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PHARMACOEPIDEMIOLOGY AND PRESCRIPTION

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# Uptake of new drugs in rural and urban areas of Queensland, Australia: the example of COX-2 inhibitors

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**Abstract** *Objective*: This study compared the changes over time in the volume of prescriptions of COX-2 selective inhibitors between rural and urban Queensland to reveal any difference in the uptake of the prescribing of these new drugs between two geographically distinct areas.
*Methods*: This study used data from an administrative claims database. Dispensing data were obtained for celecoxib and rofecoxib in two areas, one rural and one urban, defined by postcodes. The numbers of consumers in these areas were similar and they were served by similar numbers of general practitioners. The number of defined daily doses (DDDs) of celecoxib and rofecoxib dispensed at specific times was calculated.
*Results*: Statistical analysis revealed no significant difference between the total numbers of DDDs of COX-2-selective non-steroidal anti-inflammatory drugs dispensed in the rural and urban groups over the period August 2000 to December 2002 ($P = 0.81$). The rate of uptake of usage was also clearly similar between the urban and the rural groups. Total usage peaked in August 2000 in both groups (urban 39 DDD/1,000 people per day; rural 37 DDD/1,000 people per day), coinciding with the pharmaceutical benefits scheme (subsidized) listing of celecoxib. The number of DDDs declined dramatically in the following month, and then peaked again in May 2002 (urban 34, rural 36). The number of DDDs then steadily decreased in both areas after October 2002.
*Conclusion*: The results suggest that the marketing of the new COX-2 inhibitors and the patients' anticipation of a safe and effective treatment have overcome the geographical boundaries of Queensland. Both areas had very high rates of uptake of the prescribing of these new drugs.

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## Introduction

Arthritis is common in Australia, with an estimated 3.1 million people—16.5% of the population—affected [1]. Non-steroidal anti-inflammatory drugs (NSAIDs) treat the pain and inflammation of rheumatoid arthritis and osteoarthritis; however, their use has been associated with gastrointestinal (GI) ulceration, cardiac failure and renal dysfunction. Newer agents, COX-2 selective inhibitors (coxibs), were originally reported to be less likely to cause GI ulceration [2]. Despite ongoing debate about benefits, limitations and place in therapy, prescribers quickly embraced these coxibs [2, 3]. The worldwide withdrawal of rofecoxib (Vioxx) will intensify this debate.

Little research has focused on the influences on prescribing habits of general practitioners (GPs) in rural areas, especially the prescribing of new drugs. Diffusion of new innovations may be slower in areas exposed to less marketing activity and with difficult access to continuing education. GPs themselves perceive that the influences on rural prescribers are different to the influences on urban practitioners [4]. When asked specifically about the prescribing of celecoxib, GPs in rural Australia were significantly less likely ($P < 0.05$) than their urban counterparts to report initiating prescribing. [4]. It remains to be determined whether this self-reported behaviour is reflected in actual prescribing data.

The aim of this study was to compare the volume of prescription claims for celecoxib and rofecoxib between

rural and urban Queensland over the time since their listing on the Australian universal medicines reimbursement schedule (PBS). This will reveal any difference in the uptake of dispensing (as a proxy for prescribing) of these new drugs between two geographically distinct areas.

## Methods

Two distinct geographic areas in Queensland, a rural and an urban environment, were delineated by postcode. Areas were chosen with similar populations and GPs per head of population. The rural group contained a population of 63,454 [5] with 67 full-time equivalent (FTE) GPs [6]. The urban group contained similar populations; 63,537 people [5] with 67 FTE GPs [6].

Ethics approval was obtained from the UQ School of Pharmacy Ethics Committee. Dispensing data were obtained by specific request for each of these geographical areas from the Health Insurance Commission (HIC). The data were aggregated by the HIC to ensure individual prescribers could not be identified. The data supplied were the number of items dispensed on the PBS of celecoxib 100 mg and 200 mg and rofecoxib 12.5 mg and 25 mg since their introduction until December 2002. All items were above both the general and the concessional co-payment, ensuring complete data collection of the government subsidised prescriptions.

The World Health Organisation (WHO), Anatomic Therapeutic Chemical (ATC) classification codes (2003 version) were used, and the dispensing data were converted to defined daily doses (DDDs) [number of DDD = (quantity of tablets dispensed)/(DDD/strength of tablet)]. Data were standardised to DDD per 1,000 head of population per day. The DDD for celecoxib was 200 mg and for rofecoxib was 12.5 mg (2003).

Student's *t*-tests assessing the significance of any differences between the pooled means of the two groups (rural versus urban) were undertaken (SPSS version 11.5 for Windows). Statistical significance was determined as $P < 0.05$.

## Results

Figures 1 and 2 show the dispensing data for the two drugs individually in each area and for the combination, overall dispensing of COX-2 inhibitors. The similarity in dispensing data for the two distinct geographic areas is obvious.

Statistical analysis revealed no significant difference between the mean total numbers of DDD/1,000 people of the coxibs dispensed between the rural and urban groups ($P = 0.81$; Fig. 1). Total usage peaked in August 2000 in both areas (urban 39 DDD/1,000 people per day, rural 37), coinciding with the PBS listing of celecoxib. The number of DDD/1,000 people per day declined dramatically in the following month, and then peaked again in May 2002 (urban 34, rural 36).

In contrast to celecoxib listing, PBS listing of rofecoxib (February 2001) resulted in no drastic change in the monthly numbers of DDD/1,000 people per day in rural and urban areas.

Statistical comparisons of the mean numbers of DDD/1,000 people per day of each drug individually revealed no significant differences between the geographically distinct groups (Fig. 2).

## Discussion

Few studies have compared the prescribing of rural GPs to that of their urban counterparts[4, 7]. Despite rural practitioners stating that they are less likely to prescribe newer drugs [4], this present study demonstrated that for coxib drugs, the uptake in prescribing in a rural area was rapid and was identical to a matched urban area. This is consistent with previous research showing the rapid adoption of celecoxib and rofecoxib, assessed using a

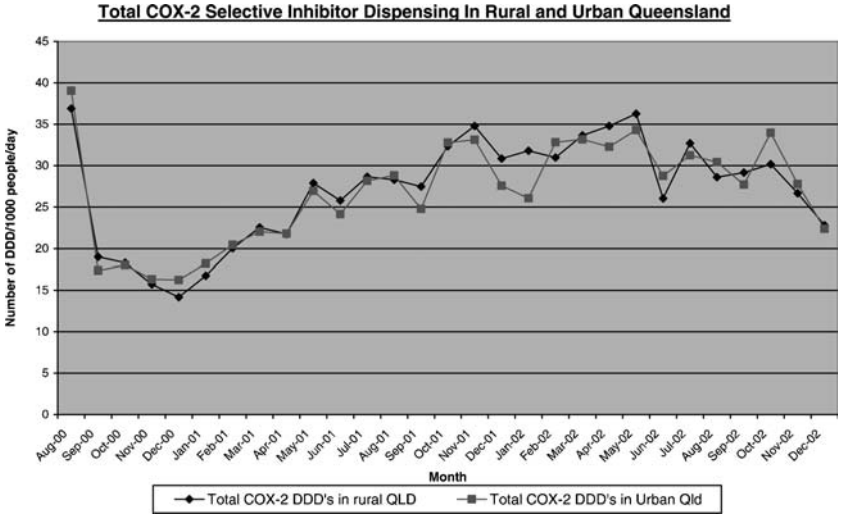


**Fig. 1** Total COX-2 selective inhibitor dispensing in rural and urban Queensland

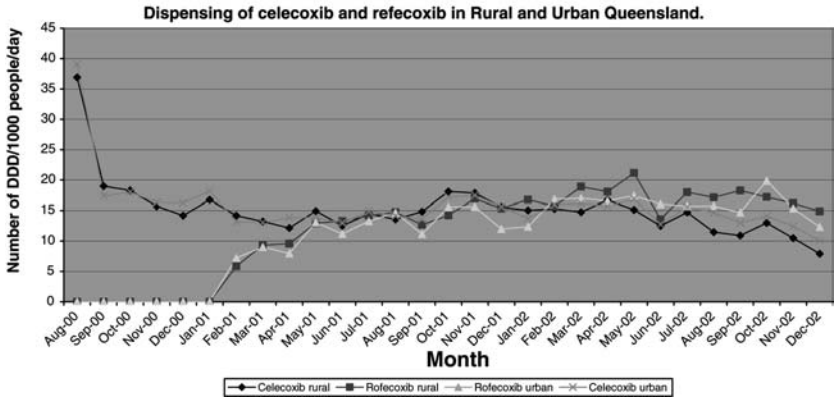


**Fig. 2** Dispensing of celecoxib and rofecoxib in rural and urban Queensland

retrospective analysis of GPs' patient records [3]. There are many factors, such as psychosocial, media and consumer demand, that potentially contributed to this quick uptake in both geographical areas and in Australia.

A self-administered questionnaire study [8] compared the influences on prescribing between rural and urban GPs. Rural GPs perceived that their practice location affected their prescribing. They preferred to prescribe a new drug if it required less monitoring and felt they were less likely than urban GPs to initiate a newly registered drug [8]. Possible reasons suggested for this included that rural GPs could be less innovative or there may be less pressure from patients and other doctors to prescribe new drugs [8].

Early studies investigating the diffusion of innovation in prescribing have suggested that uptake of new drugs depends on prescriber characteristics such as age and years of experience [9] and that diffusion of medical innovation is heavily mediated through the doctor's networks [10]. Doctors who received information from many sources were more likely to be early adopters of a new drug [10]. In the present study, rural doctors were more likely to be male (44/67 versus 33/67) and younger (mean age 45 years versus 52 years). The number of years spent practicing in each of the study areas was not available.

Two studies investigating the psychosocial influences on prescribing found that GPs are largely reactive recipients, rather than active searchers for new drug information and much of the information is from the pharmaceutical industry [11, 12]. Independent information was highly regarded; however, it was perceived as too negative about the advantages of a new drug [12]. Many GPs stated that they prescribed a new drug if their patient requested it, justifying this by citing time constraints and the desire to avoid conflict and to increase the patient's role in the decision making [11]. A positive experience with using a new drug, especially after the failure of alternative therapy, induced a change in prescribing behaviour [11, 12].

Indirect promotion of these new coxibs to the public occurred through lay channels, with both coxibs being available in other countries before their Australian release. Arthritis sufferers were aware of the promoted benefits of the new medications, which may have stimulated unmet demand to treat these common conditions or raised expectations that they would offer better relief than available products [13]. It has been reported that the uptake of new drugs is associated with attention from the mass media and patients' requests for prescriptions [10, 14, 15]

The HIC administrative database of prescription claims was used as a proxy for prescribing in this study. This is valid in Australia, where cost of subsidised medicines is not a prohibitive factor in having a prescription dispensed. Primary non-compliance is low and is likely to be similar to the UK (which also has a small price barrier) at around 3% [16]. All drugs were above the patient co-payment, thus ensuring full data capture. In Australia, dispensing data are not linked to the patient's disease demographics and no data describe the prevalence of musculoskeletal conditions between rural and urban Queensland, so this study cannot incorporate differences in disease demographics between the two areas.

Despite rural GPs saying that they do not prescribe these new drugs as readily as their urban counterparts [4] and perceiving that the influences on their prescribing are different to those on urban prescribers [4, 8], this present study has shown no difference in uptake of prescribing of the COX-2 inhibitors in two distinctly geographically different areas. The data from this present study indicate that effective methods of information dissemination were being used for the coxibs, which influenced rural and urban Australia. These marketing activities, direct and indirect, must have had a good reach across all geographic areas to achieve widespread knowledge and stimulate the immediate demand.

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