Trends in childhood illness and treatment in Australian general practice, 1971–2001

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ABSTRACT

Objective: To determine changes in morbidity and management of disease in children in Australian general practice.

Design and setting: A comparative study of general practice consultations in children under 15 years, using data from cross-sectional general practice surveys (1990–91 and 2000–01), and a descriptive comparison with a similar study from 1971.

Main outcome measures: Relative rates of management (rate/100 general practice encounters) of the most common children's problems and treatments.

Results: Problems with significantly higher management rates in 2000–01 compared with 1990–91 included vaccination (11.1 v 7.6 per 100 encounters in 1990–91) and contact/allergic dermatitis (3.1 v 2.5). Those managed significantly less often in 2000–01 v 1990–91 included acute otitis media (7.7 v 9.4), asthma (5.4 v 8.8), tonsillitis (4.4 v 6.0), acute bronchitis (3.8 v 5.3) and gastroenteritis (1.7 v 2.7). Asthma management rates rose from 2.4% of all problems managed in 1971 to 7.2% in 1990–91, then fell in 2000–01 to 4.6%. More frequent rates of counselling and advice in 2000–01 (28.4% of encounters v 22.9% in 1990–91) were associated with a decrease in rates of prescribing and supply of medication (56.6% of encounters v 64.3% in 1990–91). Antibiotic prescribing declined significantly (from 33.8 per 100 encounters in 1990–91 to 25.2 in 2000–01), as did prescribing of respiratory medications (from 15.5 to 9.9 per 100 encounters), while prescribing of vaccines and systemic corticosteroids doubled (from 9.6 to 18.8 per 100 encounters, and from 0.6 to 1.2, respectively). (All comparisons between 1990–91 and 2000–01 are significant at $P < 0.01$.)

Conclusions: These findings point to the emergence of a generation of Australian children who are generally well vaccinated and are less likely to present to GPs with "traditional" childhood illnesses.

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OBSERVING CHANGES in patterns of healthcare over time gives a picture of trends in disease and disease management. In Australia, estimates from 1985 and 1995 suggested a threefold increase in obesity prevalence in 7–15-year-olds.[1] A decrease in incidence of vaccine-preventable diseases in Australia between 1990–91 and 2000 was associated with increased vaccination levels.[2] Population-based studies in children have shown that, between 1992 and 1996, there was a 1.4% rise per year in prevalence of current wheeze, and a 3.0% rise in prevalence of type 1 diabetes.[2]

We investigated changes in childhood illness and treatment in Australian general practice by comparing data from three surveys spanning three decades.

METHODS

Our study is a secondary, comparative analysis of general practice consultations with children aged under 15 years. We used data from the year-long national Australian Morbidity and Treatment Survey 1990–91 (AMTS)[3] and the third year (2000–01) of the national BEACH program (Bettering the Evaluation and Care of Health).[4] For descriptive comparisons, we also used previously published data from the second year of the 1969–1974 Australian general practice morbidity and prescribing survey.[5]

Data sources

In 1970–71, during the Australian general practice morbidity and prescribing survey (1969–1974), 769 volunteer general practitioners each recorded details of surgery consultations and home visits for 1 week.[5] Morbidity data were classified by the GPs according to 200 codes selected from the *International classification of diseases*, 8th revision (ICD-8).[6] Prescribing data for children were not reported.

■ *Subsample of children: 24 237 consultations, 769 GPs*

In the AMTS (1990–91), a random sample of 495 GPs (stratified by state) each recorded details of surgery and home encounters for two periods of 1 week, 6 months apart.[3] Problems managed were classified according to the *International classification of primary care* (ICPC).[7] The AMTS included medications prescribed or supplied by the GP and these were classified according to the *Coding atlas for pharmaceutical substances* (CAPS).[4]

■ *Subsample of children: 15 655 encounters, 492 GPs*

In 2000–01 a random sample of 999 GPs each recorded details of 100 consecutive patient encounters wherever they occurred.[4] Problems managed were classified according to the *International classification of primary care*, version 2 (ICPC-2).[8] Medications prescribed, supplied or recommended for over-the-counter purchase were classified according to CAPS.

■ *Subsample of children: 11 381 consultations, 913 GPs*

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To compare results of the BEACH survey with those of AMTS, the BEACH 2000–01 dataset was limited to surgery and home visits, and medications recommended for over-the-counter purchase were excluded. Application of a map ensured comparability between ICPC and ICPC-2.

Statistical analysis

Both AMTS and BEACH used random samples of GPs, each providing data about a cluster of encounters. To control for this design effect, we adjusted for clustering at the individual GP level using SAS.[9] All reported *P* values and 95% CIs are based on the standard error, adjusted using the robust variance estimator method according to Kish's formula.[10] Pearson's χ^2 test was applied in testing differences in proportions (using Stata)[11] and linear regression for differences in rates (using SAS).[9] Results are reported as proportions when describing the distribution of an event that could arise only once per encounter, and as rates per 100 encounters when an event could occur more than once.

RESULTS

Descriptive comparison of the three studies

Between 1971 and 2000–01, management rates (percentage of problems managed by GPs) for vaccination rose substantially, while rates for tonsillitis, bronchitis, gastroenteritis and laceration decreased. The management rate for asthma peaked in 1991 (Box 1).

Comparative analysis, 1990–91 and 2000–01

Patients

There was no significant difference between the two studies in the sex distribution of patients (males: 52.3% in 1990–91 v 51.6% in 2000–01; $P = 0.28$). However, the age distributions differed ($P < 0.001$). There was no difference in the proportion of children aged less than 1 year (14.5% in 1990–91 v 15.7% in 2000–01), but there was a greater proportion of children aged 1–4 years in 2000–01 (34.9% in 1990–91 v 37.8% in 2000–01) and those aged 5–14 years in 1990–91 (50.7% in 1990–91 v 46.5% in 2000–01).

Problems managed

Fewer problems were managed at encounters in 2000–01 (117.8/100) than in 1990–91 (121.7/100) ($P < 0.001$). Respiratory conditions were identified as the most common problem managed by both studies, but the rate decreased from 45.3/100 encounters in 1990–91 to 38.4/100 in 2000–01 ($P < 0.001$). The rate/100 encounters for upper respiratory tract infection (URTI), the most common

1: Comparison of the top 10 childhood problems managed by GPs in 1971 compared with 1990–91 and 2000–01

	Percentage of problems*		
Problem managed†	1971 (*n* = 24237)	1990–91 (*n* = 19051)	2000–01‡ (*n* = 13406)
Upper respiratory tract infection	13.7%	14.6%	14.8%
Tonsillitis	8.4%	5.0%	3.7%
Bronchitis/bronchiolitis	7.5%	4.3%	3.3%
Otitis media	6.6%	7.7%	6.6%
Vaccination	5.4%	6.2%	9.5%
Gastroenteritis/dysentery§	3.9%	2.2%	1.4%
Asthma	2.4%	7.2%	4.6%
Laceration	2.3%	1.2%	0.9%
Eczema/dermatitis§	2.1%	2.4%	3.0%
Otitis externa	1.4%	1.5%	1.1%

* Presented in terms of proportion of total problems managed as they were reported in the 1971 published data; *n* = number of problems.
† Problems managed are presented with 1971 labels and order of frequency.
‡ 2000–01 BEACH (Bettering the Evaluation and Care of Health) sample reduced to surgery and home encounters only.
§ Based on 1971 classification groups.

2: Comparison of childhood problems most frequently managed by GPs in 1990–91 and 2000–01

	Rate per 100 encounters (95% CI)		
Problem managed*	1990–91 (*n* = 15655)	2000–01† (*n* = 11381)	*P*
Acute upper respiratory infection	17.8 (16.7–18.8)	17.4 (16.4–18.5)	0.673
Acute otitis media/myringitis‡	9.4 (8.7–10.1)	7.7 (7.1–8.3)	0.001
Asthma‡	8.8 (8.0–9.5)	5.4 (4.9–5.9)	< 0.001
Vaccination all§¶	7.6 (6.7–8.5)	11.1 (10.3–12.0)	< 0.001
Tonsillitis‡§	6.0 (5.5–6.6)	4.4 (3.9–4.8)	< 0.001
Acute bronchitis/bronchiolitis‡	5.3 (4.7–5.9)	3.8 (3.4–4.3)	< 0.001
Viral disease, unspecified¶	3.4 (2.8–3.9)	4.2 (3.7–4.7)	0.017
Gastroenteritis, presumed infection‡	2.7 (2.4–3.1)	1.7 (1.4–1.9)	< 0.001
Dermatitis, contact/allergic¶	2.5 (2.2–2.7)	3.1 (2.8–3.5)	0.002
Conjunctivitis‡	2.5 (2.3–2.8)	2.0 (1.8–2.3)	0.014
Average number of problems‡	121.7 (120.2–123.2)	117.8 (116.6–119.0)	< 0.001

* Problems managed are presented in 1990–91 order of frequency; *n* = number of encounters.
† 2000–01 BEACH (Bettering the Evaluation and Care of Health) sample reduced to surgery and home encounters only.
‡ Indicates a significant decrease in relative management rate from 1990–91 to 2000–01.
§ Includes multiple ICPC-2 (*International classification of primary care*, Version 2) or ICPC-2 PLUS codes.
¶ Indicates a significant increase in relative management rate from 1990–91 to 2000–01.

3: Significant changes in rates of medication prescribed or supplied by GPs for children (1990–91 and 2000–01)

Medication group*	Rate per 100 encounters (95% CI) 1990–91 (*n*=15655)	2000–01† (*n*=11381)	*P*
Antibiotics‡	33.8 (32.4–35.1)	25.2 (24.0–26.5)	< 0.001
Broad-spectrum penicillin‡	15.4 (14.4–16.5)	11.3 (10.4–12.1)	< 0.001
Amoxycillin‡	13.1 (12.1–14.0)	9.0 (8.2–9.8)	< 0.001
Penicillin/cephalosporins§	7.5 (6.8–8.2)	9.2 (8.4–9.9)	0.001
Cefaclor monohydrate§	1.7 (1.3–2.1)	4.5 (3.9–5.1)	< 0.001
Flucloxacillin‡	1.1 (0.9–1.4)	0.5 (0.3–0.6)	< 0.001
Other antibiotics‡	5.2 (4.6–5.8)	3.2 (2.8–3.6)	< 0.001
Erythromycin‡	5.0 (4.4–5.7)	2.2 (1.8–2.6)	< 0.001
Roxithromycin§	—	0.9 (0.6–1.1)	—
Sulfonamides‡	4.0 (3.5–4.5)	0.7 (0.6–0.9)	< 0.001
Cotrimoxazole‡	4.0 (3.5–4.5)	0.7 (0.6–0.9)	< 0.001
Anti-infectives	0.8 (0.6–1.0)	0.4 (0.3–0.6)	0.001
Metronidazole oral/systemic‡	0.6 (0.5–0.7)	0.3 (0.2–0.4)	0.001
Respiratory‡	15.5 (14.2–16.7)	9.9 (9.0–10.8)	< 0.001
Bronchodilator/spasm relaxant‡	9.0 (8.2–9.8)	5.9 (5.3–6.6)	< 0.001
Salbutamol‡	6.4 (5.7–7.0)	4.0 (3.6–4.4)	< 0.001
Asthma preventives	2.7 (2.3–3.1)	2.8 (2.4–3.2)	0.765
Fluticasone propionate§	—	0.7 (0.5–0.9)	—
Budesonide inhaled§	—	0.6 (0.4–0.7)	—
Beclomethasone‡	1.6 (1.4–1.9)	0.6 (0.4–0.7)	< 0.001
Decongestant/expectorant/cold relief‡	2.5 (2.0–2.9)	0.8 (0.6–1.1)	< 0.001
Chlorpheniramine/phenylephrine‡	1.0 (0.8–1.2)	—	—
Theophyllines/other respiratory‡	1.0 (0.8–1.2)	—	—
Theophylline‡	0.8 (0.6–1.0)	—	—
Allergy, immune system§	12.5 (11.2–13.9)	19.7 (17.8–21.6)	< 0.001
Vaccination§	9.6 (8.3–11.0)	18.8 (16.9–20.6)	< 0.001
Adult/combined diphtheria/tetanus‡	1.2 (1.0–1.5)	0.5 (0.3–0.6)	< 0.001
Mumps/measles/rubella§	0.8 (0.6–0.9)	2.1 (1.8–2.4)	< 0.001
Hepatitis B§	0.6 (0.4–0.7)	1.7 (1.4–2.1)	< 0.001
Haemophilus influenzae type b§	—	3.7 (3.2–4.3)	—
Diphtheria/pertussis/tetanus/hepatitis B§	—	0.8 (0.6–1.1)	—
Chickenpox (varicella zoster)§	—	0.6 (0.4–0.8)	—
Antihistamine‡	2.7 (2.3–3.1)	0.8 (0.6–1.0)	< 0.001
Astemizole‡	0.5 (0.4–0.7)	—	—
Skin‡	8.4 (7.9–9.0)	7.2 (6.5–7.8)	0.003
Anti-infective skin‡	2.8 (2.6–3.1)	1.7 (1.3–2.1)	< 0.001
Clotrimazole topical‡	0.9 (0.7–1.0)	0.4 (0.2–0.5)	< 0.001
Hormones§	0.6 (0.5–0.8)	1.4 (1.1–1.7)	< 0.001
Corticosteroids systemic§	0.6 (0.4–0.7)	1.2 (0.9–1.4)	< 0.001
Prednisolone sodium phosphate oral§	—	0.8 (0.6–1.0)	—
Total medication rates‡	88.1 (85.2–90.9)	80.2 (77.5–82.9)	< 0.001

* Medication groups are presented in 2000–01 order of frequency.
† Medications prescribed or supplied at surgery and home encounters only.
‡ Indicates a significant decrease in relative prescribing rate from 1990–91 to 2000–01.
§ Indicates a significant increase in relative prescribing rate from 1990–91 to 2000–01.

problem managed, was similar in both studies. Otitis media, asthma, tonsillitis, bronchitis and gastroenteritis were frequently managed in both periods, but at lower rates in 2000–01. Conversely, there was a significant increase in the rate/100 encounters for vaccination and for contact/allergic dermatitis over the decade (Box 2).

Treatment

There was a shift away from pharmacological treatment towards counselling and advice. The proportion of encounters involving medication management decreased from 64.3% in 1990–91 to 56.6% in 2000–01 ($P < 0.001$), while those involving advice and counselling increased from 22.9% to 28.4% ($P = 0.001$). The number of medications prescribed or supplied also decreased from 88.1/100 encounters to 80.2/100 ($P < 0.001$).

Changes in specific medication rates were apparent in most major drug categories. Some changes were influenced by the availability of new medications (eg, new vaccines). Box 3 compares the relative rates of prescribing of common medication groups, subgroups and generic drugs at encounters with GPs.

Prescribing of broad-spectrum penicillins, other antibiotics and sulfonamides decreased. However, the prescribing of penicillins/cephalosporins increased as a result of a 100% rise in cefaclor monohydrate prescribing.

Allergy and immune system drugs were prescribed more often in 2000–01, as a result of a twofold increase in vaccination, in particular mumps/measles/rubella and hepatitis B vaccines. *Haemophilus influenzae* type b, diphtheria/pertussis/tetanus/hepatitis B and chickenpox vaccines became available during the 1990s and were regularly prescribed in 2000–01. Adult/combined diphtheria/tetanus vaccine was less frequently recorded after the introduction of the combined vaccine with hepatitis B.

Respiratory medication rates declined, with a decrease in use of bronchodilators, and no record of use of theophyllines in the 2000–01 study. Conversely, rates of hormone therapy more than doubled, mainly as a result of the rise in prescriptions for systemic corticosteroids, particularly oral prednisolone, which was not available in 1990–91 (Box 3).

DISCUSSION

The availability of three datasets spanning a 30-year period provides a rare opportunity to follow trends in childhood illnesses and their management. Our major findings were the rise and fall in asthma encounters, with a peak in the early 1990s, a decline in encounters for common childhood ailments, an increase in encounters for vaccination, and finally, a decrease in prescribing and an increase in encounters providing counselling and advice.

The decrease in asthma management rates between 1990–91 and 2000–01 may reflect more effective management and the availability of medication at pharmacies. However, a peak in asthma incidence was also observed in the United Kingdom in 1993–94[12] and in children in the United States in 1995.[13] In Australia, hospitalisation rates for asthma dropped from 913 per 100 000 children in 1993–94 to 593 in 1999–00,[2] which corresponds with the decrease in its management in general practice.

A decline in the prevalence of common respiratory ailments in the 1990s was also found in a study in the former East Germany — the decrease in childhood incidence of non-allergic respiratory illness, including otitis media, tonsillitis and bronchitis, was associated with a marked decline in air pollution after reunification.[14] Reduced levels of pollution may also partly explain our results, with Australia's stricter laws governing pollutant emissions taking effect. The significant decrease in gastroenteritis management rates in children could be linked to improved hygiene education and stricter controls on childcare facilities and food outlets. Similar patterns were found in a Malaysian study where the incidence of some foodborne diseases in children steadily declined from 1988 to 1997.[15]

The marked rise in rate/100 encounters for vaccination reflects structured public health initiatives and the introduction of new vaccines. There was a concomitant rise in providing or prescribing vaccines, which accounted for 23% of all medications prescribed or supplied in 2000–01 for children under 15 years. Factors related to this increase include the General Practice Immunisation Incentive scheme, which has remunerated doctors since 1996 for vaccinations undertaken; more patients being vaccinated by GPs after the progressive withdrawal of local government vaccination programs; and the advent of the Australian Childhood Immunisation Register, whose data indicated a rise, from 63.8% in 1996 to 88.0% in 1999, in fully vaccinated 2-year-olds.[2]

Significant changes in medication rates are to be expected over a decade, with a swing away from certain older drug types in favour of newer medications. Part of the decline in antibiotic use may reflect the trend away from antibiotic prescribing for the frequently managed problem URTI. However, the doubling in rate of prescribing of cefaclor monohydrate might raise questions about compliance with guidelines for antibiotic use.[16] The decrease in bronchodilator prescribing reflects the lower rates of asthma management in the 2000–01 study, but would also be due to availability of salbutamol as an over-the-counter drug from the mid 1990s. The significant increase in hormone prescribing stemmed specifically from systemic corticosteroids, in particular prednisolone sodium phosphate liquid, which was not available in 1990–91, but was prescribed at one in every 100 encounters in 2000–01, showing adoption of a new therapy for asthma and other allergic conditions.

Our study has some limitations. Firstly, lack of access to raw data from the 1971 survey precluded statistical testing of comparisons with that study and limited presentation of results to proportions of total problems managed (as published). Secondly, the volunteer sample of GPs may not be representative of practising GPs at the time. Thirdly, use of a clinician-applied ICD code subset may have caused variation in classification, and the codes may not be totally comparable with those of the ICPC. Finally, by necessity, the comparison of 1990–91 and 2000–01 data was based on raw (unweighted) figures (as national sample weights cannot be applied to a subsample), and thus may not be perfectly representative on a national basis.

This overview of childhood illness and management in general practice shows that Australian children are now more likely to visit a GP for prophylactic treatment and less likely to be treated for "traditional" childhood conditions. They are also much less likely to receive medication and more likely to receive counselling for their problems.

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COMPETING INTERESTS

None identified.

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