

# Asthma data from the Swiss Sentinel Surveillance Network, 1989–2005 – from monitoring to research

Ueli Bollag

Institute of General Practice, University of Berne, Switzerland

## Summary

*Questions under study / principles:* The Swiss Sentinel Surveillance Network (SSSN) has been used as a monitoring system for asthma epidemiology. Three aspects of asthma were studied between 1989 and 2005: the seasonal pattern of asthma, practice incidence and time trends for allergic and non-allergic asthma on the basis of the association of asthma with eczema and hay fever. The purpose of this report is to use the results from 17 years of asthma monitoring to show that the SSSN can be used as an instrument of research in practice.

*Methods:* Basically, monthly and yearly rates of episodes per 1000 consultations were calculated from weekly reports, and standard time series analysis methods were used to explore trends.

*Results:* The seasonal pattern shows distinct peaks of asthma attacks in June and November.

Long-term trends show that consultations for first asthma episodes increased up to 1999 and fell thereafter. Consultations for subsequent asthma episodes have fallen by a third since 1994. Short-term trends indicate a plateau from 1997 to 2000 before a steep decline. The separate analysis of allergic and non-allergic asthma shows that the decrease in asthma consultations is chiefly due to the allergic component of asthma.

*Conclusion:* These findings are similar to those from other studies for the same time-period and show that the SSSN can generate valid scientific data.

*Key words:* research in practice; Swiss Sentinel Surveillance Network; epidemiology of asthma

## Introduction

Scientific studies are principally conducted in the tertiary care (TC) sector of medicine in the form of randomised controlled trials addressing a specific issue. The results from these studies have limited applicability to primary care (PC) because the setting, functions and tasks of PC are different from those of TC. The challenge is to develop “real world” research capable of capturing the complex and highly variable aspects of PC.

In Switzerland, PC is about to become an academic discipline. Chairs of family medicine have already been established at Basel, Zurich, Lau-

sanne and Bern. Research in practice will be pivotal to confer credibility on these units and on the professional upgrading of PC in general, but the research methods and instruments must reflect the specific characteristics of PC. Sentinel networks have been established on these premises all over the world [1, 2].

The aim of this report is to use the results from 17 years of Swiss Sentinel Surveillance Network (SSSN) monitoring of asthma to show that a surveillance network can be used as an instrument of research in practice.

There is no conflict of interest in relation to this article.

## Methods

The SSSN is a practice-based morbidity collection system operated by primary care (PC) physicians and the Federal Office of Public Health (FOPH). Funding is provided by the latter for administration and logistics. Participation by the former is voluntary and not remunerated. Data are reported once per week.

Stratification by geographic area, sociodemographic characteristics and the PC physicians' speciality (general practitioner, general internists and paediatricians) ensures the network is representative [3]. To arrive at the greatest possible consistency, data were included only from those participants who reported  $\leq 75\%$  of the time (around 90%). Based on the adjusted total number of consultations and home visits covered by state subsidised insurance companies, the participant physicians represent about 3% of all physicians practising in the PC sector and provide around 3% of the total number of annual consultations [4]. The mix of primary care physicians was quite stable, averaging 58.5% (range: 56.3–59.8) for GPs, 27.4% (range: 25.8–28.6) for general internists and 14.1% (range: 12.1–16.3) for paediatricians.

SSSN physicians were guided by precise diagnostic criteria, which remained unchanged throughout the entire study period in order to minimise inter-observer diagnostic variability. Clinical case definitions are used in other sentinel networks for the same purpose [5].

Asthma was defined according to international consensus, including exertional, allergic and infectious causes: bronchial obstruction or hyper-responsiveness diagnosed by the presence of wheezing, dyspnoea or cough during or after physical exertion or on contact with

pollen, dust or animal dander; and cough at night without an acute respiratory infection or for more than two weeks after an acute respiratory infection [6]. Asthma was divided into two broad categories, allergic and non-allergic, on the basis of the association with eczema and/or hay fever. The evidence for combining eczema, hay fever and asthma on simple clinical and historical grounds stems from a number of studies on allergic asthma [7–9].

Three aspects of asthma were studied between 1989 and 2005, viz. the seasonal pattern of asthma [10, 11], practice incidence [12] and time trends for allergic and non-allergic asthma on the basis of the association of asthma with eczema and hay fever [13].

Four weekly rates of all reported asthma episodes per 100 consultations were calculated from 1989 to 2002 [10, 11]. From 1994 to 2002, the first consultation and all other subsequent consultations for asthma were recorded separately. Standard time series analysis methods were used to explore trends. Time series of rates consisted of a trend, a seasonal component and random error allowing for the seasonal component to be estimated [12]. Monthly and yearly rates of episodes per 1000 consultations were calculated from weekly reports for the period of 1999 to 2005. Rates were determined for first and subsequent asthma episodes, for allergic and non-allergic asthma and for the respective subgroups of allergic asthma [13]. Allergic asthma episodes were defined as episodes in patients suffering from eczema and/or hay fever, either from history or concomitantly with asthma [14].

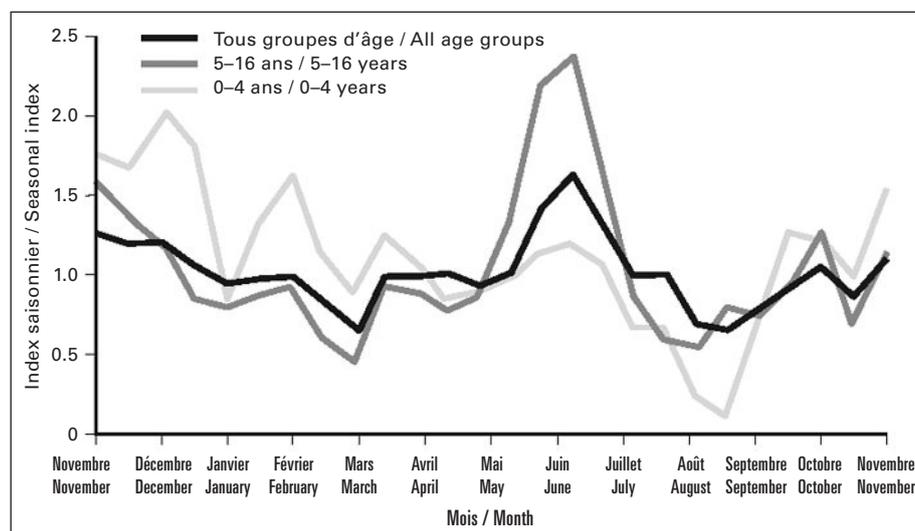
## Results

Figure 1 shows the seasonal pattern and distinct peaks of asthmatic attacks in June and November. The peak in June is most pronounced in children aged 5–16 years, and the peak in November mainly involves children aged 0–4 years.

Long-term trends in consultations for first asthma episodes increased to an estimated average of 0.78 (95% CI 0.74–0.81) per 1000 consulta-

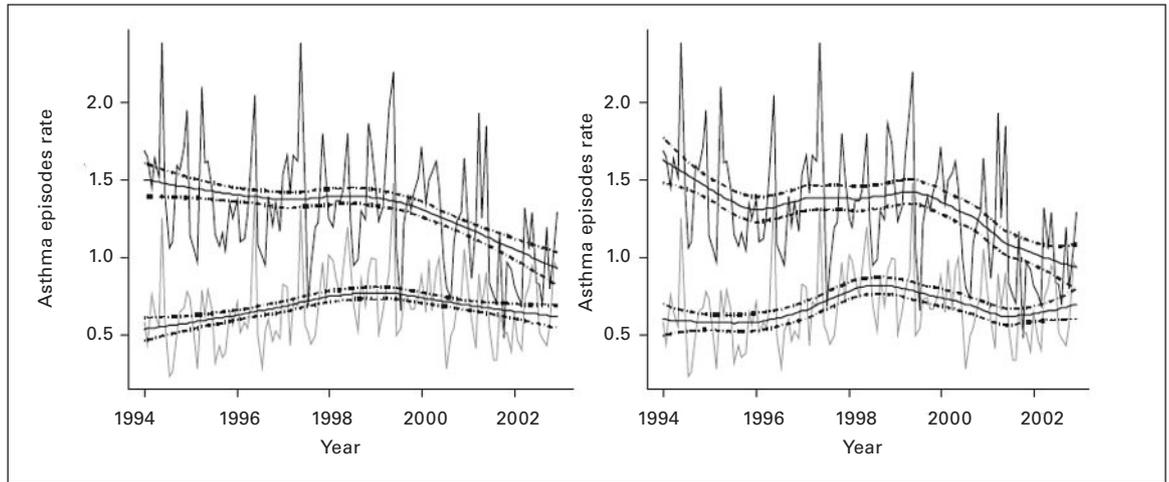
tions in 1999 and then fell to 0.62 (95% CI 0.55–0.69) in 2002 (fig. 2). Consultations for subsequent asthma episodes have fallen by 38.0% since 1994, from an estimated average of 1.50 (95% CI 1.40–1.61) per 1000 consultations to 0.93 (95% CI 0.82–1.04) in 2002. Short-term trends indicate a plateau from 1997 to 2000 before a steep decline.

**Figure 1**  
Seasonal pattern of asthmatic attacks, 1988–1996 (reproduced with permission from Eurosurveillance 1999;4[2]:23).



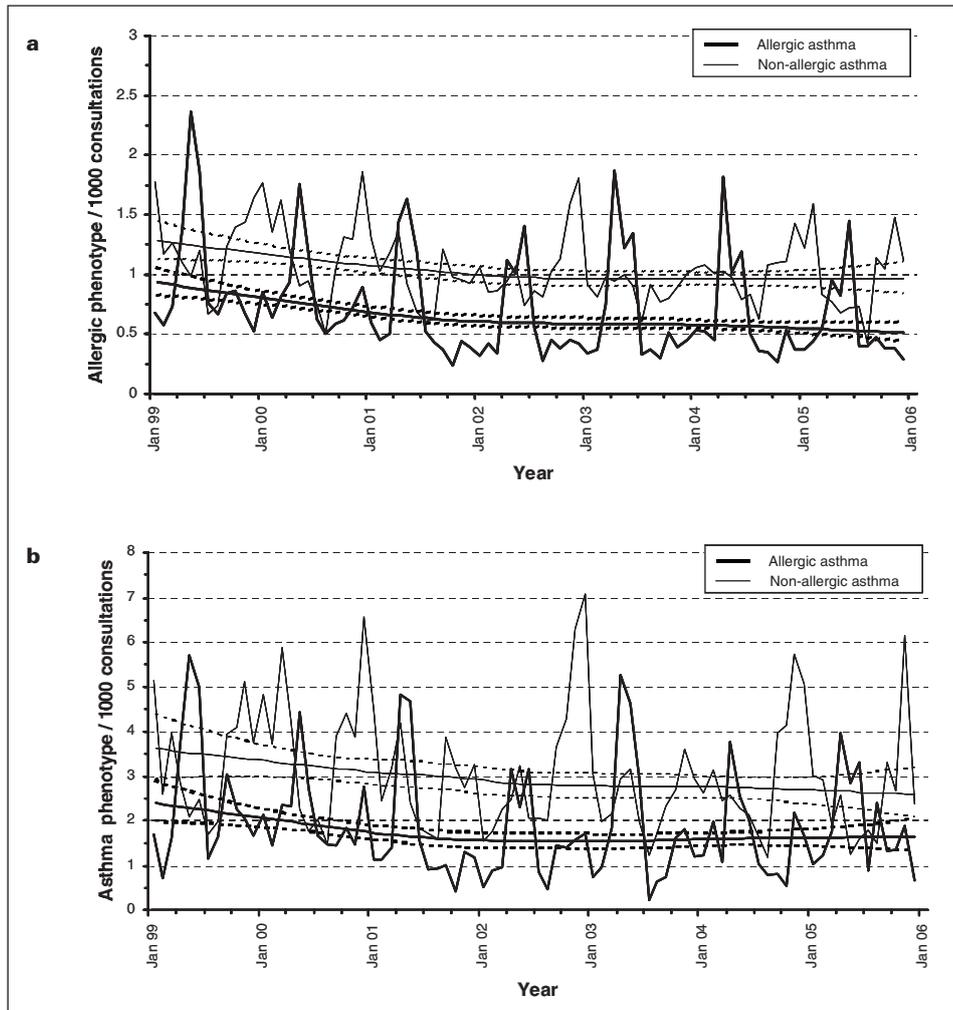
**Figure 2**

Long-term and short-term trends in first and subsequent episodes of asthma, 1994–2002. Four-weekly rates of first episodes per 1000 consultations (grey) and subsequent episodes (black). Left panel: Long-term trend estimates with loess smoother (solid line) and the corresponding upper and lower pointwise twice-standard-error curves (dashed lines);  $f = 2/3$ . Right panel: Short-term trend estimates with loess smoother (solid line) and the corresponding upper and lower pointwise twice-standard-error curves (dashed lines);  $f = 3/10$ . (reproduced with permission from Int J Epidemiol 2005;34:1015).



**Figure 3**

Long-term trends of allergic and non-allergic asthma: (a) episodes/1000 consultations in all age groups and (b) episodes/1000 consultations by paediatricians in 0–16-year-olds (reproduced with permission from Fam Pract 2009;26[2]:96–101).



Long-term trends in allergic and non-allergic asthma are shown in figure 3. Highly discordant peaks between allergic and non-allergic trend lines reveal the presence of two different asthma entities. Separate analysis of allergic and non-al-

lergic asthma among 0–16-year-old children seen by paediatricians in the SSSN (98% of all patients seen by paediatricians were in the age range 1–16) resulted in the same trends for the two phenotypes.

## Discussion

We have been able to describe important epidemiological aspects of asthma with the help of a network of primary care physicians in Switzerland. The seasonal pattern of asthma, which became evident after the first few years of this longitudinal study, were in accordance with the findings from other sentinel networks and the litera-

ture [15, 16]. The results of the second study on the practice incidence agree with those found by two separate groups of authors in the UK [17, 18]. The outcome from the third study, which focused on time trends of allergic and non-allergic asthma, was again congruent with findings in the UK [19, 20].

---

## Design of the studies

The framework, definition and rationale of PC research have been described [21, 22]. Our studies are related to one of their categories, including research into the epidemiology and natural history of common diseases and involving research networks which link community practices to academic resources. All the studies were accompanied by professionals in the field of research [10–13].

Asthma was chosen as a topic for long term monitoring because of the importance attached to it by society at large and because of the false data regarding its occurrence and impact on the population to be found in the press and studies conducted in tertiary care. During the early years PC physicians in the SSSN were reporting all encounters with patients attending for symptoms and signs of asthma, in order to create a critical mass of data. This allowed us to portray the annual distribution of the disease in different age groups.

The number of around 2000 asthma cases from one million consultations per year was a firm basis on which to study the practice incidence. Contrary to the common concept of a continued increase in asthma, we were able to show that consultations for asthmatic disorders had begun to fall during the second half of the nineties.

Stimulated by Martinez' publications on the different phenotypes of asthma [23], we concentrated our third study on separating allergic from

non-allergic asthma. We were able to show that the decrease in PC physicians' asthmatic patients was mainly due to the allergic component of asthma, a finding that was thus far unknown.

Our data must be interpreted in the light of some features which are specific to the Swiss health care system and to the SSSN, especially the denominator.

The denominator problem has been extensively discussed elsewhere [24]. Generally speaking, if practice data are used to estimate the denominator it is necessary to differentiate between countries with and without patient registration. Switzerland belongs to the latter category. Patients are free to consult a doctor of their choice, i.e. practices do not serve defined populations. Consultation-based denominators have been shown to be appropriate when time-series analyses are used to explore trends, as was the case in our studies [25]. Exact age-specific distributions could not be computed, as age and sex were collected only for consultations for asthma, but not for the total number of consultations. However, by extrapolation from a two times 2 weeks' registration of age and sex for every consultation in each year (in May and October to take into account seasonal variations), it could be shown that the age distribution did not change in spite of somewhat changing proportions within primary care physicians in the SSSN.

---

## Conclusion

The SSSN studies on asthma epidemiology extending over many years found that the seasonal prevalence of asthma shows a consistent pattern, with distinct peaks in different age groups. Consultations for asthma subsequent to the initial diagnosis have been declining since 1994. The clinical distinction between allergic and non-allergic asthma on the basis of the association of asthma with eczema and/or hay fever points to the allergic component as main contributor to this decrease. The similarity of time trends shown by the SSSN and international studies on the same topic

bear out the assumption that the SSSN is usable as a valid research instrument.

We are obliged to all the primary care physicians participating in the Swiss Sentinel Surveillance Network (SSSN) for their unceasing efforts to collect clinical and epidemiological data on asthma throughout the 17-year period. We also thank Dr. Peter Frey, Institute of General Practice, University of Berne, who has helped us with the reproduction of the graphs in the manuscript, and Leticia Grize, PhD, Institute of Social and Preventive Medicine, Dept. of Environmental and Health Sciences, University of Basel for correcting and formatting the manuscript.

## References

- 1 Eylenbosch WJ, Noah ND (eds). Surveillance in Health and Disease. Oxford: Oxford University Press, 1988.
- 2 Green L. Sentinel practices. *Fam Med*. 2000;32:394-5.
- 3 Joye D, Schuler M, Nef R, Bassand M. Typologie der Gemeinden der Schweiz. Ein systematischer Ansatz nach dem Zentren-Peripherien-Modell. Bern: Amtliche Statistik der Schweiz, N.154, Bundesamt für Statistik, 1988.
- 4 Matter HC, Cloetta J, Zimmermann HP and the Sentinella Arbeitsgemeinschaft. Measles, mumps, and rubella: monitoring in Switzerland through a sentinel network, 1986-1994. *J Epidemiol Community Health*. 1995;49 (Suppl 1):4-8.
- 5 Bartelds AJM. Validation of Sentinel Data. *Gesundh.-Wes*. 1993;55:3-7 Sonderheft 1.
- 6 Warner JO, Götz M, Landau LI, Levison H, Milner AD, Pedersen S, Silverman M. Management of Asthma: A Consensus Statement. *Arch Dis Child*. 1989;64:1065-79.
- 7 Illi S, von Mutius E, Lau S, et al. The natural course of atopic dermatitis from birth to age 7 years and the association with asthma. *J Allergy Clin Immunol*. 2004;113:925-31.
- 8 Corren J. Allergic rhinitis and asthma: how important is the link? *J Allergy Clin Immunol*. 1997;99:S781-S786.
- 9 Walker S, Sheikh A. Self reported rhinitis is a significant problem for patients with asthma. *Prim Care Respir J*. 2005;14:83-7.
- 10 Bollag U, Cloetta J, Oberreich J, Paget JW. Asthma trends in Switzerland: the Swiss Sentinel Surveillance Network, 1988-1996. *Euro Surveill*. 1999;4:21-4.
- 11 Bollag U, Paget WJ, Oberreich J, et al. Asthma in the community. Observations by the Swiss Sentinel Surveillance Network over a ten year period (1988-1997). *Eur J Gen Pract*. 2000;6:122-9.
- 12 Bollag U, Capkun G, Caesar J, Cloetta J. Trends in primary care consultations for asthma in Switzerland, 1989-2002. *Int J Epidemiol*. 2005;34:1012-8.
- 13 Bollag U, Grize L, Braun-Fahrlander C. Is the ebb of asthma due to the decline of allergic asthma: a prospective consultation based study by the Swiss Sentinel Surveillance Network, 1989-2005. *Fam Pract*. 2009;26(2):96-101.
- 14 Nystad W, Magnus P, Gulsvik A. Increasing risk of asthma without other atopic diseases in school children: A repeated cross-sectional study after 13 years. *Eur J Epidemiol*. 1998;14:247-52.
- 15 Smith JM. Epidemiology and Natural History of Asthma, Allergic Rhinitis and Atopic Dermatitis (Eczema). In: Reed CE, Ellis EF (eds): Allergy: Principles and Practice. St.Louis. The C.V. Mosby Co (1978):644-7.
- 16 Fleming DM, Norbury CA, Crombie DL. Annual and Seasonal Variation in the Incidence of Common Diseases. Occasional Paper 53, London, Royal College of General Practitioners 1991.
- 17 Fleming DM, Sunderland R, Cross KW, Ross AM. Declining incidence of episodes of asthma: a study of trends in new episodes presenting to general practitioners in the period 1989-98. *Thorax*. 2000;55:657-61.
- 18 Anderson HR, Ruggles R, Strachan DP. Trends in prevalence of symptoms of asthma, hay fever, and eczema in 12-14 year olds in the British Isles, 1995-2002: questionnaire survey. *BMJ*. 2004;328:1052-3.
- 19 Gupta R, Sheikh A, Strachan DP, Anderson HR. Time trends in allergic disorders in the UK. *Thorax*. 2007;62:91-6.
- 20 Anderson HR, Gupta R, Strachan DP, Limb ES. 50 years of asthma: UK trends from 1955 to 2004. *Thorax*. 2007;62:85-90.
- 21 Starfield B. A framework for primary care research. *Family Practice*. 1996;42:181-5.
- 22 Mold JW, Green LA. Primary care research: revisiting its definition and rationale. *Family Practice*. 200;49:206-8.
- 23 Martinez FD, Wright AL, Taussig LM, Holberg CJ, Halonen M, Morgan WJ. Asthma and wheezing in the first six years of life. The Group Health Medical Associates. *N Engl J Med*. 1995;332:133-8.
- 24 Anderson JE. The utility of routine encounter reporting in primary care research. In: Kilpatrick SJ and Boyle RM (Eds). 1984. Primary Care Research. Encounter Records and the Denominator Problem. New York: Praeger.
- 25 Schlaud M, Brenner MH, Hoopmann M, Schwartz FW. Approaches to the denominator in practice-based epidemiology: a critical overview. *J Epidemiol Community Health*. 1998;52 (Suppl 1):13S-19S.

---

*Correspondence:*  
 Dr. med. Ueli Bollag  
 Waldheimstrasse 51  
 CH-3012 Berne  
 E-Mail: u.bollag@bluewin.ch