

# The rising cost of anticancer drugs in Australia

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## ABSTRACT

**Background:** Anticancer drugs are often expensive and are contributing to the growing cost of cancer care. Concerns have been raised about the effect rising costs may have on availability of new anticancer drugs.

**Aims:** To determine recent changes in the costs of anticancer drugs in Australia.

**Methods:** Publically available expenditure and prices paid by the Australian Pharmaceutical Benefits Scheme (PBS) for anticancer drugs from 2000 to 2012 were reviewed. The measures used to determine changes in cost were total PBS expenditure and average price paid by the PBS per prescription for anticancer drugs and for all PBS listed drugs. An estimated monthly price paid for newly listed anticancer drugs was also calculated.

**Results:** Annual PBS expenditure on anticancer drugs rose from \$65 million in 1999-2000 to \$466 million in 2011-2012; an average increase of 19% per annum. The average price paid by the PBS per anticancer drug prescription, adjusted for inflation, increased 133% from \$337 to \$786. The real average annual increase in the price per anticancer drug prescription was more than double that for all other PBS drugs combined (7.6% v 2.8%, difference 4.8%, 95% confidence interval -0.4% to 10.1%,  $p=0.07$ ). The median price for a month's treatment of the new anticancer drugs listed was \$4919 (range \$1003 to \$12578, 2012 prices).

**Conclusions:** PBS expenditure and the price of anticancer drugs in Australia rose substantially from 2000 to 2012. Dealing with these burgeoning costs will be a major challenge for our health system and for those affected by cancer.

**Key Words:** Drug costs, cancer, health care costs, pharmaceutical benefits scheme, drug access

## Introduction

The cost of health care is rapidly rising. Health spending in Australia in recent years has increased at a faster rate than spending on all other goods and services.<sup>1</sup> This increase in costs creates major challenges for health care systems, particularly those like Australia's that are publically funded.

The cost of cancer care has more than doubled over the past 20 years with a most recent estimate of over \$5 billion per year in 2009.<sup>2</sup> The causes are complex and include the growing availability and use of new and expensive anticancer drugs.<sup>3</sup> Spending on drugs is one of the fastest growing components of health care costs in developed countries.<sup>1</sup> Anticancer drugs are estimated to represent 10% of cancer costs in OECD countries.<sup>4</sup>

Concerns have been raised about the effects of rising prices on the availability of new anticancer drugs.<sup>4,5,6</sup> In Australia, widespread access to expensive drugs depends on whether they are listed on the Pharmaceutical Benefits Scheme (PBS). PBS listing requires a favourable assessment of cost-effectiveness which is not forthcoming for every effective anticancer drug. Gaining access to effective anticancer drugs that are not listed on the PBS is a major dilemma for patients and doctors. However, we were unable to find published reports focusing on the costs of anticancer drugs in Australia that might inform clinicians and patients facing this increasingly common challenge.

The aims of this study were to 1) determine changes in PBS expenditure on anticancer drugs from 2000 to 2012; 2) compare price increases for anticancer drugs to other drugs listed on the PBS; 3) determine the monthly price paid for newly listed anticancer drugs; and, 4) consider the reasons for, and implications of, our findings.

## Methods

### ***PBS expenditure and average prescription prices***

We determined annual expenditure and prescription volumes for all PBS listed drugs, and for anticancer drugs (using the PBS subcategory *Anti-neoplastics*), from the publicly available *Pharmaceutical Benefits Pricing Authority Annual Reports (2000- 2010)* and *Pharmaceutical Benefits Scheme Expenditure and Prescription reports (2003-2012)*.<sup>7, 8</sup> The average price paid by the PBS per prescription was calculated by dividing the total expenditure by prescription volumes for each year. Patient co-payments were not included in these calculations. All prices were adjusted to reflect 2012 values (“real” prices) using the average health prices inflation figure of 3.0% from 1999-2000 to 2010-2011.<sup>1, 9</sup>

### ***Monthly prices of newly listed anticancer drugs***

*PBS schedules* from January 2000 to June 2012 were searched for listings of new anticancer drugs that were categorised under the PBS subcategory *Anti-neoplastics*.<sup>10</sup> Drugs that were listed on the PBS prior to 2000 but granted additional indications from 2000 to 2012 were not included. Prices paid by the PBS for a month’s treatment (28 days) were calculated for each new anticancer drug using the recommended schedule and ‘typical’ dose calculated for a patient with body surface area (1.73m<sup>2</sup>) and/or body weight (70kg).<sup>11</sup> If a drug dose varied during a treatment protocol then the dose used for the majority of the protocol was chosen for the typical dose calculation.

For each new anticancer drug listed, the *dispensed price for maximum quantity* was determined from the PBS schedule in the year the drug was listed.<sup>10</sup> An approximation of the price paid by the PBS for each dose was determined by calculating the proportion of the maximum quantity required for a typical dose. For intravenous drugs, we determined the price using the most efficient

combination of vials required for the typical dose. The estimated price paid per month was determined by multiplying the price per dose by the number of doses required per month.

We did not consider anticancer drugs listed under subcategories other than *Anti-neoplastics*, for example, endocrine therapies, vaccines, supportive care drugs, and drugs for non-melanoma skin cancer.

### ***Statistical analysis***

Descriptive statistics were used to analyse the monthly prices of new drugs listed on the PBS. A paired t-test was used to compare the annual average price rise in anticancer drugs to the annual average price rise for all other PBS listed drugs combined. Data was analysed with SPSS version 20.

## Results

PBS expenditure on anticancer drugs and the average price paid by the PBS for anticancer drugs both climbed markedly from 2000 to 2012. Expenditure on anticancer drugs rose from \$64.8 million in 1999-2000 to \$466.3 million in 2011-2012. The peak expenditure occurred in 2010-2011 and was \$561.3 million (Figure 1). PBS expenditure, excluding anticancer drugs, climbed at a lower rate from \$3.1 billion in 1999-2000 to \$8.6 billion in 2011-2012. The average annual increase in PBS expenditure on anticancer drugs over this time period was 19.1% compared with 9.0% for all other drugs combined. Expenditure on anticancer drugs was a small but growing proportion of total PBS expenditure: 2.0% in 1999-2000, 6.4% in 2010-2011 and 5.1% in 2011-2012 (Figure 2).

The average price paid by the PBS per anticancer drug prescription increased 133% in real terms from \$338 in 1999-2000 to \$786 in 2011-2012 (all adjusted to 2012 prices, Figure 3). The average price reached a peak of \$850 in 2009-2010. The average price paid by the PBS for all prescriptions, excluding anticancer drugs, increased 37% in real terms from \$32 to \$44. The real average annual increase in the average price paid by the PBS per anticancer drug prescription from 2000 to 2012 was more than double that for all other PBS drugs combined (7.6% v 2.8%) but this trend was not statistically significant (difference 4.8%, 95% confidence interval -0.4% to 10.1%,  $p=0.07$ ).

There were 23 new anticancer drugs listed on the PBS between January 2000 and June 2012 (Table 1). Most drugs were listed in the second half of the study period and 14 of the 23 (61%) were listed for treatment of solid malignancies. Chronic myeloid leukaemia was the malignancy with the highest number of new drugs listed. The median price for a month's treatment of the new anticancer drugs listed during the study period was \$4919 (2012 prices). Prices per month for individual drugs ranged from \$1003 to \$12578 (Figure 4; See Appendix 1 for list of individual drugs).

## Discussion

This is the first report in the medical literature describing the increasing costs of anticancer drugs to the Australian PBS. The 7-fold increase in expenditure from 2000 to 2012 is identical to that seen in Europe from 1993 to 2004.<sup>12</sup> The median price paid by the PBS for a year's treatment of the new anticancer drugs listed during the study period was approximately \$60,000 in 2012 prices. The average price paid by the PBS per prescription for anticancer drugs has more than doubled in real terms, climbing an average of 7.6% per annum, which echo US price rises over a similar period.<sup>13</sup> In comparison, the average price paid by the PBS for all other PBS drugs combined has increased more gradually.

The many and complex reasons for the rise in PBS expenditure on anticancer drugs include increases in the prevalence of cancer and in the proportions of patients for whom there are suitable treatments.<sup>14</sup> The 7.6% rise per annum in the average price paid by the PBS per prescription for anticancer drugs is driven by rapid growth in the number of new expensive drugs. This may explain why the average prices paid for prescriptions used to treat other high burden diseases, in which the number of newly available drugs has grown more slowly, have changed much less. For example for drugs used to treat diabetes, the average annual increase in the average prescription price paid by the PBS over the study period was 1.6%, while for lipid-modifying drugs and psychoanaleptics used to treat mental illness, there have been average annual falls of 2.4% and 2.0% respectively.<sup>7, 8</sup>

The effort to develop newer and better drugs to treat patients with cancer has resulted in over 70 anticancer drugs being currently listed on the PBS, many with multiple indications.<sup>10</sup> The US Food and Drug Administration approved 12 new anticancer drugs in 2012 alone.<sup>15</sup> Some have argued that the price of new anticancer drugs is increasing rapidly because of the increasing cost of drug development, with estimates ranging from \$500 million to \$2 billion per new drug approved.<sup>16</sup> This figure includes substantial expenditure on drugs that fail to reach the market. For example, it is

estimated that of the 920 drugs tested in clinical trials between 1990 and 2006, only 32 were approved in the US.<sup>17</sup> Debate continues about whether these costs justify the asking price for new anticancer drugs, particularly when marketing budgets and profits are also substantial.<sup>15</sup>

Many new anticancer drugs are molecularly-targeted and are substantially more expensive than traditional cytotoxic drugs.<sup>12</sup> The beneficial effects of targeted anticancer drugs are usually confined to a subgroup of all patients. The presence of a testable molecular target offers the potential to identify and treat only those for whom treatment is most likely to be beneficial. This reduces the total number of patients to be treated, which should reduce total costs, but also provides a commercial rationale for increasing the price to make up for a smaller market. Another factor tending to increase the total costs of molecularly targeted agents is that they are often used for longer periods than their cytotoxic counterparts.<sup>18</sup> Furthermore, older anticancer drugs are commonly not phased out with the introduction of new drugs but rather used sequentially or in combination which also significantly contributes to growing costs.<sup>19</sup>

Reductions in prices of anticancer drugs due to the availability of generic equivalents can help mitigate the effect of expensive new drugs on the growth rate of expenditure. Australia's pricing and reimbursement system may result in a lower price for new drugs, but a higher price for generic drugs, in comparison with similarly developed countries.<sup>20</sup> Therefore, the potential cost savings due to the use of generic drugs may not be as substantial in Australia as in other developed countries, an effect which is compounded by the speed of oncology drug development. Newer, more expensive versions of existing anticancer drugs that are either equivalent or offer only modest additional benefits may penetrate the market and reduce the use of cheaper generics by making them seem suboptimal and superseded.<sup>19</sup>

This study is limited by its short time frame (2000 to 2012) and focus on drugs listed under the *Anti-neoplastics* sub-category which does not include endocrine drugs used to treat breast cancer or

prostate cancer or immunomodulating drugs such as the colony stimulating factors commonly used in conjunction with chemotherapy. Our estimates of the monthly prices for new anticancer drugs are based on the price listed on the PBS schedule, whereas the actual prices paid by the PBS are negotiated in confidence by the Pharmaceutical Benefits Pricing Authority, and can involve special pricing arrangements and risk sharing agreements.<sup>21</sup> This study also ignores variations in total costs attributable to variations in durations of use.

It was surprising to see that total expenditure on anticancer drugs and the average prescription price paid by the PBS dropped in 2011-2012. This was partly due to PBS listing of cheaper generics for high use drugs such as docetaxel and the introduction of the Australian Commonwealth government's *Efficient funding of chemotherapy drugs* policy.<sup>22</sup>

Despite rapid rises in total expenditure on anticancer drugs, and in the average price paid by the PBS per prescription, anticancer drugs accounted for less than 6% of the total PBS budget in 2012.

Anticancer drugs are estimated to account for about 10-15% of expenditure on cancer care; hospitalisation of cancer patients is estimated to account for about 70%.<sup>23</sup> Nevertheless, the rising costs of anticancer drugs substantially strains publicly funded health care systems like Australia's.

The Pharmaceutical Benefits Advisory Committee (PBAC), the body that makes recommendations to the Federal health minister as to whether new drugs should be publically reimbursed, is just as likely to make a positive recommendation for an anticancer drug as it is for other drugs.<sup>24</sup> Despite this, the high price asked for many new anticancer drugs often results in an initial rejection for PBS listing due to the PBAC's reasonable assessment of unsatisfactory cost-effectiveness. This delays, and therefore reduces access to reimbursed new anticancer drugs.

This study indicates that patients wanting to use new anticancer drugs that are not reimbursed currently face bills of about \$5000 per month. Physicians will increasingly find themselves in the

difficult position of having to discuss with patients whether the financial toxicity of these new drugs is warranted by their benefits, which are often relatively modest.<sup>25</sup>

This study demonstrates a substantial increase in the average prescription price paid by the PBS for anticancer drugs, over and above inflation for health prices in general, alongside a rapid growth in total government expenditure on anticancer drugs. Dealing with these burgeoning costs at both the societal level, and for individuals, while retaining effective, equitable and readily accessible cancer care, poses a major challenge for all health systems.

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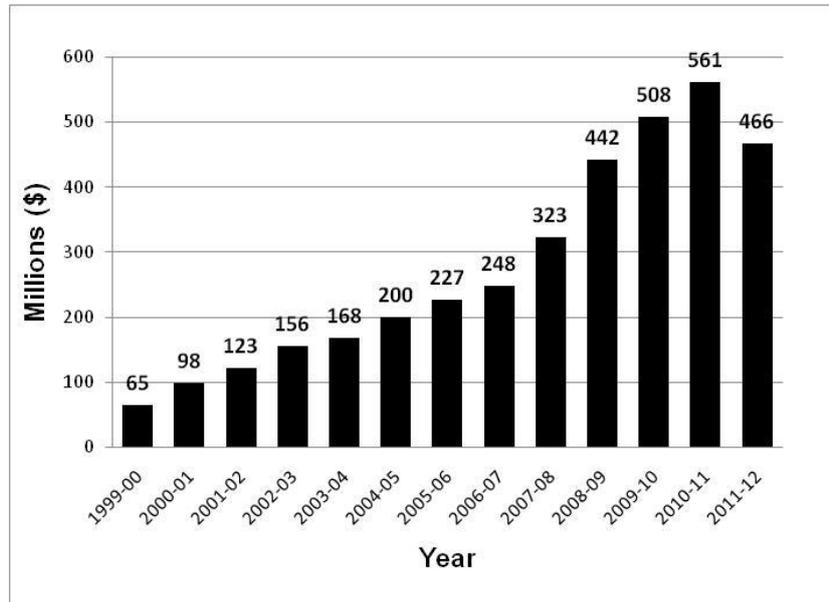
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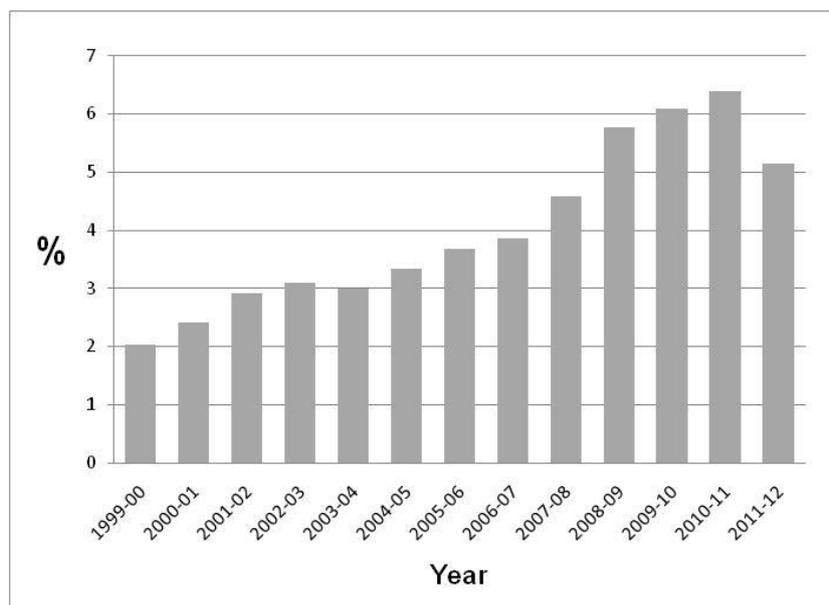
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**Table 1: Characteristics of newly listed anticancer drugs (2000 – 2012).**

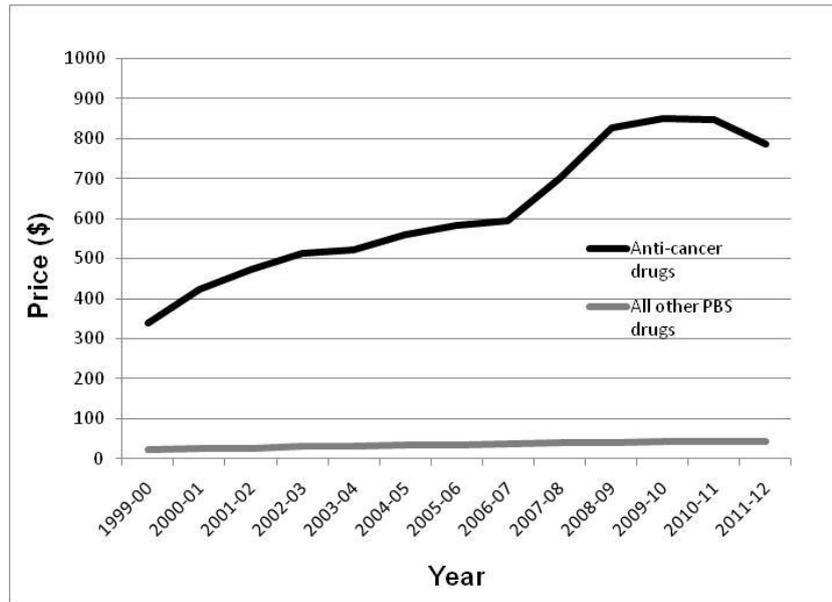
<b>Drug characteristics</b>	<b>N (%)</b>
<b>Total</b>	23
<b><i>Year PBS listed</i></b>	
<b>2000 – 2006</b>	9 (39)
<b>2007 – 2012</b>	14 (61)
<b><i>Drug class</i></b>	
<b>Cytotoxics</b>	8 (35)
<b>Tyrosine kinase inhibitors</b>	8 (35)
<b>Monoclonal antibodies</b>	3 (13)
<b>Other</b>	4 (17)
<b><i>Tumour type</i></b>	
<b>Chronic myeloid leukaemia</b>	4 (17)
<b>Myeloma</b>	3 (13)
<b>Breast</b>	3 (13)
<b>Colorectal</b>	3 (13)
<b>Lung</b>	3 (13)
<b>Other</b>	7 (30)



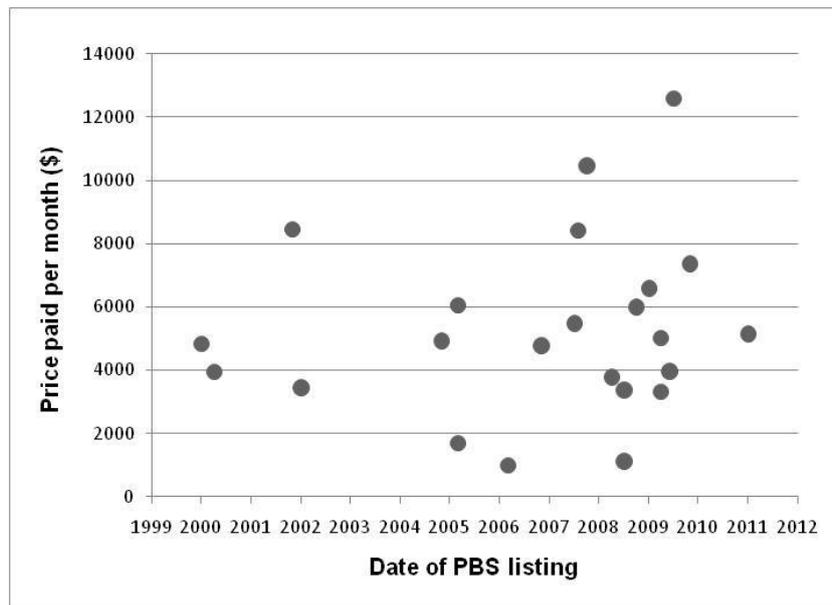
**Figure 1: PBS expenditure on anticancer drugs (without adjustment for inflation)**



**Figure 2: Percentage of PBS expenditure on anticancer drugs**



**Figure 3: Average price paid by the PBS per prescription: all anticancer drugs vs. all other PBS drugs (adjusted to 2012 prices)**



**Figure 4: Monthly prices for newly listed anticancer drugs (adjusted to 2012 prices)**

**Appendix 1: Monthly prices for newly listed anticancer drugs (adjusted to 2012 prices)**

<b>Drug name</b>	<b>Year PBS listed</b>	<b>Tumour type</b>	<b>Monthly price (\$)</b>
<b>Temozolomide</b>	2000	Glioblastoma multiforme	4830
<b>Irinotecan</b>	2000	Colorectal cancer	3946
<b>Imatinib</b>	2001	Chronic myeloid leukaemia	8461
<b>Oxaliplatin</b>	2002	Colorectal cancer	3448
<b>Gefitinib</b>	2004	Non-small cell lung cancer	4920
<b>Fotemustine</b>	2005	Melanoma	1696
<b>Pemetrexed</b>	2005	Non-small cell lung cancer	6052
<b>Thalidomide</b>	2006	Myeloma	1003
<b>Trastuzumab</b>	2006	Breast cancer	4777
<b>Dasatinib</b>	2007	Chronic myeloid leukaemia	5483
<b>Cetuximab</b>	2007	Head and neck cancer	8424
<b>Bortezomib</b>	2007	Myeloma	10462
<b>Lapatinib</b>	2008	Breast cancer	3778
<b>Fludarabine</b>	2008	Chronic lymphocytic leukaemia	1118
<b>Erlotinib</b>	2008	Non-small cell lung cancer	3375
<b>Nilotinib</b>	2008	Chronic myeloid leukaemia	5999
<b>Sorafenib</b>	2009	Hepatocellular carcinoma	6585
<b>nab-Paclitaxel</b>	2009	Breast cancer	3319
<b>Sunitinib</b>	2009	Renal cell carcinoma	5024
<b>Bevacizumab</b>	2009	Colorectal cancer	3960
<b>Arsenic trioxide</b>	2009	Acute promyelocytic leukaemia	12578
<b>Lenalidomide</b>	2009	Myeloma	7356
<b>Azacitidine</b>	2011	Myelodysplastic syndrome, acute myeloid leukaemia, chronic myeloid leukaemia	5145