Prevalence and incidence of epilepsy in the Nordic countries

BACKGROUND Updated knowledge on the prevalence of epilepsy is valuable for planning of health services to this large and complex patient group. Comprehensive epidemiological research on epilepsy has been undertaken, but because of variations in methodology, the results are difficult to compare. The objective of this article is to present evidence-based estimates of the prevalence and incidence of epilepsy in the Nordic countries.

METHOD The article is based on a search in PubMed with the search terms epilepsy and epidemiology, combined with each of the Nordic countries separately.

RESULTS Altogether 38 original articles reported incidence and/or prevalence rates of epilepsy in a Nordic country. Four studies had investigated the prevalence of active epilepsy in all age groups, with results ranging from 3.4 to 7.6 per 1 000 inhabitants. Only two studies had investigated the incidence of epilepsy in a prospective material that included all age groups. The reported incidence amounted to 33 and 34 per 100 000 person-years respectively. A prospective study that only included adults reported an incidence of 56 per 100 000 person-years.

INTERPRETATION We estimate that approximately 0.6 % of the population of the Nordic countries have active epilepsy, i.e. approximately 30 000 persons in Norway. Epilepsy is thus one of the most common neurological disorders. The incidence data are more uncertain, but we may reasonably assume that 30–60 new cases occur per 100 000 person-years.

Marte Syvertsen
marsyv@vestreviken.no
Jeanette Koht
Department of Neurology
Drammen Hospital

Karl O. Nakken
National Centre for Epilepsy
Oslo University Hospital

MAIN MESSAGE

Epidemiological research on epilepsy is fraught with a number of methodological weaknesses, indicating that results need to be interpreted with caution.

Estimates indicate that approximately 30 000 Norwegians undergo treatment for epilepsy or have suffered at least one epileptic seizure over the last 2–5 years.

Good studies of the incidence of epilepsy in the Nordic countries are scarce, but it is assumed that there are 30–60 new cases per 100 000 inhabitants per year.

Epilepsy is one of the most common neurological disorders and strikes people of all ages (1). An epilepsy diagnosis will often imply far more than recurring unprovoked epileptic seizures. The diagnosis may have an impact on the choice of education and profession, family, social contact and mental health (2, 3). As a result, this patient group has complex needs for health and social services. Updated knowledge on the prevalence of epilepsy is important for the planning of such programmes.

It has been estimated that 30 000–40 000 people in Norway have this diagnosis (4, 5), but this estimate is based on epidemiological studies conducted outside the Nordic countries. However, geographic and socioeconomic conditions may influence the prevalence of epilepsy (6, 7). Thus, epidemiological data must be extrapolated with caution. The Nordic countries are not only in geographical proximity to each other, they are also fairly similar in terms of their cultures, living standards and economies. We have therefore chosen to review these countries as one entity. A good overview of Nordic epidemiological studies of epilepsy has so far been unavailable. The objective of this article is to report what we currently consider to be the best estimates of incidence and prevalence rates for epilepsy in the Nordic countries.

Method

We have undertaken a review of original articles based on searches in PubMed up to and including 1 January 2015. We searched for the terms epilepsy and epidemiology with the aid of the Boolean operator AND in combination with each of the Nordic countries separately. The search returned 141 hits for Norway, 262 for Sweden, 199 for Finland (including the Åland Islands, for which there were no hits), 213 for Denmark (including six for Greenland and one for the Faroe Islands) and 29 for Iceland.

The search results were reviewed in light of the title and abstract. In total, we found 38 original articles in English, Norwegian or Danish in which prevalence and/or incidence rates were reported. We found no articles in Finnish, Icelandic or Swedish.

An additional search with the terms «epilepsy AND (incidence OR prevalence)» for each of the Nordic countries returned 163 hits for Norway, 296 for Sweden, 247 for Finland (including the Åland Islands), 243 for Denmark (including six for Greenland and one for the Faroe islands) and 30 for Iceland. The additional search did not identify any further relevant original articles. The search results were cross-checked against reference lists in key English-language review articles and commentaries (6–9).

Prevalence

Prevalence is defined as the proportion of individuals in a given population who have the diagnosis in question at a given point in time (the prevalence day). Prevalence is commonly reported as a percentage or thou-

Table 1 Original articles on prevalence of epilepsy in the Nordic countries. The studies are sorted by the age groups included and by whether the studies were restricted to patients suffering from active epilepsy

First author (reference)	Year	Country	Age (years)	Prevalence per 1 000	Only active epilepsy	Number of cases
Gudmundsson (10)	1966	Iceland	All	3.4	Yes	635
Joensen (11)	1986	Faroes	All	7.6	Yes	333
Olafsson (12)	1999	Iceland	All	4.8	Yes	428
Syvertsen (13)	2015	Norway	All	6.5	Yes	1 771
Breivik (14)	2008	Norway	0–14	3.8	Yes	114
Sillanpää (15)	1973	Finland	0–15	3.2	Yes	348
Eriksson (16)	1997	Finland	0–15	3.9	Yes	329
Sidenvall (17)	1996	Sweden	0–16	4.2	Yes	155
Larsson (18)	2006	Sweden	0–16	3.4	Yes	205
Brorson (19)	1967	Sweden	0–19	3.5	Yes	195
Becker-Christensen (20)	1998	Greenland	0–19	4.1	Yes	35
Waaler (21)	2000	Norway	6–12	5.1	Yes	198
Keränen (22)	1989	Finland	> 15	6.3	Yes	1 233
Forsgren (23)	1992	Sweden	> 17	5.5	Yes	713
Svendsen (24)	2007	Norway	31, 41, 46, 61, 76	8.2	Yes	90
Brodtkorb (25)	2008	Norway	18–65	6.7	Yes	12
de Graaf (26)	1974	Norway	All	3.5	No	749
Juul-Jensen (27)	1975	Denmark	All	6.9	No	1 675
Christensen (28)	2007	Denmark	All	5.7	No	28 303[1]
Bolin (29)	2014	Sweden	All	8.8	No	81 606[1]
Surén (30)	2013	Norway	0–12	6.6	No	5 269[1]
Olesen (31)	1996	Greenland	0–15	5.9	No	15
Blichfeldt (32)	2004	Greenland	0–15	3.4	No	43
Li (33)	2014	Sweden	2–17	9.0	No	9 309[1]
Sillanpää (34)	1992	Finland	4–15	6.8	No	104
Baldin (35)	2012	Iceland	7–15	7.7	No	75
Wagner (36)	1983	Denmark	16–66	4.3	No	1 054
Bakken (37)	2014	Norway	18–82	9.0	No	33 571[1]
Löfgren (38)	2009	Finland	39	19	No	222

[1] Registry-based

sandth part of the total population in the relevant area.

Nordic studies that have investigated the prevalence of epilepsy are shown in Table 1 (10–38). Eight of these studies include all age groups (10–13, 26–29), but only four of them were restricted to active epilepsy (10–13). The procedure for identification of patients was identical in the four studies of active epilepsy, with hospital-based searches and retrospective review of patient records. Unfortunately, they used varying definitions of epilepsy.

One of these studies had been conducted in Iceland more than 50 years ago. Unsurprisingly, it found a significantly lower prevalence rate (3.4/1 000) than the three others (10). This finding is in line with an older study from Northern Norway (prevalence 3.5/1 000), which included all age groups, but was not restricted to active epilepsy (26).

The three remaining studies reported prevalence rates of 4.8/1 000 (12), 6.5/1 000 (13) and 7.6/1 000 (11). The study with the lowest prevalence rate stemmed from Iceland. Here, untreated patients who had been seizure-free for more than one year were excluded (12). The highest prevalence rate was found in the Faroe Islands, despite exclusion of all patients who had been seizure-free for more than five years, irrespective of treatment. As an explanation, the author noted that the patient records had frequently been written by personnel who had no particular interest in epilepsy, and that this may have resulted in overdiagnosis. The final study stemmed from Norway. In it, active epilepsy was defined as ongoing treatment and/or at least one seizure over the last five years (13). To date, this remains the only study that has used the most recent guidelines for epidemiological epilepsy research from the International League Against Epilepsy (ILAE) and their comprehensive proposals for amendment of the terminology from 2010 (39, 40).

Eight studies investigated the prevalence of active epilepsy in children (14–21). The prevalence rates range from 3.2 to 5.1 per 1 000 inhabitants. When considering that the prevalence of epilepsy increases with age (12), it is unsurprising that the study reporting the highest prevalence rates did not include the youngest children (the age group 0–5 years) (21).

Prevalence figures for active epilepsy in adults have been reported in four Nordic studies (22–25), two of which stem from Norway (24, 25). We believe there is reason to assume that both of these have a high sensitivity and specificity with regard to the identification of patients, since they used population-based surveys combined with individual interviews and hospital searches/retrospective record reviews respectively. The cohorts investigated, however, were small. Their prevalence rates of active epilepsy amounted to 6.7 (24) and 8.2 per 1 000 (25) respectively. The two other Nordic studies were based on larger populations, with prevalence rates found to be 5.5 (23) and 6.3 per 1 000 (22) respectively. In the latter study, all included patients were clinically examined by the authors, and we may thus assume that it has high specificity.

Incidence

Incidence is defined as the proportion of individuals in a certain population who are diagnosed with the condition is question within a given period of time. Incidence is commonly reported as the number of new cases per 100 000 persons per year. Nordic studies that have investigated the incidence of epilepsy are shown in Table 2 (10, 11, 14, 15, 18, 22, 26–28, 41–49). Because such studies are often difficult to undertake in practice, there are fewer studies of incidence than of prevalence. To ensure the highest possible sensitivity and specificity, incidence studies ought to be prospective in nature (9). Moreover, it should be noted whether the study also includes single, unprovoked seizures or whether it is restricted to the ILAE definition of epilepsy (40, 50). This is especially relevant for incidence studies, since many of them register all those who are recorded with a first-time epileptic seizure and report this figure, without waiting to see whether the patient suffers a second seizure. The definitions of epilepsy used in the studies we are referring to in this article are summarised in Table 3 (10–38, 41–49).

Only five prospective incidence studies of epilepsy (41–45) have been undertaken in the Nordic countries, of which only two include all age groups. The study with the largest population basis, that included single, unprovoked seizures (42), found an annual incidence of 34/100 000. A prospective study from Iceland found an incidence of 33/100 000. Here, single unprovoked seizures had been excluded (41).

A smaller prospective study among children found an annual incidence of epilepsy of 53/100 000 (44). A prospective study of adult patients found an incidence of 56/100 000. Here, single unprovoked seizures had been included (45).

Table 2 Original articles on incidence of epilepsy in the Nordic countries. The articles are sorted by design and age of the included patients

First author (reference)	Year	Country	Age (years)	Incidence per 100 000 person-years	Design
Olafsson (41)	2005	Iceland	All	33	Prospective
Adelöw (42)	2009	Sweden	All	34	Prospective [1]
Sidenvall (43)	1993	Sweden	0–15	73	Prospective [1]
Braathen (44)	1995	Sweden	0–16	53	Prospective
Forsgren (45)	1996	Sweden	> 17	56	Prospective [1]
Gudmundsson (10)	1966	Iceland	All	26	Retrospective
de Graaf (26)	1974	Norway	All	33	Retrospective
Juul-Jensen (27)	1975	Denmark	All	30	Retrospective [1]
Joensen (11)	1986	Faroes	All	43	Retrospective
Olafsson (46)	1996	Iceland	All	47	Retrospective
Sillanpää (47)	2006	Finland	All	53	Retrospective
Christensen (28)	2007	Denmark	All	69	Retrospective
Breivik (14)	2008	Norway	0–14	47	Retrospective
Sillanpää (15)	1973	Finland	0–15	25	Retrospective
Blom (48)	1978	Sweden	0–15	82	Retrospective
Larsson (18)	2006	Sweden	0–16	40	Retrospective
Brorson (49)	1987	Sweden	0–19	50	Retrospective
Keränen (22)	1989	Finland	> 15	24	Retrospective

[1] Including single unprovoked seizures

Discussion

In 2011, ILAE published new guidelines for epidemiological research on epilepsy (39), because substantially differing methodologies had made comparisons of studies difficult (6, 7). Epidemiological studies commonly define epilepsy as a minimum of two unprovoked epileptic seizures during a period of more than 24 hours (39, 51). This remained ILAE's definition until 2014, when it was expanded to also include a single unprovoked seizure if it is part of an epilepsy syndrome or if the risk of recurring seizures is estimated to exceed 60 % (50).

Studies that include single unprovoked and/or acute symptomatic seizures will naturally result in a higher prevalence of epilepsy than studies that have deemed such seizures as not qualifying for the diagnosis.

According to the ILAE definition, active epilepsy is a condition involving ongoing treatment with antiepileptic medication and/or at least one epileptic seizure over a specified period of time, commonly the last 2–5 years. It is recommended that epidemiological studies restrict their reporting to active epilepsy (39, 51). However, there is still room for some discrepancy – the shorter the period that has elapsed since the last seizure, the more patients will be excluded from the group with active epilepsy. For those who have been seizure-free for more than ten years and have gone without antiepileptic medication for more than five years, the ILAE has introduced the concept of «resolved epilepsy» (50). This means that their epilepsy is in remission, not that the disease has been cured. This concept has not yet been applied in epidemiological studies.

Another cause of substantially different findings is the method used for identification of patients. No method is totally watertight, and recommending a single specific procedure is therefore difficult. Studies that use a population-based questionnaire may have limitations caused by low response rates and selection bias. Moreover, such studies may for practical reasons be restricted to smaller populations or delimited age groups, as are door-to-door surveys.

Studies based on registered diagnostic codes may provide for larger study populations, although there is a risk of overestimating the prevalence of the disease. In addition, it is difficult to restrict such studies to active epilepsy. A study from Denmark showed that approximately 20 % of all patients who were registered with an epilepsy code did not fulfil ILAE's definition of epilepsy (52). In our recent study from Buskerud county we made similar findings (13). A retrospective review of patient records to validate the diagnosis would naturally increase the specificity, but this is conditional on the correctness of the information in the records and that the registrations have been made by competent personnel.

Age variation in the study population is another problem. Only a handful of studies from the Nordic countries include all age groups. Studies that are limited to a specific

Table 3 Definitions of epilepsy and active epilepsy used in the included original studies of prevalence and/or incidence

Definition of epilepsy	Reference
> 1 unprovoked epileptic seizure	27, 42, 43, 45
> 2 unprovoked epileptic seizures	19, 36, 49
> 2 unprovoked epileptic seizures over a period of > 24 hours	11, 13, 14, 17, 18, 21–23, 25, 41, 46
> 3 unprovoked epileptic seizures over a period of > 1 week	15
Chronic organic brain disorder with recurring epileptic seizures	26, 34
Recurring epileptic seizures over the last three years	48
Recurring unprovoked epileptic seizures	12, 16, 24
Recurring unprovoked seizures of cerebral origin	44
Paroxysmal and transitory disturbance of the brain function that develops suddenly, stops spontaneously and tends to recur	10
> 2 unprovoked epileptic seizures/1 seizure and finding of epileptic activity by EEG/approved reimbursement of costs for antiepileptic drugs	38
Registered with an ICD-10 code for epilepsy	28–30, 33, 37
Approved reimbursement of costs for antiepileptic drugs	47
Affirmative answer to a question about epilepsy in a questionnaire	35
Not stated	20, 31, 32

Definition of active epilepsy	Reference
> 1 seizure over the last year and/or antiepileptic medication	12
> 1 seizure over the last 2 years and/or antiepileptic medication	20
> 1 seizure over the last 3 years, irrespective of medication	19
> 1 seizure over the last 4 years, irrespective of medication	15, 21
> 1 seizure over the last 5 years, irrespective of medication	11, 14, 18, 25
> 1 seizure over the last 5 years and/or antiepileptic medication	10, 13, 16, 17, 22–24

age group can only with difficulty be extrapolated to the entire population, since it has previously been proven that there is an elevated prevalence of epilepsy in the oldest section of the population (12). This trend is also evident in the material we have collected for this article. In studies that have investigated the prevalence of active epilepsy in children and adolescents (0–19 years), the prevalence rate varies from 3.2 to 4.1 per 1 000 (14–20), while the prevalence of active epilepsy among adults is higher (5.5–8.2/1 000) (22–25). In the Nordic countries, no isolated studies of prevalence among the elderly have been made, nor has this been investigated in the adolescent group.

As regards incidence, there are too few studies in our material and their results are too divergent to permit any conclusions regarding the age distribution. It is known, however, that the incidence curve for epilepsy is double-humped, with a peak early in life and a new increase in the oldest age groups (53).

Unfortunately, some stigma remains attached to the diagnosis of epilepsy (54). A wish to keep this diagnosis secret on the part of some people in certain communities or age groups may cause underreporting. This source of error may perhaps be greater in older studies, and perhaps also in studies undertaken in rural areas.

Conclusion

Epidemiological research on epilepsy is not an exact science. All the methods in use include sources of error. An adequate description of the methodology and its limitations, as well as a shared definition of epilepsy, is essential in all such research efforts. Studies that are based on updated guidelines and classifications of epilepsy remain scarce – not only in the Nordic countries, but also globally.

On the basis of this literature review, it is reasonable to assume that the real prevalence of active epilepsy in the Nordic countries amounts to approximately 6 per 1 000, i.e. that approximately 30 000 individuals in Norway suffer from active epilepsy. In light of the few prospective studies that have been undertaken, the annual incidence can be estimated to 30–60 new cases per 100 000 inhabitants.

Marte Roa Syvertsen (born 1982)
specialty registrar. She is working on a research project based on epidemiological data studying epilepsy in Buskerud county.
The author has completed the ICMJE form and declares no conflicts of interest.

Jeanette Koht (born 1969)
researcher, specialist in neurology and senior consultant.
The author has completed the ICMJE form and declares no conflicts of interest.

Karl O. Nakken (born 1945)
specialist in neurology with special competence in epilepsy diseases, and medical supervisor.
The author has completed the ICMJE form and declares no conflicts of interest.

References

1. Hirtz D, Thurman DJ, Gwinn-Hardy K et al. How common are the «common» neurologic disorders? Neurology 2007; 68: 326–37.
2. Nakken KO, Brodtkorb E, Koht J. Epilepsi og rehabilitering. Tidsskr Nor Lægeforen 2007; 127: 309–12.
3. Alfstad KA, Clench-Aas J, Van Roy B et al. Psychiatric symptoms in Norwegian children with epilepsy aged 8–13 years: effects of age and gender? Epilepsia 2011; 52: 1231–8.
4. Gjerstad L, Taubøll E. Hva er epilepsi? Tidsskr Nor Lægeforen 2003; 123: 1359–61.
5. Nakken KO. Epilepsi. 2 utg. Oslo: Cappelen Akademisk, 2010: 29.
6. Bell GS, Neligan A, Sander JW. An unknown quantity–the worldwide prevalence of epilepsy. Epilepsia 2014; 55: 958–62.
7. Beghi E, Hesdorffer D. Prevalence of epilepsy–an unknown quantity. Epilepsia 2014; 55: 963–7.
8. Banerjee PN, Filippi D, Allen Hauser W. The descriptive epidemiology of epilepsy-a review. Epilepsy Res 2009; 85: 31–45.
9. Forsgren L, Beghi E, Oun A et al. The epidemiology of epilepsy in Europe – a systematic review. Eur J Neurol 2005; 12: 245–53.
10. Gudmundsson G. Epilepsy in Iceland. A clinical and epidemiological investigation. Acta Neurol Scand 1966; 43 (suppl 25): 1–124.
11. Joensen P. Prevalence, incidence, and classification of epilepsy in the Faroes. Acta Neurol Scand 1986; 74: 150–5.
12. Olafsson E, Hauser WA. Prevalence of epilepsy in rural Iceland: a population-based study. Epilepsia 1999; 40: 1529–34.

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13. Syvertsen M, Nakken KO, Edland A et al. Prevalence and etiology of epilepsy in a Norwegian county-A population based study. Epilepsia 2015; 56: 699–706.
14. Breivik N, Reiher T. Epilepsi hos barn på Sunnmøre. Tidsskr Nor Legeforen 2008; 128: 2049–51.
15. Sillanpää M. Medico-social prognosis of children with epilepsy. Epidemiological study and analysis of 245 patients. Acta Paediatr Scand Suppl 1973; 237: 3–104.
16. Eriksson KJ, Koivikko MJ. Prevalence, classification, and severity of epilepsy and epileptic syndromes in children. Epilepsia 1997; 38: 1275–82.
17. Sidenvall R, Forsgren L, Heijbel J. Prevalence and characteristics of epilepsy in children in northern Sweden. Seizure 1996; 5: 139–46.
18. Larsson K, Eeg-Olofsson O. A population based study of epilepsy in children from a Swedish county. Eur J Paediatr Neurol 2006; 10: 107–13.
19. Brorson LO. A survey of epilepsy among children and young people in the county of Uppsala. Acta Neurol Scand 1967; 43 (suppl 31): 163.
20. Becker-Christensen FG. Sygdomme og helbredsproblemer hos børn i Grønland. En epidemiologisk undersøgelse baseret på henvisninger til paediatrisk speciallægeundersøgelse i otte grønlandske distrikter 1992–94. Ugeskr Læger 1998; 160: 2856–62.
21. Waaler PE, Blom BH, Skeidsvoll H et al. Prevalence, classification, and severity of epilepsy in children in western Norway. Epilepsia 2000; 41: 802–10.
22. Keränen T, Riekkinen PJ, Sillanpää M. Incidence and prevalence of epilepsy in adults in eastern Finland. Epilepsia 1989; 30: 413–21.
23. Forsgren L. Prevalence of epilepsy in adults in northern Sweden. Epilepsia 1992; 33: 450–8.
24. Svendsen T, Lossius M, Nakken KO. Age-specific prevalence of epilepsy in Oppland County, Norway. Acta Neurol Scand 2007; 116: 307–11.
25. Brodtkorb E, Sjaastad O. Epilepsy prevalence by individual interview in a Norwegian community. Seizure 2008; 17: 646–50.
26. de Graaf AS. Epidemiological aspects of epilepsy in northern Norway. Epilepsia 1974; 15: 291–9.
27. Juul-Jensen P, Ipsen J. Prævalens og incidens af epilepsi i Stor-Århus. Ugeskr Læger 1975; 137: 2380–8.
28. Christensen J, Vestergaard M, Pedersen MG et al. Incidence and prevalence of epilepsy in Denmark. Epilepsy Res 2007; 76: 60–5.
29. Bolin K, Berggren F, Landtblom AM. Prevalence and cost of epilepsy in Sweden–a register-based approach. Acta Neurol Scand 2015; 131: 37–44.
30. Surén P, Bakken IJ, Lie KK et al. Fylkesvise forskjeller i registrert forekomst av autisme, AD/HD, epilepsi og cerebarl parese i Norge. Tidsskr Nor Legeforen 2013; 133: 1929–34.
31. Olesen T. Paediatrisk sygdoms- og symptomprofil i Sydgrønland. Erfaringer fra konsulentbesøg i 1992. Ugeskr Læger 1996; 158: 52–4.
32. Blichfeldt S, Bille T, Nielsen IM et al. Epilepsy among children in Greenland. Int J Circumpolar Health 2004; 63 (suppl 2): 363–5.
33. Li X, Sundquist J, Zöller B et al. Neighborhood, family, and childhood and adolescent epilepsy: a nationwide epidemiological study from Sweden. Seizure 2014; 23: 62–8.
34. Sillanpää M. Epilepsy in children: prevalence, disability, and handicap. Epilepsia 1992; 33: 444–9.
35. Baldin E, Ludvigsson P, Mixa O et al. Prevalence of recurrent symptoms and their association with epilepsy and febrile seizure in school-aged children: a community-based survey in Iceland. Epilepsy Behav 2012; 23: 315–9.
36. Wagner AL. A clinical and epidemiological study of adult patients with epilepsy. Acta Neurol Scand Suppl 1983; 94: 63–72.
37. Bakken IJ, Revdal E, Nesvåg R et al. Substance use disorders and psychotic disorders in epilepsy: a population-based registry study. Epilepsy Res 2014; 108: 1435–43.
38. Löfgren E, Pouta A, von Wendt L et al. Epilepsy in the northern Finland birth cohort 1966 with special reference to fertility. Epilepsy Behav 2009; 14: 102–7.
39. Thurman DJ, Beghi E, Begley CE et al. Standards for epidemiologic studies and surveillance of epilepsy. Epilepsia 2011; 52 (suppl 7): 2–26.
40. Berg AT, Berkovic SF, Brodie MJ et al. Revised terminology and concepts for organization of seizures and epilepsies: report of the ILAE Commission on Classification and Terminology, 2005–2009. Epilepsia 2010; 51: 676–85.
41. Olafsson E, Ludvigsson P, Gudmundsson G et al. Incidence of unprovoked seizures and epilepsy in Iceland and assessment of the epilepsy syndrome classification: a prospective study. Lancet Neurol 2005; 4: 627–34.
42. Adelöw C, Andell E, Amark P et al. Newly diagnosed single unprovoked seizures and epilepsy in Stockholm, Sweden: First report from the Stockholm Incidence Registry of Epilepsy (SIRE). Epilepsia 2009; 50: 1094–101.
43. Sidenvall R, Forsgren L, Blomquist HK et al. A community-based prospective incidence study of epileptic seizures in children. Acta Paediatr 1993; 82: 60–5.
44. Braathen G, Theorell K. A general hospital population of childhood epilepsy. Acta Paediatr 1995; 84: 1143–6.
45. Forsgren L, Bucht G, Eriksson S et al. Incidence and clinical characterization of unprovoked seizures in adults: a prospective population-based study. Epilepsia 1996; 37: 224–9.
46. Olafsson E, Hauser WA, Ludvigsson P et al. Incidence of epilepsy in rural Iceland: a population-based study. Epilepsia 1996; 37: 951–5.
47. Sillanpää M, Kälviäinen R, Klaukka T et al. Temporal changes in the incidence of epilepsy in Finland: nationwide study. Epilepsy Res 2006; 71: 206–15.
48. Blom S, Heijbel J, Bergfors PG. Incidence of epilepsy in children: a follow-up study three years after the first seizure. Epilepsia 1978; 19: 343–50.
49. Brorson LO, Wranne L. Long-term prognosis in childhood epilepsy: survival and seizure prognosis. Epilepsia 1987; 28: 324–30.
50. Fisher RS, Acevedo C, Arzimanoglou A et al. ILAE official report: a practical clinical definition of epilepsy. Epilepsia 2014; 55: 475–82.
51. Commission on Epidemiology and Prognosis, International League Against Epilepsy. Guidelines for epidemiologic studies on epilepsy. Epilepsia 1993; 34: 592–6.
52. Christensen J, Vestergaard M, Olsen J et al. Validation of epilepsy diagnoses in the Danish National Hospital Register. Epilepsy Res 2007; 75: 162–70.
53. Kotsopoulos IA, van Merode T, Kessels FG et al. Systematic review and meta-analysis of incidence studies of epilepsy and unprovoked seizures. Epilepsia 2002; 43: 1402–9.
54. Tuft M, Nakken KO. Epilepsi som stigma – ond, hellig eller gal? Tidsskr Nor Legeforen 2014; 134: 2328–30.

Received 14 April 2015, first revision submitted 29 June 2015, accepted 14 August 2015. Editor: Trine B. Haugen.