senior Consultant, specialist in gastroenterological surgery, University Hospital of North Norway

Øyvind Irtun, Senior Consultant, specialist in gastroenterological surgery, University Hospital of North Norway

Stig Kåre Hegna, specialist in orthopedic surgery, University Hospital of North Norway

Hebe Kvernmo, Senior Consultant, specialist in orthopedic surgery, University Hospital of North Norway

Gunnar Knutsen, Senior Consultant, specialist in orthopedic surgery, University Hospital of North Norway

Khaled Meknas, Senior Consultant, specialist in orthopedic surgery, University Hospital of North Norway

Henrik Sandbu, Assistant Director, specialist in general and orthopedic surgery, Central Norway Regional Health Authority

Jens Ivar Brox, Senior Consultant, specialist in physical medicine and rehabilitation, Oslo University Hospital

Solveig Nilsson Fossan, Senior Consultant, specialist in ear, nose, and throat diseases, Finnmark Hospital Trust

Hans Johan Breidablikk, Medical Director, specialist in ear, nose, and throat diseases, Helse Førde Health Trust

Siv Annick Grønlie, Private Specialist, specialist in eye diseases, Øyelegesenteret Tromsø

Rolf Busund, Head of Hearth and Lung Department, specialist in vascular surgery, University Hospital of North Norway

Sven Martin Almdahl, Senior Consultant, specialist in vascular surgery, University Hospital of North Norway.

Appendix D

Procedures by administrative care level

Selected day surgery procedures by administrative care level for the period 2011–2013.

Procedure	Inpatient		Day patient		Day surgery		Outpatient		Private specialist		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Shoulder surgery (acromion resection)	3,657	16.9	1,935	8.9	16,074	74.2	0	0	0	0	21,666	100.0
Meniscus surgery	2,899	7.3	2,906	7.3	33,636	85.0	0	0	136	0.3	39,577	100.0
Surgery, hallux valgus and hammer toe	992	6.8	614	4.2	12,723	87.5	0	0	213	1.5	14,542	100.0
Selected hand surgery	175	1.6	416	3.8	9,130	83.6	0	0	1,197	11.0	10,918	100.0
Carpal tunnel syndrome surgery	379	1.9	585	3.0	18,363	93.1	0	0	396	2.0	19,723	100.0
Tonsillectomy	12,963	31.3	55	0.1	20,670	49.9	0	0	7,717	18.6	41,405	100.0
Aural ventilation tube	2,038	9.1	50	0.2	14,030	62.5	72	0.3	6,261	27.9	22,451	100.0
Cataract surgery	1,241	1.1	2,625	2.4	55,095	50.9	0	0	49,288	45.5	108,249	100.0
Droopy eyelid surgery	13	0.1	120	0.5	6,151	27.9	0	0	15,770	71.5	22,054	100.0
Inguinal hernia surgery	6,507	34.2	115	0.6	12,372	65.1	15	0.1	0	0	19,009	100.0
Varicose vein surgery	1,625	8.5	432	2.3	16,483	86.1	479	2.5	116	0.6	19,135	100.0
Haemorrhoid operations	2,168	8.7	19	0.1	8,269	33.1	14,435	57.8	84	0.3	24,975	100.0

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