Epidemiological features of Guillain-Barré syndrome in Sweden, 1978-93

Guo-Xin Jiang, Qi Cheng, Hans Link, Jesús de Pedro-Cuesta

Abstract

Objectives—To describe the incidence of Guillain-Barré syndrome in Sweden during the period 1978-93 and its temporal and geographical variations.

Methods—Stratified and Poisson regression analyses and tests for detection of small epidemics were applied to population based hospital discharge data from 2257 incident cases of Guillain-Barré syndrome in Sweden during the study period.

Results—The incidence of Guillain-Barré syndrome was (1) 1.77 per 100 000 person-years when age adjusted to the European population; (2) higher in males; and (3) stable across time, although occasional increases of annual incidence rates were found—namely, in 1978 (relative risk (RR) 1.30 (95% CI 1.10-1.54)), and in 1983 (RR 1.24 (95% CI 1.06-1.40)). The incidence increased with age and was bimodal, with peaks at 20-24 and 70-74 years. There was a moderate but significant seasonality with a peak in August, particularly among the young age groups. The age adjusted incidence by county varied from 1.11 to 2.57 per 100 000 person-years. Neither temporal nor spatial clustering was significant, except during the period July-September in 1983 at ages below 40 years.

Conclusions—The incidence of Guillain-Barré syndrome in Sweden during the period 1978-93 had a magnitude similar to those described in other surveys, a bimodal distribution by age, and modest geographical and temporal variations with significantly high rates in 1978 and 1983 and in autumn. Minor outbreaks might have passed unnoticed up to the present. Whereas reported drug induced cases of Guillain-Barré syndrome may in part explain the high incidence in 1983, the cause of the aberrant incidence in 1978 remains unknown. Epidemiological surveillance of Guillain-Barré syndrome in Sweden might have been useful.

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Keywords: Guillain-Barré syndrome; incidence; epidemiology

The reported crude incidence figures of Guillain-Barré syndrome ranged from 0.16 to 4.00 per 100 000.¹⁻⁸ However, the age spe-

cific, spatial, and temporal variations of the incidence of the disease are not well known due to difficulties in comparing such rates. This is because (1) they were often based on few cases; (2) their validity may vary because of diverse factors, such as differences in access to medical care, diagnostic traditions, case finding procedures, or diagnostic criteria; and (3) the variation related to specific clinicoepidemiological subgroups⁹ may be concealed in comparisons of pooled cases of Guillain-Barré syndrome.

Since 1963, diagnoses at discharge from hospitals in different Swedish counties have been compiled at the Hospital Inpatient Register of the National Board of Health and Welfare. The first county which provided such data was Uppsala. Afterwards, progressively more counties contributed with data from all the institutions for somatic and psychiatric care, so that complete information from all counties was available from 1990 onwards. Recently, the Parliament Bill prohibiting the use of such person based statistics was abolished. Updating of person based information at the Hospital Inpatient Register enables analysis covering most of the Swedish population from 1978 to 1993.

Hospital statistics for Guillain-Barré syndrome have been considered to be a useful tool for the study of frequency and epidemiological surveillance.¹⁰ In prior studies we used such information to describe the incidence of Guillain-Barré syndrome in southwest Stockholm^{8,9} and Stockholm County.¹¹ The quality of registered diagnoses of Guillain-Barré syndrome in southwest Stockholm during 1973-91 was assessed by examining case files using the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) clinical criteria for Guillain-Barré syndrome.¹² Whereas 69 (83%) of 83 registered patients with Guillain-Barré syndrome fulfilled the NINCDS criteria for the syndrome, none of 40 randomly selected patients with diagnosis of "unspecific polyneuropathy" fulfilled the NINCDS criteria.⁸ The quality of the data and the completeness of ascertainment of incident cases were considered to be good for epidemiological studies on Guillain-Barré syndrome. The aim of the present study was to describe the geographical distribution, seasonal variation, time trends, and age specific and sex specific incidence rates of Guillain-Barré syndrome in Sweden during 1978-93 based on registered data.

Division of Neurology,
Karolinska Institute,
Huddinge University
Hospital, Stockholm,
Sweden
G-X Jiang
Q Cheng
H Link
J de Pedro-Cuesta

Department of Applied
Epidemiology,
National Centre for
Epidemiology, "Carlos
III" Institute of
Health, Madrid,
Spain
J de Pedro-Cuesta

Correspondence to:
Dr Guo-Xin Jiang, Division
of Neurology, Huddinge
University Hospital, S-141
86 Huddinge, Sweden.

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Table 1 Population in 1993, annual number of incident cases of Guillain-Barré syndrome by county, and age adjusted incidence per 100 000 person-years in Sweden, 1978–93

County	Population in 1993	No of incident cases									
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Stockholm	1 669 840	36	31	23	36	26	37	31	35	36	31
Uppsala	279 610	8	7	6	12	6	4	14	7	6	7
Södermanland	257 858	9	3	2	2	4	4	2	2	5	3
Östergötland	408 268	—	—	—	12	5	16	3	6	10	4
Jönköping	309 867	—	—	—	—	8	8	9	6	2	8
Kronoberg	178 961	—	—	—	—	—	—	—	—	—	3
Kalmar	241 912	9	5	3	7	5	5	1	1	3	9
Gotland	57 578	2	2	6	1	0	4	2	1	0	0
Blekinge	151 266	—	—	—	—	—	—	4	1	3	1
Kristianstad	292 993	3	5	3	0	5	4	7	3	0	6
Malmöhus	793 696	23	18	16	18	11	19	12	16	13	8
Halland	261 172	2	6	5	0	3	2	4	10	2	2
Göteborgs and Bohus	747 849	12	9	14	12	13	19	11	15	8	15
Älvsborg	455 921	13	5	7	4	12	10	6	11	9	9
Skaraborg	278 860	7	8	2	8	5	4	—	—	7	8
Värmland	284 691	—	—	—	—	—	—	—	—	—	—
Örebro	274 325	6	2	1	3	2	4	6	7	4	1
Västmanland	260 096	6	7	8	6	7	5	—	11	4	1
Kopparberg	290 245	3	6	9	2	10	3	—	6	5	3
Gävleborg	289 190	10	5	7	8	2	9	2	10	10	4
Västerbotten	260 829	—	—	—	—	—	—	4	4	3	4
Jämtland	135 910	0	1	2	1	1	4	—	2	1	1
Västerbotten	255 987	—	—	7	—	—	—	5	8	3	0
Norrbottn	266 089	—	—	—	—	—	—	—	—	—	—
All	8 692 013	149	120	121	132	125	161	123	162	134	128
Age adjusted incidence per 100 000 person-years		2.30	1.76	1.81	1.86	1.68	2.23	1.72	2.03	1.67	1.52

—Data not, or only in part, available.

Methods

We obtained hospital discharge data from the Hospital Inpatient Register on hospital visits resulting in a diagnosis, main or secondary, up to the sixth level, coded as the international classification of diseases (ICD-9) Swedish version 357A during the period 1978–93. The data consisted of dates of birth; admission to hospital and discharge; hospital and department; residence; type of surgical operation and way of discharge; and cause of death. As there was a unique individual number for everyone in the Hospital Inpatient Register statistics, we could identify different stays in hospital for each person with Guillain-Barré syndrome as a main or secondary diagnosis at discharge and selected for study the first hospital stay with admission date from 1 January 1978 to 31 December 1993.

Table 1 describes the information on registered data of Guillain-Barré syndrome available at the Hospital Inpatient Register. Although we used all available data during the period 1978–93 for studying the epidemiology of the syndrome, some results may vary depending on the time point for incorporation of the contributing counties. Specific study populations, in which data were continuously registered for 12 counties during 1978–93 and all counties during 1990–93 were selected for analysing epidemiological features of the syndrome. This strategy might be required for comparability of populations in the investigation regarding time trends and spatial variation, because the records of cases of Guillain-Barré syndrome would then be generated by a population relatively homogeneous across space and time. Population data on 1 January for each year and each contributing county were obtained from annual reports produced by Statistics Sweden.

INCIDENCE

The incidence counts for Guillain-Barré syndrome were based on the admission date of

the first hospital stay with the diagnosis at discharge during the period 1978–93 for a patient, disregarding the duration between successive hospital stays. Table 1 specifies the numerical data for years and counties contributing to the incidence counts. Twenty three cases admitted to hospital for the first time with Guillain-Barré syndrome diagnosis before 1 January 1978 and 66 cases from counties with incompletely registered data in certain years were discarded. Incidence rates of age adjusted Guillain-Barré syndrome were calculated using as a standard the European population. Particular efforts were made to identify a possible bimodality of incidence by age and the specific features previously described in studies in southwest Stockholm^{8,9} and Stockholm County.¹¹

TIME TRENDS

The variation of annual incidence during the period 1978–93 was studied from age adjusted rates of Guillain-Barré syndrome among the general population, and from age specific groups displaying unimodal distributions of incidence by age corresponding to clinicoepidemiological subgroups described in southwest Stockholm in a prior study⁹—that is, at ages under 40 and 40 and over. Annual Mantel-Haenszel estimators of relative risks (RRs) were calculated taking as a reference the incidence during the remaining study period.^{13,14} This analysis was stratified by age when focusing on the general population. Otherwise, crude RR estimators were calculated. Systematic search of significant temporal aggregation was studied using the Scan test operating on data from 12 counties, for the whole population or two specific age groups (under 40 years and 40 and over), with a one month or three month forwarding moving window.^{15,16} Seasonal differences in incidence were studied for specific age groups and the general population from RRs obtained by comparing monthly incidence with incidence

1988	1989	1990	1991	1992	1993	All	Age adjusted incidence
21	30	30	30	45	36	514	1.95
6	2	5	5	3	10	108	2.57
5	3	3	4	4	4	59	1.34
7	7	9	6	5	4	94	1.79
7	2	8	1	7	5	71	1.78
3	3	4	4	4	3	24	1.88
6	4	2	6	2	2	70	1.63
1	0	1	0	3	3	26	2.33
4	2	1	2	3	4	25	1.38
1	6	3	1	2	6	55	1.11
11	21	20	12	18	16	252	1.94
2	4	3	6	7	2	60	1.54
8	8	8	7	15	8	182	1.46
4	14	7	13	9	4	137	1.83
3	3	3	1	4	2	65	1.62
—	8	6	5	8	6	33	1.92
4	3	5	6	2	3	59	1.24
0	3	7	4	3	3	75	1.86
4	5	7	7	2	6	78	1.74
11	6	5	6	7	10	112	2.16
8	4	3	4	7	8	49	1.64
3	2	0	5	4	5	32	1.48
2	7	4	7	8	3	54	1.84
—	—	3	7	9	4	23	2.02
121	147	147	149	181	157	2257	—
1.45	1.64	1.62	1.65	1.93	1.60	—	1.77

in the remaining 11 months. Significance of heterogeneity of distribution of Guillain-Barré syndrome by month was also assessed using a χ^2 test.¹⁷

GEOGRAPHICAL DISTRIBUTION

Age adjusted incidence rates for 24 counties and six healthcare regions¹⁸ were calculated using the whole data base. The RRs for Guillain-Barré syndrome in counties and healthcare regions during the study period were obtained using a log linear model controlling for calendar year, age and sex, and taking as a reference the Stockholm County and Stockholm Region respectively. Geographical maps, based on age adjusted incidence rates, were worked out using three categories of strata with equidistant limits. Spatial patterns were described from visual analysis. Significance of spatial aggregation for counties was assessed using the Ohno test.¹⁹

ANALYSIS OF SPECIFIC FINDINGS

A set of phenomena identified in the prior descriptive study¹¹ was further analysed by fit-

Figure 1 Crude age and sex specific incidence of Guillain-Barré syndrome in Sweden, 1978-93.

ting log linear Poisson models to information from the whole data base available on the Hospital Inpatient Register for years with complete information. To identify possible factors resulting in spatially and temporally restricted higher risks of Guillain-Barré syndrome affecting the general population or specific age groups, particular efforts were performed to study interactions between year, geographical unit, and age. The independent variables year, county or healthcare region, and age group under 40 and 40 and over, coded as dummy, were sequentially introduced in the models and, later on, their corresponding first order interaction factors. Log likelihood ratios were used for testing goodness of fit of different models. The results of this analysis were compared with those from stratified analysis. Specific findings were described separately in detail.

Results

Table 1 gives the annual numbers of incident cases of Guillain-Barré syndrome identified in the Hospital Inpatient Register on each county and age adjusted incidence of Guillain-Barré syndrome per 100 000 person-years in Sweden during 1978-93. For the period 1978-93, information on 1634 cases was consecutively obtained for 12 counties. The total number of cases for all counties was 2257. The number of cases from the whole country during the period 1990-3 was 634. A large variation of the annual number of cases per county was found, reflecting in part the uneven distribution of the population in the country.

The age adjusted annual incidence rates per 100 000 population in Sweden during the period 1978-93 ranged from 1.45 in 1988 to 2.30 in 1978. The age adjusted incidence during the whole period was 1.77 per 100 000 person-years. When the annual incidence rates in counties were examined, high rates (recorded as values over 4.0 per 100 000, and less attributable to random variation than those often found in Gotland with population less than 60 000) were found in Uppsala in 1981 and 1984, and Halland and Västmanland in 1985.

Figure 1 shows the age specific and sex specific incidence rates of Guillain-Barré syndrome in Sweden for the period 1978-93. The lowest rate per 100 000 person-years was 0.74 for those aged under 10 years, and the highest in the 70-74 age-group (5.13 for men and 3.39 for women). A bimodal type of distribution was perceived with peak values for the 20-24 and 70-74 age groups. The age adjusted incidence per 100 000 person-years during the study period was 2.01 in males and 1.54 in females (male/female (M/F) ratio 1.31). Similar patterns for age specific and sex specific incidence rates were seen from data in 12 counties for 1978-93 and in the whole country for the 1990-3 period.

The crude and age adjusted incidence rates for Guillain-Barré syndrome among males and females in Swedish counties and healthcare

Figure 2 Geographical distribution of age adjusted incidence of Guillain-Barré syndrome in Sweden, 1990–3.

regions during the period 1978–93, as well as the aforementioned corresponding RRs for the geographical units for both sexes were scrutinised. Three counties (Västmanland, Kopparberg, and Jämtland) presented a higher risk in females (M/F ratios 0.61 to 0.85). By contrast, in Blekinge County a 144% excess risk for males (M/F ratio 2.44) was found. The RRs for counties ranged from 0.60 for Kristianstad to 1.42 for Gotland when compared to Stockholm County. Only Uppsala

presented a significantly higher risk (RR 1.31 (95% CI 1.06–1.61)), and four counties had significantly lower risks (RR 0.60 to 0.77). The variation of the RRs for incidence of different healthcare regions was not remarkable, but significantly lower RRs were disclosed in healthcare regions 2 (RR 0.87 (95% CI 0.76–0.99)), and 3 (RR 0.84 (95% CI 0.73–0.95)).

When counties were classified into three categories based on age adjusted incidence using equidistant limits, no spatial aggregation patterns were discernible, as seen on the map (fig 2). The Ohno test did not disclose significant aggregation ($P > 0.20$).

Table 2 gives the RRs for year to year variation in incidence of Guillain-Barré syndrome in the general population and in selected age groups during the period 1978–93, compared with the incidence in the remaining study period. From stratified analysis by age, significantly higher incidence rates were found among the general population in 1978 (RR 1.30 (95% CI 1.10–1.54)) and in 1983 (RR 1.24 (95% CI 1.06–1.40)), and lower rates were found in 1988 (RR 0.75 (95% CI 0.63–0.90)). When analysed separately, the significant excess risks seen in 1978 and 1983 were present in both males and females (data not shown). The analysis for specific age groups disclosed significant excess risk for the year 1978 at ages under 40 and 40 and over, and also for the year 1983 at ages under 40 years, with a modest increase for those at ages 40 and over. Significantly reduced risks were found at ages under 40 in 1993 and at ages 40 and over in 1987.

Figure 3 shows the monthly distribution of Guillain-Barré syndrome in the aforementioned 12 counties during the period 1978–93. A distinct pattern is suggested at ages below 40, with a peak in August, and at ages 40 and over, which falls in December and June. A high incidence of Guillain-Barré syndrome at all ages is suggested in autumn. The monthly RRs were highest in August at ages under 40 (RR 1.39 (95% CI 1.08–1.80)), and in October as well as in November (RR 1.14 (95% CI 0.92–1.40)) at ages of 40 and over. Again, among all ages, the RRs peaked in August (RR 1.18 (95% CI 1.00–1.39)). Significant differences were also found for the lowest monthly incidence in June at all ages (RR 0.73) and among those aged 40 and over (RR 0.69). Heterogeneity of monthly distribution of cases of Guillain-Barré syndrome was significant for all ages ($P = 0.048$), but not for specific age groups.

The search for significant aggregation by time across the whole study period in the general population or specific age groups in the population gave negative results, except for the number of cases during the period July–September in 1983 at ages under 40 (observed 23 cases *v* average expected 9.17, $P = 0.042$). When attention was specifically paid to phenomena during high risk years (fig 4), the most prominent variations in 1978 were found in January and July among those aged 40 and over (16 and 17 cases). By contrast, in 1983 monthly peak values were seen among elderly

Table 2 Annual relative risks (RRs) of Guillain-Barré syndrome for both sexes in Sweden, 1978–93

Year	Age < 40 years RR (95% CI)	Age ≥ 40 years RR (95% CI)	All RR (95% CI)
1978	1.36 (1.03–1.78)*	1.29 (1.05–1.59)*	1.30 (1.10–1.54)*
1979	0.95 (0.69–1.30)	1.10 (0.88–1.37)	1.03 (0.86–1.24)
1980	1.00 (0.74–1.36)	1.01 (0.80–1.27)	1.00 (0.83–1.20)
1981	0.98 (0.72–1.33)	1.13 (0.91–1.40)	1.06 (0.89–1.26)
1982	1.00 (0.75–1.35)	0.94 (0.75–1.18)	0.95 (0.79–1.14)
1983	1.53 (1.19–1.96)*	1.11 (0.90–1.37)	1.24 (1.06–1.46)*
1984	1.14 (0.85–1.51)	0.90 (0.71–1.14)	0.97 (0.81–1.17)
1985	1.15 (0.87–1.51)	1.20 (0.98–1.46)	1.17 (1.00–1.37)
1986	0.90 (0.66–1.21)	0.93 (0.75–1.16)	0.92 (0.77–1.09)
1987	0.98 (0.74–1.31)	0.78 (0.62–0.98)*	0.85 (0.71–1.02)
1988	0.72 (0.52–1.00)	0.84 (0.67–1.04)	0.75 (0.63–0.90)*
1989	0.87 (0.65–1.17)	0.97 (0.79–1.18)	0.94 (0.80–1.11)
1990	0.86 (0.64–1.15)	0.91 (0.75–1.12)	0.90 (0.77–1.07)
1991	0.93 (0.70–1.23)	0.89 (0.72–1.09)	0.91 (0.77–1.08)
1992	1.20 (0.93–1.54)	1.06 (0.87–1.28)	1.12 (0.96–1.30)
1993	0.63 (0.45–0.89)*	1.10 (0.91–1.32)	0.96 (0.81–1.12)

* $P < 0.05$.

Figure 3 Monthly distribution of cases of Guillain-Barré syndrome in 12 Swedish counties, 1978-93.

Figure 4 Monthly distribution of cases of Guillain-Barré syndrome in Sweden, 1978 and 1983.

people in March and November (12 cases each), and among the young in August (13 cases).

The interactions tested with goodness of fit of different models, between (1) age (under 40, and 40 and over) and sex; (2) healthcare region and age; and (3) year and age, were found to be non-significant. However, a nega-

tive interaction between year 1983 and age 40 and over (reference: age under 40 and year with the lowest incidence) reached an RR of 0.65 (95% CI 0.39-1.06, $P = 0.084$). This finding deserves further consideration, given the aforementioned excess risk found in 1983 at ages 40 and over. Interaction between year and healthcare region was not tested because of lack of convergence. Bimodality by age was confirmed in the model results when 10 year age groups were computed.

Discussion

The results of the present study showed that Guillain-Barré syndrome in Sweden, during the past 15 years, had (1) an incidence similar to those reported in other populations^{8,20}; (2) uneven geographical and temporal distributions; and (3) epidemiological characteristics with regard to seasonality and distribution by age and sex, similar to those described in Stockholm County¹¹ and in southwest Stockholm.⁸

During the study period, access to hospital care was good and at low cost. Access to neurological expertise in the 1970s might have been limited in remote regions. Taking the positive and negative predictive values of 83% and 100% detected for registered diagnoses of Guillain-Barré syndrome in southwest Stockholm⁸ as valid in the whole country, the findings of this study should be attributable to Guillain-Barré syndrome. Mild cases might have not been admitted to hospitals and, in consequence, the incidence based on the Hospital Register data could have been underestimated. Only one ambulatory patient with suspected Guillain-Barré syndrome in remission was identified from the outpatient register at the Department of Neurology, Huddinge University Hospital during 1973-86.⁸ The results confirm that the incidence of Guillain-Barré syndrome increases with age and decreases relatively in the oldest age group (older than 75), as reported in two other large studies, in the USA²¹ and Canada.²⁰ Although modest underascertainment of cases of Guillain-Barré syndrome in the most elderly subjects cannot be excluded, we think that few cases would have been ignored by the Hospital Discharge Register in Sweden.

Minor inaccuracies of incidence rates might depend on variation of policy for discharge or delay in admission to hospital after onset of the disease. The mean duration of the first hospital stay with diagnosis of Guillain-Barré syndrome in 1992 was 21 (SD 28) days, median 11 days. Because some patients admitted before 31 December 1993 and discharged in later months would have been captured in 1994, the incidence in 1993 should have been underestimated. We identified cases, in our series, admitted in a year and discharged after the first admission to hospital in later years during the period 1978-92. The average annual number of such cases was nine—that is, 6% of all cases per year. This source of error could in part explain the low incidence rates registered in 1993 but not the excess

found in early 1978 as all cases admitted before 1 January 1978 had been excluded.

The years for which significant increases in risk were found in this study were the same as those identified in another study in Stockholm County in 1978 and 1983.¹¹ From the data in table 1 and corresponding incidence rates it would seem that diverse phenomena might underlie those high annual counts. Nevertheless, whereas the increase of Guillain-Barré syndrome in 1978 in Stockholm County was highest for ages under 40 and in autumn, the monthly incidence rates in Sweden peaked in January and July at ages of 40 and over. As age at onset in Guillain-Barré syndrome may be relevant in differentiating clinicoepidemiological subgroups,⁹ the high incidence of the disease in 1978 due to different factors cannot be excluded. The increase in incidence in 1983 presented in Stockholm County with many cases among the elderly subjects clustered in spring, which fitted well the peak of drug induced Guillain-Barré syndrome reported as secondary to the zimeldine incident in the same period.^{22,23} However, the peak in Sweden in August 1983 in the population aged under 40 years was not seen in Stockholm County and the cases were geographically scattered. Calculated on the basis of the difference in crude incidence rates between 1983 and the whole study period, the excess number of cases of Guillain-Barré syndrome in 1983 over the expected average in Sweden was 36. As only 13 cases of zimeldine induced Guillain-Barré syndrome have been reported, some of them had clinical onset in 1982,^{22,23} and depression is more common among elderly people, the data for 1983 suggest that the magnitude of the zimeldine induced Guillain-Barré syndrome epidemic was underestimated or, most likely, that there was an aetiologically different, to date unnoticed, increased incidence of Guillain-Barré syndrome in summer 1983 among young adults.

Recalculation of annual RRs after elimination of the data in 1978 and 1983 resulted in loss of significance for the low annual RRs in 1987 in the older group, but not for 1993 at ages under 40 (RR 0.67 (95% CI 0.48–0.94)). This may suggest that aberrant high incidence rates of Guillain-Barré syndrome in other years than 1978 and 1983 may have remained unidentified, particularly in the younger population.

The low M/F ratio in two counties with more than 70 cases is difficult to explain by random error, particularly in Västmanland in 1985 where the high incidence of 4.30 per 100 000 population was due to Guillain-Barré syndrome in women (nine out of 11 cases, 7.07 per 100 000; RR 4.24, 95% CI 2.20–8.17) when compared with the crude incidence in all Swedish females during 1978–93, and even higher if compared with the incidence among females in 1985 (RR 6.34 (95% CI 3.18–12.62)). In this county, the cases were not clustered by season or residence. An occupational risk factor, nursing, relevant for Guillain-Barré syndrome in

females, has been suggested.²⁴

We found a somewhat uneven geographical and temporal distribution of Guillain-Barré syndrome in Sweden. Higher incidence in populations served by neurologists, particularly concentrated at university hospitals—such as the high rates in Uppsala—may suggest that differences in ascertainment of mild cases or reporting quality underlie some high counts. High incidence rates in 1985 in some counties did not correspond to nearby areas. Whereas the high incidence in 1983 among those younger than 40 was suggested from Poisson regression, the study of interaction using this method proved relatively inefficient, likely due to the sparse variation of Guillain-Barré syndrome incidence rates. The high risk seasonal period suggested in southwest Stockholm and Stockholm County as late summer for younger people was found here. More difficult is the interpretation of the fall in incidence at ages 40 and over in December and June.

Comparisons in southwest Stockholm and Stockholm County, and at the national level, would support the notion that Guillain-Barré syndrome behaves as a similar entity across the country. Seasonality, a bimodal age specific distribution, and those Guillain-Barré syndrome subgroups identified in southwest Stockholm⁹ occur in the country as a whole. Guillain-Barré syndrome attributed to *Campylobacter jejuni* infection corresponds to a ubiquitous, severe form.^{25–28} Although Guillain-Barré syndrome preceded by *C. jejuni* infection has been sparsely reported in Sweden, *C. jejuni* is frequent in the country, with peak incidence rates from July to September.²⁹ We think that the subgroup denoted as H-B, identified in southwest Stockholm⁹ and characterised by a severe and highly incapacitating form of Guillain-Barré syndrome in the younger patients as well as a greater frequency in autumn, is present in Sweden. This shares traits with Guillain-Barré syndrome preceded by *C. jejuni* infection, such as severity, seasonal variation, and low rate of preceding respiratory infections. Cases of pure motor, severe Guillain-Barré syndrome, found to be linked to *C. jejuni* in The Netherlands were frequent in August.²⁷ The restriction of this subgroup to ages under 40 in our prior study⁹ may have resulted from overweighting of age in the classification procedure. Furthermore, *C. jejuni* could be hypothesised as a cause of seasonality and up to date unidentified summer outbreaks of Guillain-Barré syndrome in 1978 and 1983 in Sweden. An appropriate evaluation of possible small Guillain-Barré syndrome outbreaks, such as those in Västmanland in 1985, and in the summers of 1978 and 1983, would require access to clinical data. If proved preventable, as in the zimeldine epidemic, epidemiological surveillance for Guillain-Barré syndrome in Sweden would be worthwhile.

To conclude, the incidence of Guillain-Barré syndrome in Sweden during the period 1978–93 had a magnitude similar to those described in other surveys, bimodal distribu-

tion by age, and modest geographical and temporal variations with significantly high rates in 1978 and 1983 and in autumn. Minor outbreaks may have passed unnoticed up to the present date.

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