

The BAMSE Project: presentation of a prospective longitudinal birth cohort study

Wickman M, Kull I, Pershagen G, Nordvall SL. The BAMSE Project: presentation of a prospective longitudinal birth cohort study. *Pediatr Allergy Immunol* 2002; 13 (Suppl. 15): 11–13.

© 2002 Blackwell Munksgaard

The aims of this prospective and longitudinal project are to establish crucial risk factors for asthma and other allergic diseases in childhood, and to study factors of importance for prognosis at already established allergic disease. Socio-economic factors, such as inequality in health, are also to be addressed. The project started in February 1994. To reach sufficient power, 4,000 children had to be included. In November 1996, this number was reached (4,093). Inclusion in the study was made at 3–4 months of age. At that time, and before induction of allergic disease/asthma of the child, a questionnaire focused on exposure, genetics and socio-economic factors was answered. Settled dust was sampled for later analysis of furred animal and mite allergens. When the children were aged both 1 and 2 years, their parents were asked to fill in new questionnaires focusing on respiratory and allergic (skin, gastrointestinal) symptoms, but also key variables of exposure. Cases with asthma are identified and, for every case, two matched controls drawn. During the following winter, the homes of cases and controls were investigated and the temperature, indoor humidity, air change rate and NO₂ measured. Two hundred cases (5%) were expected to be identified during the first 2 years of the children's lives. Some 479 homes have now been investigated and 97.7% of the original 4,093 children still remain in the cohort. The 2-year symptom follow-up ended in November 1998. The 4-year follow-up started on 1 September 1998 and was planned to be finished in June 2000. Questionnaires (allergic and respiratory symptoms, key variables of exposure at home and day care) are sent out to all 4,093 families. All children are invited for examination, lung function tests (PEF, flow-volume, MVV and oxygen clearance) and physical performance. Blood is taken from all children (20 ml). Allergy screening is performed and specific IgE examined. Blood cells will be frozen to allow for later DNA extraction. In subsets (children with any allergic and/or respiratory manifestation and controls), markers of inflammation in blood and urine will be examined, as well as eosinophils in nasal smear. Interviews are carried out to assess the severity of asthma, type/periodicity of health care given, asthma medication and parental sick leave when appropriate. As a separate project, financed by the EU, outdoor pollution as risk factors for asthma and allergies are to be studied within the BAMSE cohort. A follow-up of 8–9 years is underway.

**Magnus Wickman^{1–3},
Inger Kull^{1,2},
Göran Pershagen² and
S. Lennart Nordvall⁴**

¹Department of Environmental Health, Stockholm County Council, Stockholm, Sweden, ²Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, ³Sachs's Children's Hospital, Institute of Södersjukhuset, Karolinska Institute, Stockholm, Sweden, ⁴Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden

Magnus Wickman, Department of Environmental Health, Norrbacka Building, Level 3, Karolinska Hospital, SE-171 76 Stockholm, Sweden
Tel.: +46 8 5177 7912
Fax: +46 8 5177 7900
E-mail: magnus.wickman@smd.sll.se

The incidence of asthma and other allergic diseases continues to increase, not least among children and teenagers. Several factors have an impact on the development and prognosis of childhood asthma. In addition to genetic factors,

environmental influences are thought to play an important role and, among them, factors as discrepant as socio-economic status and housing are of great importance. Follow-up of children who develop asthma at an early age, to determine

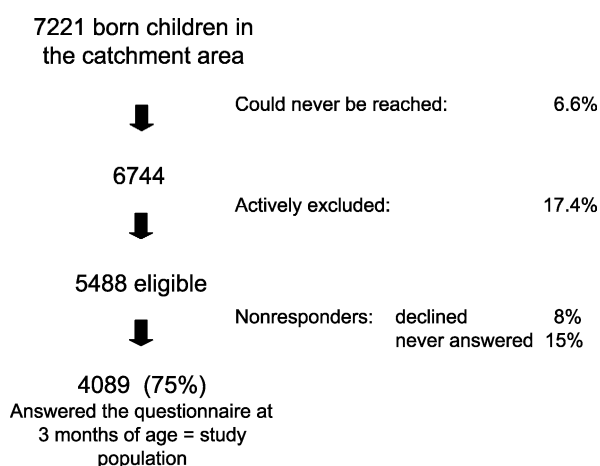


Fig. 1. Description of the study population.

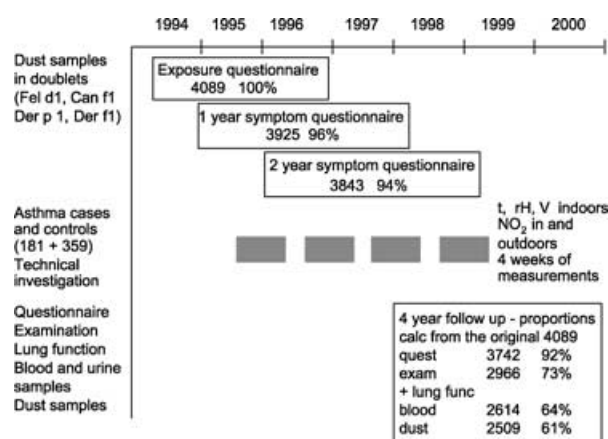


Fig. 2. Flow chart of the BAMSE project from the start up to the 4-year follow-up time-point.

which factors play a part in lifelong disease, is of great importance.

The BAMSE Project aims to elucidate, in detail, the role of several factors (e.g. heredity, socio-economic conditions, environment, diet, and infections) believed to be of importance in the development of asthma, eczema, and other allergic diseases among children.

Methods

Study subjects

Between February 1994 and November 1996, parents of all newborn children ($n = 7221$), living in certain areas of northern and central Stockholm, were asked to participate in the study (Fig. 1). Inner city, urban and suburban districts were represented in the study area, which included areas with different types of buildings and socio-economic status (education and profession) of the parents. Access to a community population register ensured that the parents of all infants born in the area during the period under study were included. However, 477 could never be reached and another 1,256 children were actively excluded, according to the following exclusion criteria: the family planned to move within 1 year of the study start; insufficient knowledge of the Swedish language; the family had a seriously ill child; or an older sister or brother was already included in the study. A total of 1,399 parents of children were defined as non-responders. The final study cohort comprised 4,089 infants, which constituted 75% of the eligible subjects. During the first 2 years of participation, three questionnaires were mailed to the parents (Fig. 2). The first questionnaire was completed when the child

was 3 months old: parents were requested to provide details concerning their age, conditions in the perinatal period, housing, lifestyle, socio-economic status, and allergies within the family. Dust samples were collected for analysis of indoor allergens. When the children were 1 and 2 years old, the parents were asked to complete detailed questionnaires on allergy and asthmatic symptoms, infections and vaccinations, and the child's diet. A response rate of 96% was achieved for the questionnaire mailed when children reached 1 year of age and 94% for the questionnaire mailed when children reached 2 years of age. Ninety-three per cent of the study population completed all three questionnaires concerning the first 2 years of the child's life.

Analysis for generalization of data

At the start of 1996, and after ethical approval had been obtained, a short version of the previous questionnaire was mailed to 1,418 families who, for different reasons, had not been included in the study. The children targeted were 4–15 months of age at this time. Details of parental heredity, parental smoking at 2–4 months following the birth of the child, and the presence of furred pets in the household were asked for, in order to be able to study parental reasons to participate or not in relation to these factors. Of these 1,418 families, 43% had chosen not to respond to the initial request to participate in the study; 23% had responded, but abstained from participation; and a further 32% had planned to move within 1 year and were actively excluded. The overall response rate was 67%; and among the three groups was 58% (chose not to respond); 63% (responded but abstained); and 83% (planned to move and were actively excluded).

Results

Analysis of the 1,418 non-responders and actively excluded families compared with the BAMSE cohort

Any or double heredity did not differ between the non-responders and actively excluded families compared with the study population of 4,089 families. Neither did the keeping of pets. However, parental smoking was significantly more prevalent among the non-responders and actively excluded families than among the participating families (maternal smoking: 18% vs. 9% in the BAMSE cohort; paternal smoking: 23% vs. 17% in the BAMSE cohort). There was no significant difference in parental smoking between non-responders and actively excluded families. Therefore, heredity for atopic disease did not influence the willingness to participate, but lifestyle (as indicated by parental smoking) did.

Preliminary results

The 4,089 children recruited to the study at 3 months of age were followed-up when 1 and 2 years of age. The cumulative incidence of asthma, as defined here, was 8.5%, and the corresponding figure for atopic dermatitis was 25% and, for suspected allergic rhinitis, 7%. Significant risk factors for asthma-fulfilling criteria included low maternal age (<26 years), maternal smoking (especially during pregnancy), male gender, short parental education, and dampness and/or fresh paint in the home. Breast-feeding reduced

the risk not only for asthma, but also for other allergy-related disorders in infancy.

Follow-up at 4 years of age

In December 2000, the follow-up at 4 years of age was closed. The parents responded to a questionnaire on current exposure, allergic diseases, gastrointestinal problems, and infections. Detailed questions concerning medication for asthma in relation to the level of medical care and use of medical facilities were administered. The children were examined using pulmonary function tests (peak expiratory flow, tidal flow-volume curves, and nitrogen washout). Blood samples were obtained for determination of specific immunoglobulin E (IgE) and serological testing for signs of viral infection. Blood cells were collected for DNA extraction and examination of genetic markers. Questionnaire data are available for 92% of the children included in the cohort. Of these, 79% undertook the examinations described above. Moreover, dust samples were collected from the homes of many of these families, to enable estimation of longitudinal allergen exposure and possible associations with the development of allergic disease. The database is now under preparation.

Continued follow-up

Follow-up at 8–9 years will occur during 2003 and the first half of 2004. Follow-up at 14 years of age is also planned.