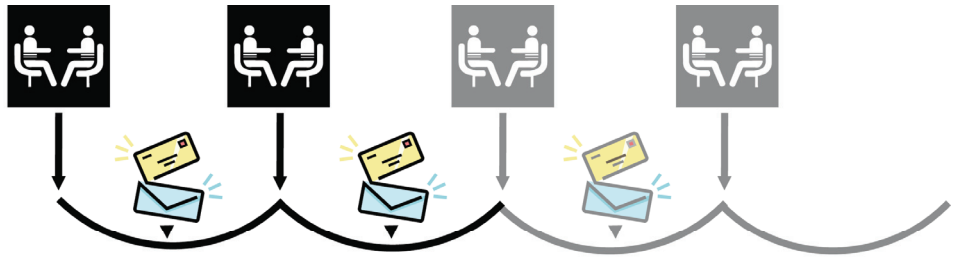
2 Methods

Data source

This report presents results from ACAM's analysis of data from Growing Up in Australia: the Longitudinal Study of Australian Children. LSAC was initiated and is funded by the Australian Government Department of Families, Community Services and Indigenous Affairs (FaCSIA) and aims to explore a range of research questions about children's development and wellbeing. The study commenced in 2004 with a sample of approximately 10,000 children recruited from the Medicare enrolments database. With the exception of children living in some remote areas of Australia, the sample is broadly representative of Australian children in each of two selected age cohorts: children born between March 2003 and February 2004 and, hence, aged 3–19 months at baseline (infant cohort) and children born between March 1999 and February 2000 and, hence, aged 4 years and 3 months to 5 years and 7 months at baseline (kindergarten cohort). The intention of the study is to reassess the children every two years until 2010, at which time the infant cohort will be 6–7 years of age and the kindergarten cohort will be 10–11 years of age, using a combination of face-to-face interviews and mail-out surveys as shown in Figure 2.1.



Note: Data from baseline and 2 year follow-up have been analysed in this report.

Figure 2.1: Timeline of the Longitudinal Study of Australian Children, indicating face-to-face interviews and mail-out surveys and the age of the cohorts at these times

The primary study informant is the person, such as the child's parent or main care giver, who knows the most about the child, their birth, history and current routines (FaHCSIA: Wake et al. 2008). Typically this has been the child's biological mother (Sanson et al. 2002). In addition, the LSAC cohorts have been linked to the PBS and MBS databases, where consent was given for this linkage (approximately 93% of parents gave permission). This will facilitate the acquisition of data on the child's use of medicines and medical care during the course of the study.

The analysis presented here relates to data on asthma and wheezing, together with relevant data on risk factors and outcomes, that were collected when the infant or child was enrolled (that is, baseline or Wave 1) and at the 2 year follow-up assessment (that is, Wave 2) on both cohorts.

Definitions

Wheeze is a term used throughout this report to describe parent-reported symptoms of wheezing, which was evaluated as a positive response to the question 'Has [child] had an illness with wheezing in the chest which lasted for a week or more in the last 12 months?'.

Asthma is used to describe parent-reported asthma that has 'ever' been clinically diagnosed by a physician and has been evaluated as a positive response to the question 'Has a doctor ever told you that [child] has asthma?'.

Maternal asthma. Information about maternal asthma was not collected as part of the LSAC. In our analysis we have assumed that mothers who reported using either prescribed or 'over-the-counter' medicines for asthma during pregnancy, had asthma.

The use of prescribed medications for asthma during pregnancy was defined as a positive response to the question 'During the pregnancy with [child] did you/child's mother take any medicines or tablets on a doctor's prescription?' and then by marking 'asthma medication' in response to 'What prescribed medicines or tablets were taken?'. Likewise, the use of over-the-counter medication for asthma was evaluated as a positive response to the question 'During the pregnancy with [child], did you/child's mother take any over-the-counter medicines or tablets, like paracetamol or vitamins?' and then by marking 'asthma medications (Ventolin etc.)' in response to 'What over-the-counter medications were used?'.

Study data

At baseline of the LSAC, 5,107 infants and 4,983 4–5 year old children were recruited, representing 57% and 50%, respectively, of those approached to participate (Table 2.1). The main reasons for non-participation at baseline were refusals, or non-contact due to PO Box or families having moved. Children with a name matching that of a child that had died were removed from the sample. A design weight was calculated for each child selected in the survey, to adjust for initial non-response (Soloff et al. 2006). Ninety percent of both cohorts participated in the 2 year follow-up assessment.

Table 2.1: Sample sizes and response rates by cohort and wave

	Infant cohort		Kindergarten cohort	
	Wave 1 (baseline) (0–1 years)	Wave 2 (follow-up) (2–3 years)	Wave 1 (baseline) (4–5 years)	Wave 2 (follow-up) (6–7 years)
Number sent a letter of invitation	8,921	..	9,893	..
Number recruited	5,107	4,606	4,983	4,464
Response rate	57%	90%	50%	90%

.. Not applicable

Note: Response rates for wave 2 (follow-up) are based on the number of participants retained from wave 1 (baseline).

Representativeness of the data

The LSAC sample is broadly representative of the Australian population (FaHCSIA: Wake et al. 2008). However, there are aspects of the LSAC sample design which have introduced bias into the sample. These include a selection design based on geographical representation and voluntary participation.

The Medicare database was used as the sampling frame for LSAC to ensure that the sample chosen was representative of infants and 4–5 year old children in Australia. In the first stage of the design postcodes were selected for inclusion. Some remote postcodes were excluded from the sample due to the small number of children residing in these remote areas and the excessive costs that would have been associated with data collection (Soloff et al. 2005). As a consequence, the sample frame excludes 40% of children living in remote areas (FaHCSIA: Wake et al. 2008; Hunter 2008). Furthermore, the study design explicitly excluded Indigenous communities in remote areas. The under-representation of children, especially Indigenous children, living in remote areas significantly impedes our analysis of associations between remoteness and asthma.

The Health Insurance Commission (HIC) invited selected families to participate in the study by letter. Families could opt out of the study by either phoning a 1800 number or returning a reply paid form (Soloff et al. 2006). Parents or carers of 31% of infants and 35% of 4–5 year old children declined to participate. This non-participation rate might potentially be a source of selection bias. In fact, mothers who had not completed Year 12 at school and those who spoke a language other than English were more likely refuse to participate in LSAC (Soloff et al. 2006). Non-response was also more common for single-parent families, Indigenous children, families that spoke a language other than English at home, the child's father not having completed Year 12 and the child not having any siblings (FaHCSIA: Wake et al. 2008; Soloff et al. 2006). The effect of this potential selection bias due to non-response was minimised by the use of a data weighting scheme designed to adjust for differences between the sociodemographic structure of the LSAC sample and that of the Australian population.

In summary, the results presented here are broadly representative of Australian infants and children between the ages of 4 and 5 years, except for children living in very remote areas.

Analysis methods

A general description of the analysis methods used in this report is provided here. Further information about analysis methods that are relevant to specific chapters of this report can be found within those chapters.

Incidence

Incidence is defined as the number of new cases (of a disease, condition or event) occurring in a population during a given period.

Incidence rates are calculated as the number of *new* cases in a period of time divided by the total person years at risk during that period.

In this report, incidence rates have been calculated for:

- the incidence of wheeze or asthma by the age of 2–3 years among the infant cohort; and

- the incidence of asthma between ages 5 and 7 years among the child cohort.

For the infant cohort, the total person years at risk at 2 year follow-up was calculated as the sum of the total time of observation for each child, that is, from birth up to age 2–3 years.

For the kindergarten cohort, the total person years at risk at 2 year follow-up was calculated as the sum of the time between baseline and 2 year follow-up, for each child who did not have asthma at the baseline survey.

Tests for association

Logistic regression

Associations between risk factors measured at baseline and outcomes measured at 2 year follow-up were assessed using logistic regression models that accounted for the clustered survey design (Proc Surveylogistic, SAS version 9.1). Univariate analyses were conducted first, to estimate the unadjusted associations. Multivariable logistic regression was then used to identify any independent associations between each risk factor and the outcome.

Odds ratios

Results derived from the logistic regression models were expressed as odds ratios (OR) with 95% confidence intervals. The OR is the ratio of the odds of an outcome, such as the incidence of asthma, in children with a specific risk factor and the odds of that outcome in children without that risk factor.

Rate ratios

The effect of asthma status at baseline in the kindergarten cohort on outcomes during follow-up was estimated as a rate ratio.

For a particular outcome, the rate ratio (RR) was calculated as:

$$RR = P_e / P_{ue}$$

where P_e is the proportion of children with the outcome at age 6–7 years among children with wheeze or ever diagnosed asthma at age 4–5 years; and

P_{ue} is the proportion of children with the outcome at age 6–7 years among children with no wheeze or ever diagnosed asthma at age 4–5 years.

The P_e and P_{ue} were estimated using Proc Surveymeans, SAS version 9.1, to account for the clustered survey design.

The 95% confidence intervals (95% CI) for the rate ratios were calculated as:

$$95\%\ CI = RR^{(1 \pm 1.96/\chi)}$$

where $\chi = (P_e - P_{ue}) / \sqrt{se(P_e)^2 + se(P_{ue})^2}$ (Parkin et al. 1992).

Population attributable fraction

To quantify the impact of having wheeze or ever diagnosed asthma at age 4–5 years on outcomes measured at age 6–7 years, we calculated the population attributable fraction (PAF) for each outcome. PAF can be described as the reduction in the proportion of the

population who would experience a particular outcome (for example, hospitalisation) if no children had the risk factor, in this case wheeze or ever diagnosed asthma at baseline.

For a particular outcome, the PAF% was calculated as:

$$PAF\% = (P_e \times (RR - 1)/(P_e \times (RR - 1) + 1)) \times 100$$

where P_e is the prevalence of wheeze or ever diagnosed asthma at age 4–5 years and RR is the rate ratio for the association between having wheeze or ever diagnosed asthma at baseline and experiencing the outcome during follow-up.