

**The Victorian Ambulatory  
Care Sensitive Conditions  
Study:**

***Opportunities for Targeted  
Interventions***

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Health Outcomes Section  
Development and Resources Branch  
Public Health Division

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# Executive Summary

## Background

The flagship project “Meeting Emergency Demand” is a joint initiative between Public Health, ACMH and Acute Health Divisions. Diabetes complications, asthma, and vaccine preventable influenza and pneumococcal pneumonias were identified as key conditions where interventions could realistically be set up with a demonstrable and significant short term impact on demand for emergency hospital admission.

## Purpose

The aim of this report is to demonstrate opportunities for targeted interventions for reducing demand on hospital services. Detailed analyses of the key conditions are provided, identifying trends in hospitalisations, urban/rural differentials, regional variations, and variations by the Primary Care Partnerships (PCPs).

## Methods

The Victorian Admitted Episodes Dataset (VAED) was analysed from 1993-94 to 1999-2000. Rates of admission were age and sex standardised to the Victorian population (1996) using the direct method. The comorbidity score is an index for measuring severity of illness using routine databases such as the VAED.

## Key Findings

### Diabetes Complications

- **There were 12,100 admissions for diabetes complications with an average of 8.06 bed days in 1999-2000.**
- **A twenty five percent reduction in number of admissions for diabetes complications would lead to a reduction of 20,520 bed days in Victoria.**
- **Admission rates for diabetes complications are higher in rural than in metropolitan regions.**
- **The Gippsland region has the highest admission rate while Loddon Mallee is similar to metropolitan regions.**
- **There is a twelve fold variation in admission rates for diabetes complications across PCPs.**

- There are 13 PCPs with significantly higher admission rates than Victoria.
- The thirteen PCPs with admission rates significantly higher than Victoria, from highest to lowest, are East Gippsland, Frankston and Peninsula, Central West, Wellington, Moira/Strathbogie/Greater Shepparton, Wimmera, South West, Alpine/Delatite/Wangaratta, West Bay, Brimbank/Melton, Central Grampians, Mt Alexander/Central Goldfields/Macedon Ranges, and Inner West.
- These thirteen PCPs contribute just over half of all admissions (6,114) for diabetes complications in Victoria, and thirty nine per cent of total bed days.
- The average comorbidity score for these PCPs was 2.95 compared to 2.67 which was the average for Victoria.
- A thirty five percent reduction in number of admissions for diabetes complications in these thirteen PCPs and an eighteen percent reduction in the remaining PCPs would lead to a twenty five percent reduction in the number of admissions for diabetes complications in Victoria, which equates to approximately \$8.4 million of hospital expenditure.

## **Asthma**

- There were 10, 079 admissions for asthma with an average of 2.71 bed days in 1999-2000 where asthma was listed as the principal diagnosis.
- A thirty percent reduction in number of admissions for asthma would lead to a reduction of 8,161 bed days in Victoria.
- During the period 1993-94 to 1999-2000, there has been a 37% reduction in asthma admission rates in rural regions and a 26 % decline in metropolitan regions.
- Asthma ACSC admission rates remain consistently higher in rural regions than in metropolitan regions.
- Hume region has the highest rate of admission, while Western Metropolitan Region is the only metropolitan region with a rate higher than Victoria.

- There are sixteen PCPs with significantly higher admission rates than Victoria.
- The sixteen PCPs with admission rates significantly higher than Victoria, from highest to lowest, are Campaspe, Mitchell/Murrindindi, South West, Swan Hill/Gannawarra/Buloke, Moira/Strathbogie/Greater Shepparton, Wimmera, Alpine/Delatite/Wangaratta, Mildura, Southern Grampians/Glenelg, Central Grampians, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Brimbank/Melton, South East, Wellington and West Bay.
- The average comorbidity score (1.10) for these sixteen PCPs is similar to that of Victoria.
- These sixteen PCPs contribute to about forty per cent of all admissions for asthma in Victoria, which is thirty eight per cent of total bed days.
- A forty percent reduction in number of admissions for asthma in these sixteen PCPs and twenty three percent reduction in the remaining PCPs would lead to a thirty percent reduction in the number of admissions for asthma in Victoria, which equates to approximately \$3.5 million of hospital expenditure.

#### **Vaccine Preventable Influenza and Pneumococcal Pneumonia**

- There were about two thousand admissions for influenza and pneumococcal pneumonia in Victoria in 1999-2000. Sixty three percent (n=1,312) of these were due to pneumococcal pneumonia.
- The average number of bed days was 9.03 for influenza and pneumococcal pneumonia, and 11.26 for pneumococcal pneumonia, respectively.
- A forty percent reduction in number of admissions for influenza and pneumococcal pneumonia would lead to a reduction of 7,304 bed days in Victoria. A similar reduction in the proportion of admissions for pneumococcal pneumonia would free 5,782 bed days in Victoria.
- The rates for influenza and pneumococcal pneumonia, and pneumococcal pneumonia are consistently higher in rural areas compared to the metropolitan precinct.

- **Barwon South Western has the highest admission rates for influenza and pneumococcal pneumonia, as well for pneumococcal pneumonia.**
- **There were thirteen PCPs for influenza and pneumococcal pneumonia which had admission rates significantly higher than Victoria. They were, from highest to lowest, Swan Hill/Gannawarra/Buloke, Barwon, Brimbank/Melton, Moira/Strathbogie/Greater Shepparton, Mitchell/Murrindindi, Central Grampians, Southern Grampians/Glenelg, Alpine/Delatite/Wangaratta, Mildura, South Coast Health Services Consortium, Wellington, Banyule/Nilumbik, and North Central Metropolitan.**
- **The average comorbidity score (1.02) for these thirteen PCPs is similar to that of Victoria.**
- **These thirteen PCPs contribute to about forty per cent of all admissions for influenza and pneumococcal pneumonia in Victoria, which is thirty eight per cent of total bed days.**
- **A forty percent reduction in number of admissions for influenza and pneumonia across all PCPs in Victoria equates to approximately \$5.5 million of hospital expenditure.**
- **There were nine PCPs for pneumococcal pneumonia which had admission rates significantly higher than Victoria. They were, from highest to lowest, Barwon, Mildura, Banyule/Nilumbik, Moira/Strathbogie/Greater Shepparton, Alpine/Delatite/Wangaratta, North Central Metropolitan, South Coast Health Services Consortium, Mitchell/Murrindindi, and Wellington.**
- **The average comorbidity score for these nine PCPs is 1.31 compared to 0.80 which is the average for Victoria.**
- **These nine PCPs contribute about thirty five percent of all admissions for pneumococcal pneumonia in Victoria, which is thirty three percent of total bed days.**

# **1 Introduction**

## **1.1 Background**

There is increasing pressure on the Victorian public acute and emergency hospital system to meet the demand for inpatient care. This has resulted in an increase in the number of patients awaiting elective surgery and extended waiting times in emergency departments for inpatient beds. (1).

To address these issues, the Secretary of the Department of Human Services has identified the flagship project “Meeting Emergency Demand” a joint initiative between Public Health, ACMH and Acute Health Divisions.

The Victorian Ambulatory Care Sensitive Conditions (ACSCs) study has recently generated report on preliminary analyses of the VAED (Victorian Admitted Episodes Dataset) (2). The report has identified significant differentials in the rates of ACSCs between regions, urban and rural areas, and Primary Care Partnerships (PCPs). The analysis has the potential to provide evidence for targeting interventions at the PCP level for reducing pressure on the hospital system.

## **1.2 Choice of ACSCs**

Discussions have recently been held between Public Health and Acute Health identifying a limited number of key conditions where interventions could realistically be set up with a demonstrable and significant short-term impact on demand for emergency hospital admissions. The following conditions were identified:

### **1.2.1 Diabetes Complications**

The major acute complications of diabetes includes hypoglycemia and diabetes coma. Diabetic coma, a situation that requires emergency treatment, includes hyperglycaemic coma (diabetic ketoacidosis and hyperosmolar coma), hypoglycaemic coma, and lactic acidosis. These complications are likely to occur if patients do not adhere to therapy, possibly because of poor education about the management of diabetes, or if they are receiving inadequate monitoring and surveillance from qualified medical personnel. (3)

The major long term complications of diabetes include retinopathy, microvascular disease, sensory neuropathy and impaired renal function. The onset of these complications can be postponed or reduced if patients with diabetes are able to control their blood glucose to near normal levels and if they receive sufficient and prompt medical care for complications in their early stages. (4)

Areas with high rates of diabetes complications may indicate a problem with access to diabetes services in the community since admissions for these

conditions are potentially avoidable with good quality and timely primary care.

### **1.2.2 Asthma**

Asthma under good medical control rarely requires hospitalisation. It has been demonstrated that adequate ambulatory care can prevent hospitalisation for asthma. (5-6) High rates of hospitalisation may indicate problems in access to primary healthcare in the community and the admissions are therefore potentially preventable.

### **1.2.3 Vaccine Preventable Influenza and Pneumococcal Pneumonia**

Influenza and pneumococcal pneumonia are important causes of morbidity. Elderly persons and persons with underlying medical disorders are at increased risk of complications from both conditions.(7)

The Public Health Division recommends that influenza and pneumococcal vaccinations should be provided to all persons age 65 and older, as well as other high- risk individuals. This is in accordance with the recommendations of the Centre for Disease Control. (7) Areas with high rates of admissions for preventable influenza and pneumococcal pneumonia may be associated with problems in access to immunisation services in the community.

## **1.3 Purpose**

The aim of this report is to demonstrate opportunities for targeted interventions for reducing demand on hospital services. More specifically, this report identifies:

- i. trends in hospitalisations;
- ii. urban/rural differentials;
- iii. regional variations;
- iv. variations by PCP;

## **1.4 Data Sources and Methods**

### **1.4.1 Hospital Admissions Data**

Hospital separation data were obtained from the Victorian Admitted Episodes Dataset (VAED). The VAED is a minimum dataset containing data on all admitted patient activity submitted by all public and private acute hospitals, including acute facilities in rehabilitation and extended care institutions and day procedure centres. (8)

Clinical data are stored as ICD-9-CM codes in twelve diagnosis and procedure fields in the VAED. (9) The ACSCs identified using the ICD-9-CM codes in the twelve diagnoses fields of the VAED were diabetes complications (ICD-9-CM 2501-2509) in any diagnosis field; asthma (493) as principal diagnosis only; and influenza and pneumococcal pneumonia (481, 4870, 4871, 4878) in any diagnosis field. (2)

Co-morbidities were identified by the Charlson index using ICD-9-CM codes in any of the diagnosis fields. (10-11) The comorbidity score is an index for measuring severity of illness using routine databases such as the VAED.

### **1.4.2 Trend Analysis**

Data from 1993–94 through 1999–2000 were used in this analysis. Prior to 1993, not all hospitals were contributing to the database and this year also coincides with the introduction of case-mix funding for hospitals.

### **1.4.3 Admission Rates**

Population figures by gender and five-year age groups were obtained from using the Estimated Resident Population (ERP) figures produced by the Australian Bureau of Statistics (ABS) and were used for calculating admission rates and 95% confidence intervals (CI). Estimates at the local government area (LGA) level were used to calculate admission rates and 95% CI for the thirty two PCP areas in Victoria. Admission rates were age and sex standardised (direct method) using the Victorian population for 1996 as the reference. Standardisation eliminates the effects of differences in the age and gender structure of various populations. This allows comparisons between groups with different age and gender compositions. Confidence intervals (CIs) define the range of values within which the rate is likely to lie. Ninety five per cent CIs for the standardised rates were based on the Poisson distribution.

### **1.4.4 Geographic Areas**

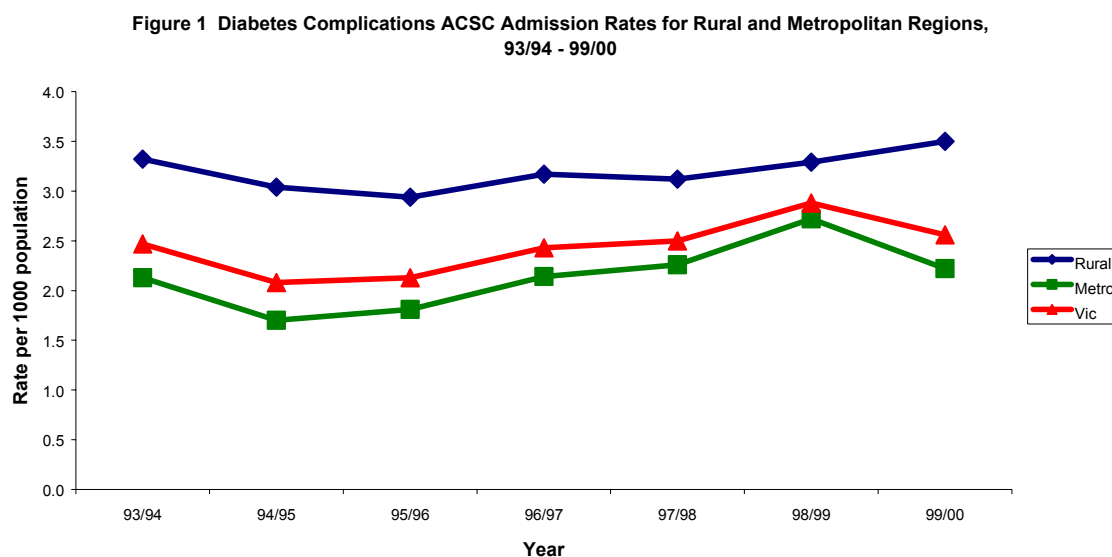
The use of individual ACSC admissions to hospital requires calculation of admission rates for defined geographic areas. In Victoria, there have been

significant changes over the last decade to the boundaries of the geographic areas that make up Local Government Areas under the Australian Standard Geographic Classification (ASGC). Currently there are 200 statistical local areas (SLAs), which make up 78 LGAs. These boundaries have been collapsed into thirty two PCP catchment areas for calculation of admission rates and 95% CI for the year 1999-2000. Comparisons across the entire seven years used in this analysis were made at the Department of Human Services Region level. Victoria is divided into nine health Regions, four of which encompass metropolitan Melbourne and five that cover the non-metropolitan areas in Victoria.

## 2 Diabetes Complications

### 2.1 Trends in Victoria

There were 12,100 admissions for diabetes complications with an average of 8.06 bed days in 1999-2000. The rates of admissions for diabetes complications varied from 2.47-per 1000 population (2.42-2.51) in 1993-94 to 2.56 per 1000 (2.53-2.63) in 1999-2000 (fig 1).



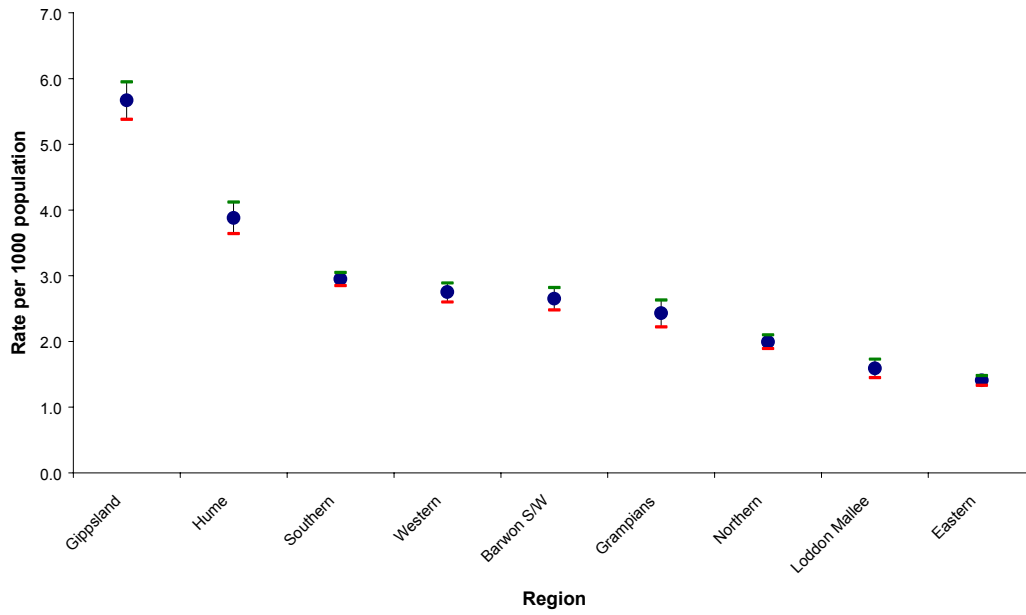
### 2.2 Rural and Metropolitan Differences

There is a significantly higher admission rate for diabetes complications in rural areas compared to metropolitan, 3.50/1000 population (3.40-3.61) and 2.22/1000 (2.17-2.27), respectively, in 1999/2000. Rural areas show higher rates over the seven year period compared to metropolitan areas (fig 1).

### 2.3 Variations across DHS Regions

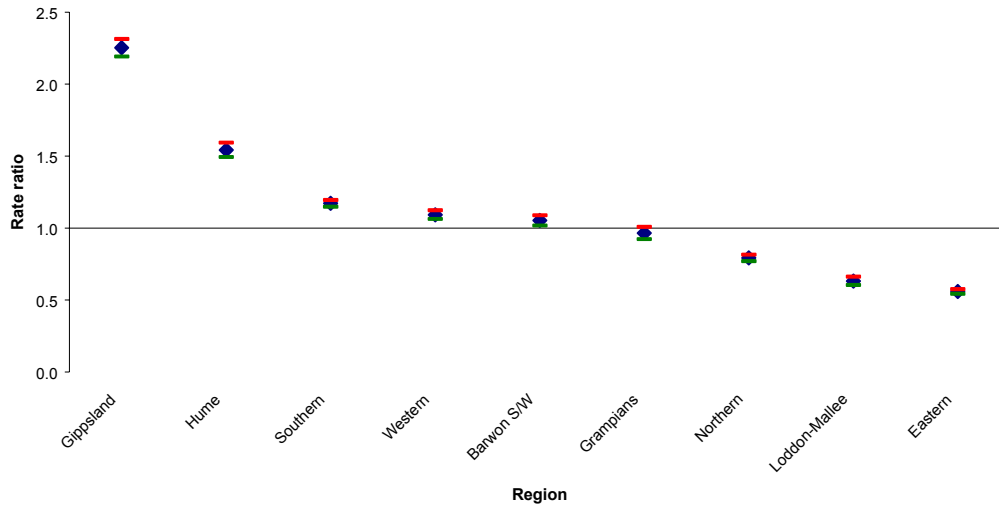
There are significant variations across DHS regions in Victoria. The admission rates in 1999/2000 varied from a high of 5.66/1000 (5.37-5.95) in Gippsland to a low of 1.40/1000 (1.33-1.48) in the Eastern Metropolitan Region (fig 2).

Figure 2 Diabetes Complications ACSC Admission Rates by Region, 99/00



Compared to Victoria, Gippsland has the highest rate ratio while Eastern Metropolitan Region has the lowest (fig 3). Loddon Mallee has a rate ratio quite similar to that of Eastern Metropolitan Region.

Figure 3 Diabetes Complications ACSC Admission Rate Ratios for Regions, 99/00



## 2.4 Variations across PCPs

The rate of admissions for diabetes complications, average bed days and comorbidity scores for various PCPs for the year 1999-2000 are summarised in table 1.

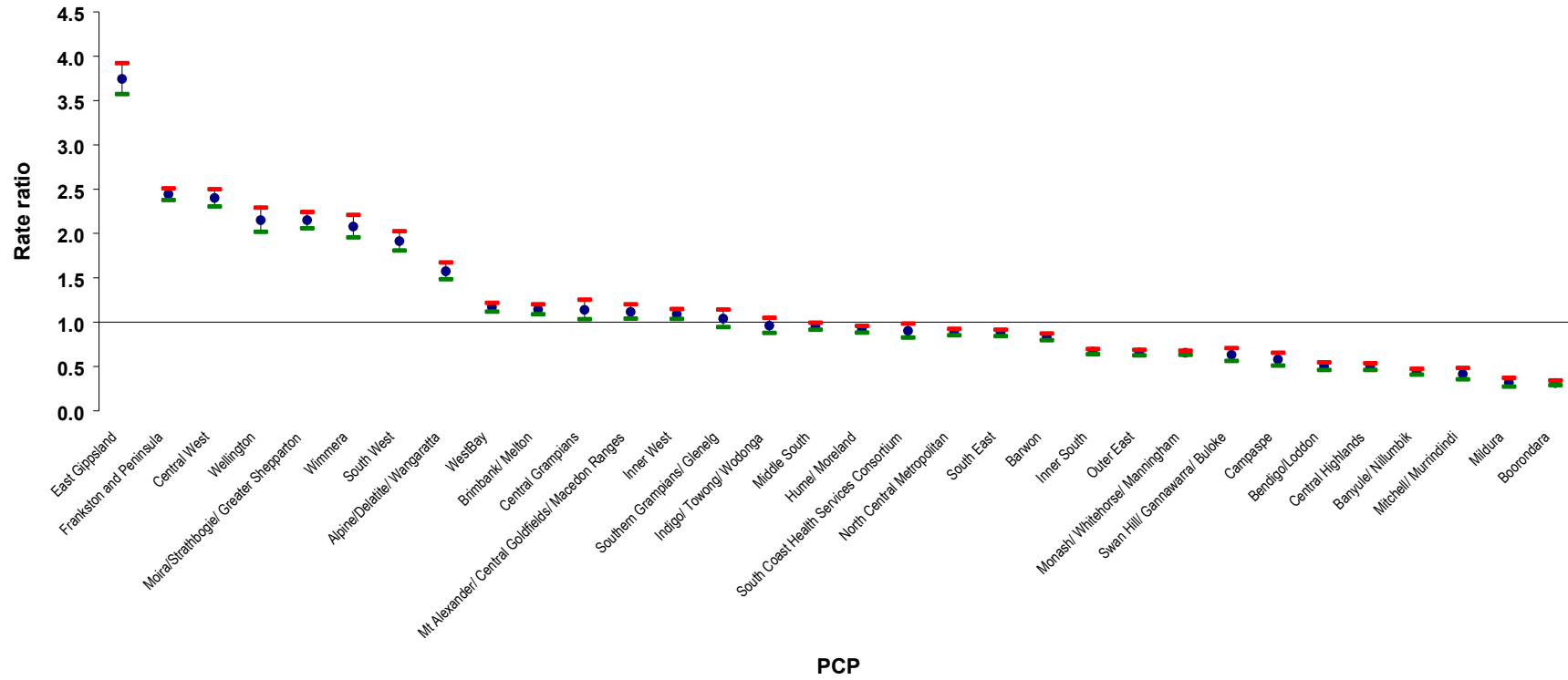
*Table 1: Rates of admission and 95% confidence intervals, average bed days and comorbidity score for diabetes complications 99/00*

		1999/2000					
<i>Region</i>	<i>Primary Care Partnership</i>	<i>Number of admissions</i>	<i>Rate per 1000 persons</i>	<i>lower 95% CI</i>	<i>upper 95% CI</i>	<i>Average Bed-days</i>	<i>Average Comorbidity</i>
Gippsland	East Gippsland	480	9.42	8.55	10.28	2.88	3.39
Southern Metro	Frankston and Peninsula	1550	6.15	5.84	6.46	3.03	2.91
Gippsland	Central West	645	6.04	5.57	6.50	5.14	3.27
Gippsland	Wellington	256	5.41	4.75	6.08	5.67	3.42
	Moirra/Strathbogje/ Greater Shepparton						
Hume	Shepparton	568	5.41	4.96	5.85	3.16	4.26
Grampians	Wimmera	271	5.23	4.59	5.87	2.50	2.73
Barwon S/W	South West	317	4.81	4.28	5.34	5.80	1.95
Hume	Alpine/Delatite/ Wangaratta	288	3.96	3.50	4.42	4.93	1.87
Western Metro	WestBay	605	2.94	2.70	3.18	8.95	2.52
Western Metro	Brimbank/ Melton	428	2.88	2.59	3.16	11.04	2.77
Grampians	Central Grampians	108	2.87	2.30	3.43	5.56	2.03
	Mt Alexander/ Central Goldfields/ Macedon Ranges						
Loddon Mallee	Macedon Ranges	194	2.81	2.41	3.21	6.07	2.75
Western Metro	Inner West	404	2.75	2.47	3.02	8.80	2.77
Barwon S/W	Southern Grampians/ Glenelg	114	2.61	2.13	3.10	6.89	1.92
Hume	Indigo/ Towong/ Wodonga	129	2.42	2.00	2.84	9.33	2.05
Southern Metro	Middle South	622	2.40	2.21	2.59	5.31	2.92
Northern Metro	Hume/ Moreland	579	2.31	2.12	2.50	9.75	2.68
	South Coast Health Services Consortium						
Gippsland	Consortium	135	2.27	1.86	2.68	6.84	1.41
Northern Metro	North Central Metropolitan	639	2.24	2.06	2.41	7.77	2.66
Southern Metro	South East	619	2.21	2.03	2.39	8.23	2.45
Barwon S/W	Barwon	541	2.10	1.92	2.28	8.62	2.05
Southern Metro	Inner South	523	1.68	1.54	1.83	9.22	2.52
Eastern	Outer East	455	1.65	1.52	1.78	10.18	2.05
Eastern	Monash/ Whitehorse/ Manningham	782	1.65	1.53	1.76	6.72	2.46
Loddon Mallee	Swan Hill/ Gannawarra/ Buloke	79	1.59	1.23	1.95	9.00	1.87
Loddon Mallee	Campaspe	64	1.46	1.09	1.82	8.31	1.67
Loddon Mallee	Bendigo/Loddon	134	1.26	1.05	1.48	12.75	1.84
Grampians	Central Highlands	169	1.25	1.06	1.44	9.66	1.93
Northern Metro	Banyule/ Nillumbik	182	1.11	0.94	1.27	10.70	2.35
Hume	Mitchell/ Murrindindi	41	1.04	0.72	1.37	11.24	2.20
Loddon Mallee	Mildura	40	0.80	0.55	1.05	5.23	2.42
Eastern	Boorondara	139	0.79	0.66	0.93	11.05	2.30

The rates in 1999-2000 varied from 0.79/1000 (0.66-0.93) in Boorondara to 9.42/1000 (8.55-10.28) in East Gippsland. The average bed days during the same time period varied from 2.50 in Wimmera to 12.75 in Bendigo/Loddon, while the comorbidity scores ranged from a low of 1.41 in South Coast Health Services Consortium to 4.26 in Moira/Strathbogje/Greater Shepparton.

There were thirteen PCPs with rate ratios significantly higher than Victoria (fig 4). East Gippsland had the highest rate ratio of 3.74 (3.57-3.92), while Boorondara had the lowest 0.31 (0.29-0.34).

Figure 4 Diabetes Complications ACSC Admission Rate Ratios for PCP's (Victoria=1), 99/00



## 2.5 Key Findings

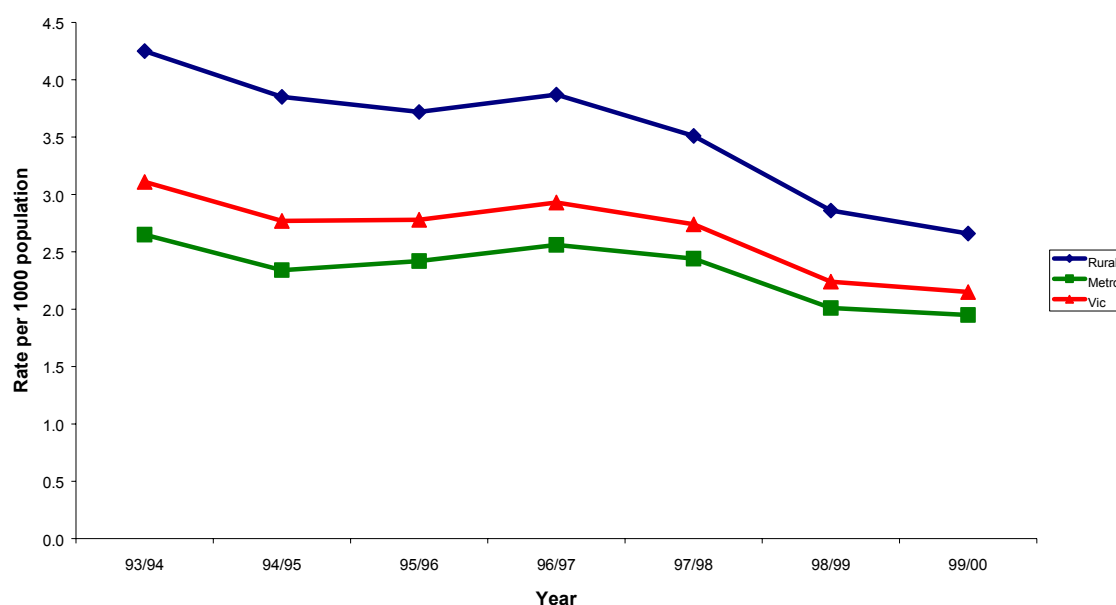
- There were 12,100 admissions for diabetes complications with an average of 8.06 bed days in 1999-2000.
- A twenty five percent reduction in number of admissions for diabetes complications would lead to a reduction of 20,520 bed days in Victoria.
- Admission rates for diabetes complications are higher in rural than in metropolitan regions.
- The Gippsland region has the highest admission rate while Loddon Mallee is similar to metropolitan regions.
- There is a twelve fold variation in admission rates for diabetes complications across PCPs.
- There are 13 PCPs with significantly higher admission rates than Victoria.
- The thirteen PCPs with admission rates significantly higher than Victoria, from highest to lowest, are East Gippsland, Frankston and Peninsula, Central West, Wellington, Moira/Strathbogie/Greater Shepparton, Wimmera, South West, Alpine/Delatite/Wangaratta, West Bay, Brimbank/Melton, Central Grampians, Mt Alexander/Central Goldfields/Macedon Ranges, and Inner West.
- These thirteen PCPs contribute just over half of all admissions (6,114) for diabetes complications in Victoria, and thirty nine per cent of total bed days.
- The average comorbidity score for these PCPs was 2.95 compared to 2.67 which was the average for Victoria.
- A thirty five percent reduction in number of admissions for diabetes complications in these thirteen PCPs and an eighteen percent reduction in the remaining PCPs would lead to a twenty five percent reduction in the number of admissions for diabetes complications in Victoria, which equates to approximately \$8.4 million of hospital expenditure.

### 3 Asthma

#### 3.1 Trends in Victoria

There were 10, 079 admissions for asthma with an average of 2.71 bed days in 1999-2000 where asthma was listed as the principal diagnosis. The overall rate of admission for asthma has decreased from 3.11/1000 (3.06-3.16) in 1993-94 to 2.15/1000 (2.11-2.19) in 1999-2000 (fig 5). This is a significant decrease in asthma hospitalisation rates reflecting approximately thirty eight per cent reduction in total asthma admissions to Victorian hospitals over the seven years period.

Figure 5 Asthma Admission Rates for Rural and Metropolitan Regions, 93/94 - 99/00



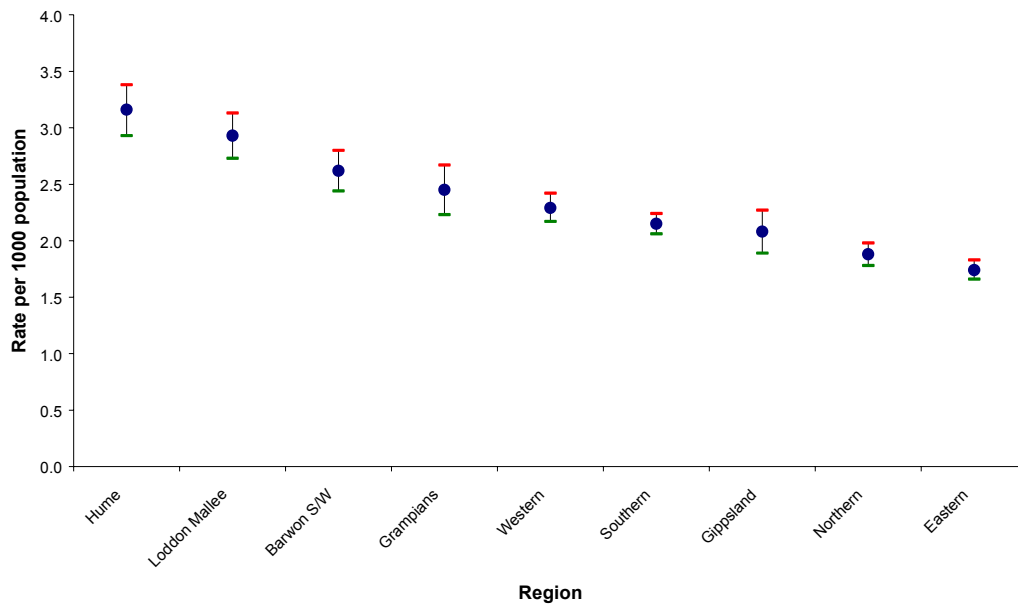
#### 3.2 Rural and Urban Differences

There has been a decline in the rates of asthma admissions in both rural and metropolitan areas. The rural admission rates for asthma have declined from 4.25/1000 (4.14-4.37) in 1993-94 to 2.66/1000 (2.58-2.75) in 1999-2000, while during the same time period, admission rates in metropolitan areas have declined from 2.65/1000 (2.60-2.71) to 1.95/1000 (1.90-2.00) (fig 5). Rural rates for asthma admissions were higher than for metropolitan areas over the entire seven year period. (fig 5).

#### 3.3 Variations across DHS Regions

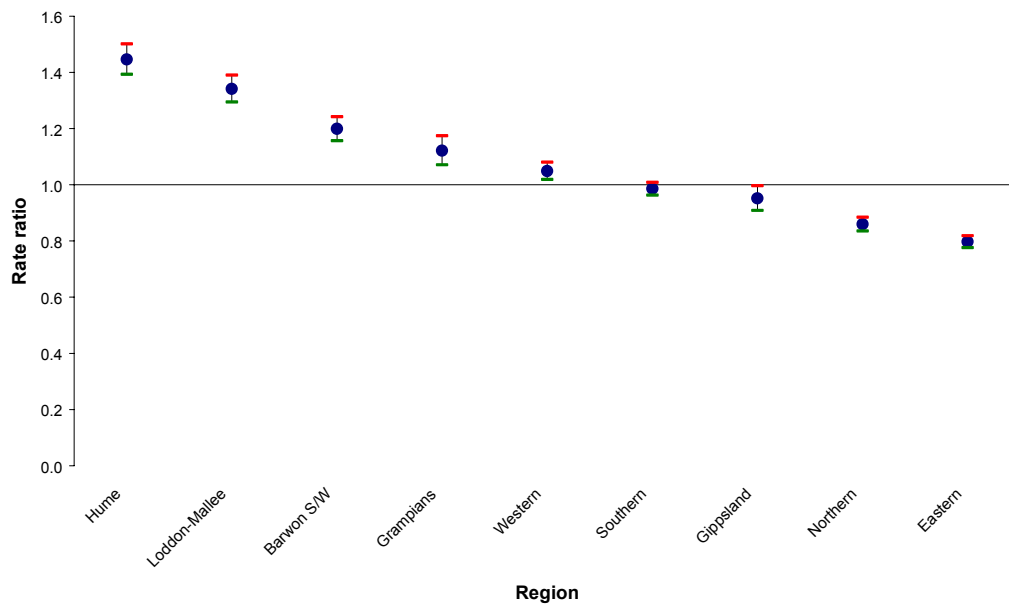
The highest admission rate for asthma was 3.15/1000 (2.93-3.38) in the Hume region, while the Eastern Metropolitan Region had the lowest rates of 1.74/1000 (1.65-1.82) (fig 6).

Figure 6 Asthma ACSC Admission Rates by Region, 99/00



Western Metropolitan Region is the only metropolitan region with an admission rate significantly higher than Victoria (fig 7).

Figure 7 Asthma ACSC Admission Rate Ratios for Regions (Victoria=1), 99/00



### 3.4 Variations across PCPs

The rates of admissions for asthma, average bed days and co-morbidity scores for various PCPs for the year 1999-2000 are summarised in table 2.

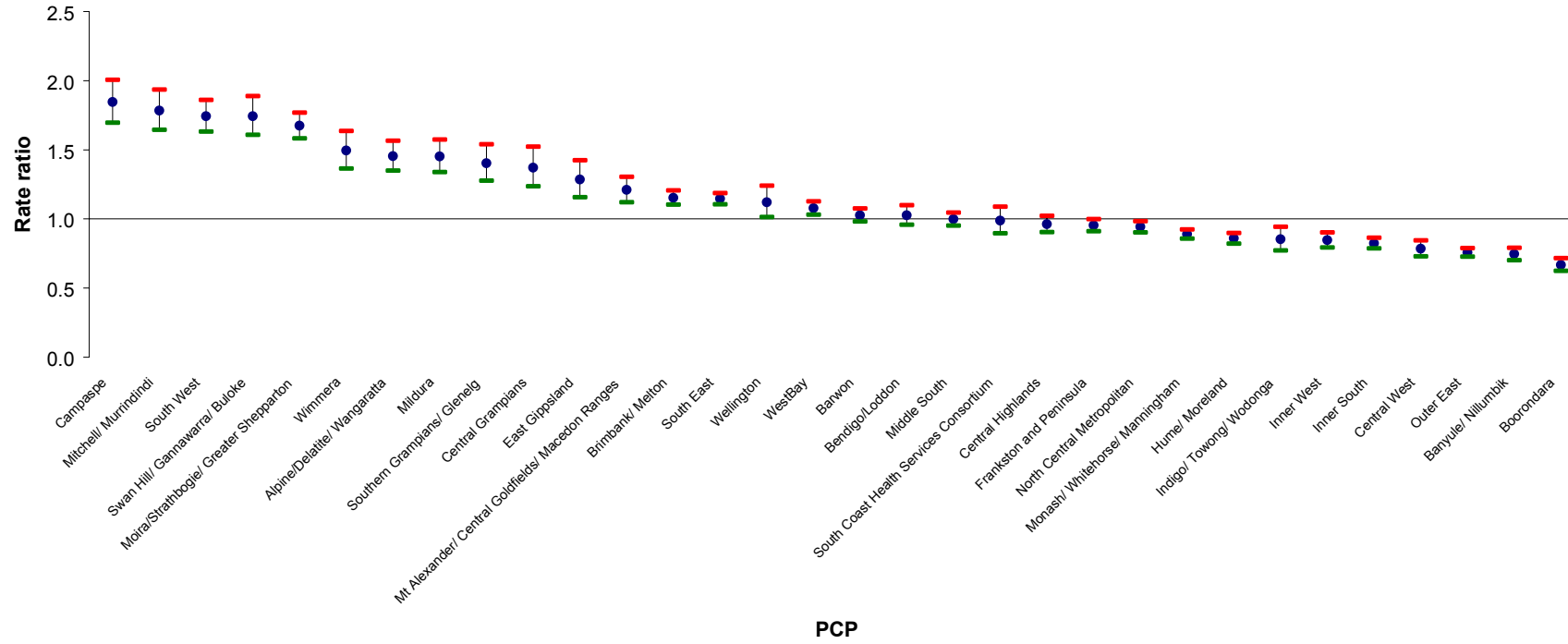
**Table 2: Rates of admission and 95% confidence intervals, average bed days and comorbidity score for asthma 99/00**

		1999/2000					
Region	Primary Care Partnership	Number of admissions	Rate per 1000 persons	lower 95% CI	upper 95% CI	Average Bed-days	Average Comorbidity
Loddon Mallee	Campaspe	144	4.03	3.36	4.71	2.99	1.15
Hume	Mitchell/ Murrindindi	153	3.90	3.27	4.52	3.02	1.15
Barwon S/W	South West	236	3.81	3.32	4.30	2.55	1.05
Loddon Mallee	Swan Hill/ Gannawarra/ Buloke	159	3.81	3.20	4.42	3.3	1.13
Hume	Moira/Strathbogie/ Greater Shepparton	337	3.66	3.26	4.05	2.67	1.08
Grampians	Wimmera	124	3.27	2.68	3.85	2.46	1.19
Hume	Alpine/Delatite/ Wanqaratta	187	3.18	2.71	3.65	2.57	1.11
Loddon Mallee	Mildura	153	3.17	2.66	3.68	2.84	1.12
Barwon S/W	Southern Grampians/ Glenelg	115	3.06	2.49	3.64	4.71	1.12
Grampians	Central Grampians	93	3.00	2.36	3.64	3.3	1.30
Gippsland	East Gippsland	94	2.81	2.20	3.41	2.63	1.05
Loddon Mallee	Mt Alexander/ Central Goldfields/ Macedon Ranges	178	2.64	2.25	3.04	2.81	1.06
Western Metro	Brimbank/ Melton	525	2.52	2.30	2.74	2.02	1.06
Southern Metro	South East	865	2.51	2.34	2.67	2.35	1.09
Gippsland	Wellington	99	2.45	1.96	2.95	2.56	1.11
Western Metro	WestBay	534	2.36	2.16	2.56	2.37	1.08
Barwon S/W	Barwon	508	2.24	2.05	2.44	2.55	1.10
Loddon Mallee	Bendigo/Loddon	217	2.24	1.94	2.54	2.97	1.08
Southern Metro	Middle South	464	2.18	1.98	2.38	2.94	1.17
Gippsland	South Coast health Services Consortium	108	2.16	1.74	2.58	2.11	1.07
Grampians	Central Highlands	279	2.10	1.85	2.35	2.92	1.09
Southern Metro	Frankston and Peninsula	494	2.08	1.90	2.27	2.71	1.13
Northern Metro	North Central Metropolitan	594	2.06	1.89	2.23	2.78	1.15
Eastern	Monash/ Whitehorse/ Manningham	777	1.94	1.81	2.08	3	1.12
Northern Metro	Hume/ Moreland	497	1.88	1.71	2.04	2.51	1.08
Hume	Indigo/ Towong/ Wodonga	103	1.86	1.50	2.23	2.75	1.10
Western Metro	Inner West	255	1.85	1.62	2.08	2.44	1.14
Southern Metro	Inner South	475	1.80	1.63	1.97	3.26	1.11
Gippsland	Central West	188	1.72	1.47	1.96	2.31	1.03
Eastern	Outer East	625	1.65	1.52	1.78	2.65	1.07
Northern Metro	Banyule/ Nillumbik	283	1.63	1.44	1.82	2.56	1.10
Eastern	Boorondara	216	1.46	1.26	1.66	3.11	1.10

The lowest admission rate of 1.46/1000 (1.26-1.66) was observed in Boorondara, while Campaspe had the highest rates of 4.03/1000 (3.36-4.71) in 1999-2000. During the same year, the average bed days varied from a low of 2.11 in South Coast Health Services Consortium to a high of 4.71 in Southern Grampian/Glenelg, while the comorbidity scores ranged from a low of 1.05 in South West and East Gippsland, to a high of 1.19 in Wimmera.

There were sixteen PCPs with rate ratios significantly higher than Victoria (fig 8). The rate ratios varied from a high of 1.84 (1.70-2.01) in Campaspe to a low of 0.67 (0.62-0.72) in Boorondara.

Figure 8 Asthma ACSC Admission Rate Ratios for PCPs (Victoria=1, 99/00)



### 3.5 Key Findings

- There were 10, 079 admissions for asthma with an average of 2.71 bed days in 1999-2000 where asthma was listed as the principal diagnosis.
- A thirty percent reduction in number of admissions for asthma would lead to a reduction of 8,161 bed days in Victoria.
- During the period 1993-94 to 1999-2000, there has been a 37% reduction in asthma admission rates in rural regions and a 26 % decline in metropolitan regions.
- Asthma ACSC admission rates remain consistently higher in rural regions than in metropolitan regions.
- Hume region has the highest rate of admission, while Western Metropolitan Region is the only metropolitan region with a rate higher than Victoria.
- There are sixteen PCPs with significantly higher admission rates than Victoria.
- The sixteen PCPs with admission rates significantly higher than Victoria, from highest to lowest, are Campaspe, Mitchell/Murrindindi, South West, Swan Hill/Gannawarra/Buloke, Moira/Strathbogie/Greater Shepparton, Wimmera, Alpine/Delatite/Wangaratta, Mildura, Southern Grampians/Glenelg, Central Grampians, East Gippsland, Mt Alexander/Central Goldfields/Macedon Ranges, Brimbank/Melton, South East, Wellington and West Bay.
- The average comorbidity score (1.10) for these sixteen PCPs is similar to that of Victoria.
- These sixteen PCPs contribute to about forty per cent of all admissions for asthma in Victoria, which is thirty eight per cent of total bed days.
- A forty percent reduction in number of admissions for asthma in these sixteen PCPs and twenty three percent reduction in the remaining PCPs would lead to a thirty percent reduction in the number of admissions for asthma in Victoria, which equates to approximately \$3.5 million of hospital expenditure.

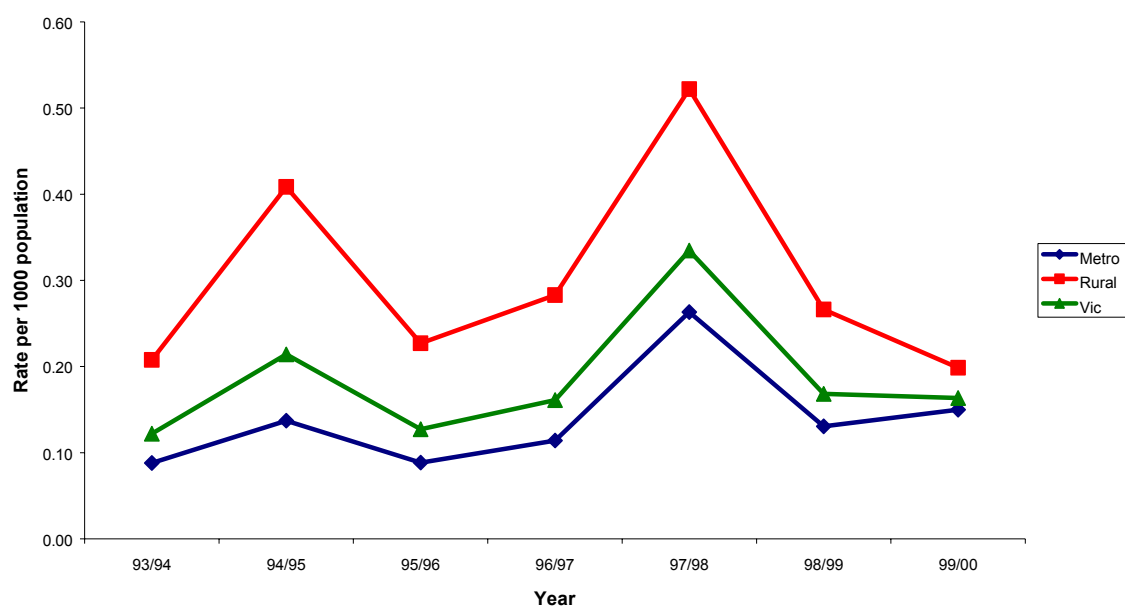
## 4 Vaccine Preventable Influenza and Pneumococcal Pneumonia

### 4.1 Trends in Victoria

There were 2,079 admissions for influenza and pneumococcal pneumonia in Victoria in 1999/2000, of which sixty three per cent (n=1312) were due to pneumococcal pneumonia. The average bed days were 9.03 for influenza and pneumococcal pneumonia, and 11.26 for pneumococcal pneumonia.

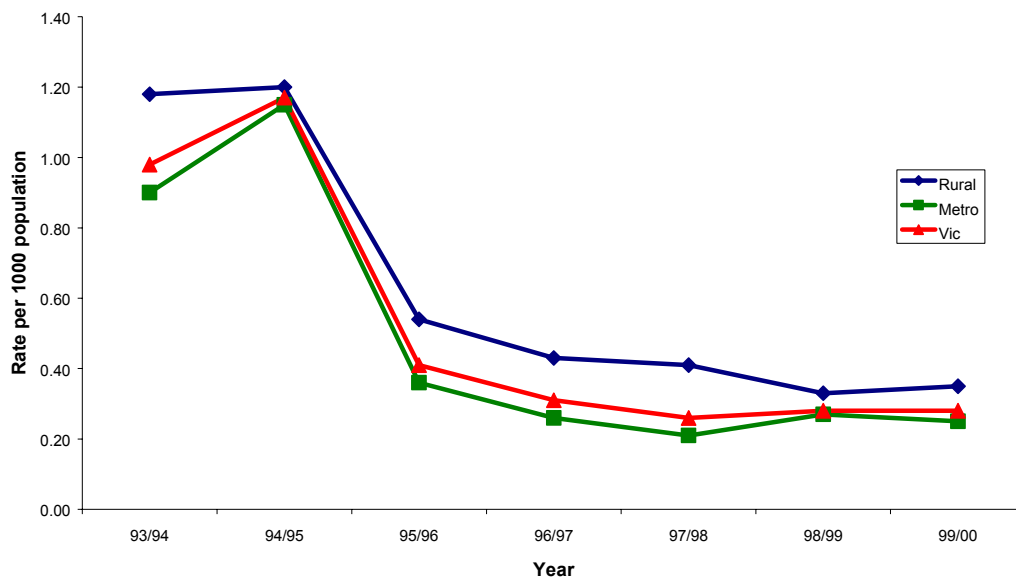
Although the rates for influenza show fluctuations over the seven year period, they have been fairly constant over the last two years (fig 9).

Figure 9 Influenza ACSC Admission Rates for Rural and Metropolitan Regions, 93/94 - 99/00



A decline has been observed in the rate for pneumococcal pneumonia (fig 10).

Figure 10 Pneumococcal Pneumonia ACSC Admission Rates for Rural and Metropolitan Regions, 93/94 - 99/00



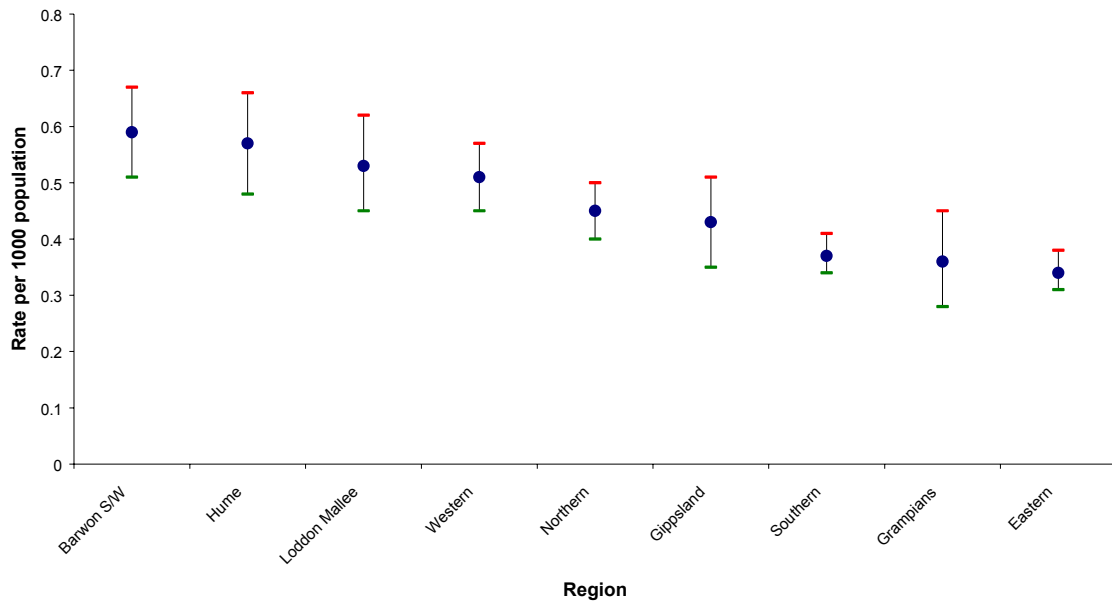
#### 4.2 Rural and Urban Differences

The rates for influenza and pneumococcal pneumonia in rural areas were 0.55/1000 (0.51-0.59) compared to the rate of 0.40/1000 (0.38-0.42) in metropolitan areas in 1999-2000. The rates over the seven years period are consistently higher in rural areas compared to metropolitan (fig 9). A similar pattern is observed for pneumococcal pneumonia (fig 10).

### 4.3 Variations across DHS Regions

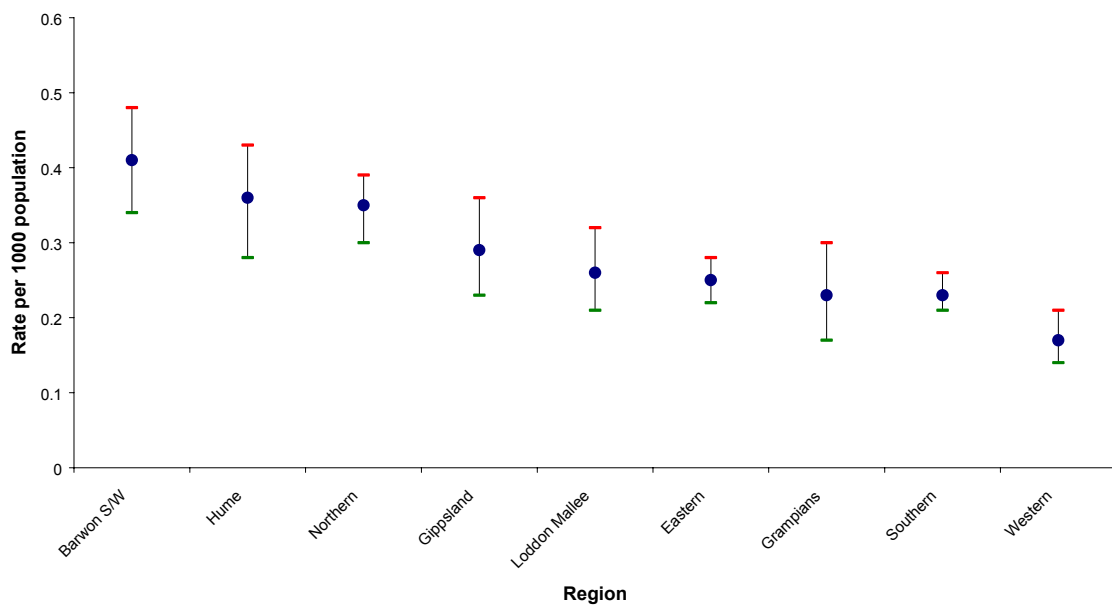
Influenza and pneumococcal pneumonia are higher in rural regions compared to metropolitan regions. (fig 11) Eastern Metropolitan Region has the lowest admission rate of 0.34/1000 (0.30-0.38) for Influenza and pneumococcal pneumonia.

Figure 11 Influenza and Pneumococcal Pneumonia ACSC Admission Rates by Region, 99/00



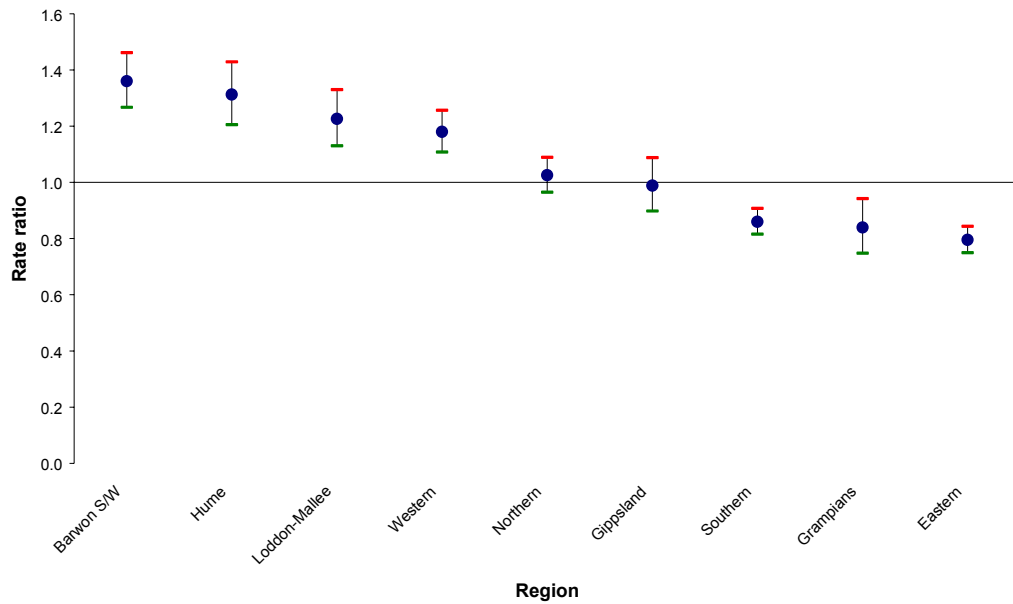
Barwon South Western has higher rates of admission for pneumococcal pneumonia compared to other regions (fig 12).

Figure 12 Pneumococcal Pneumonia ACSC Admission Rates by Region, 99/00

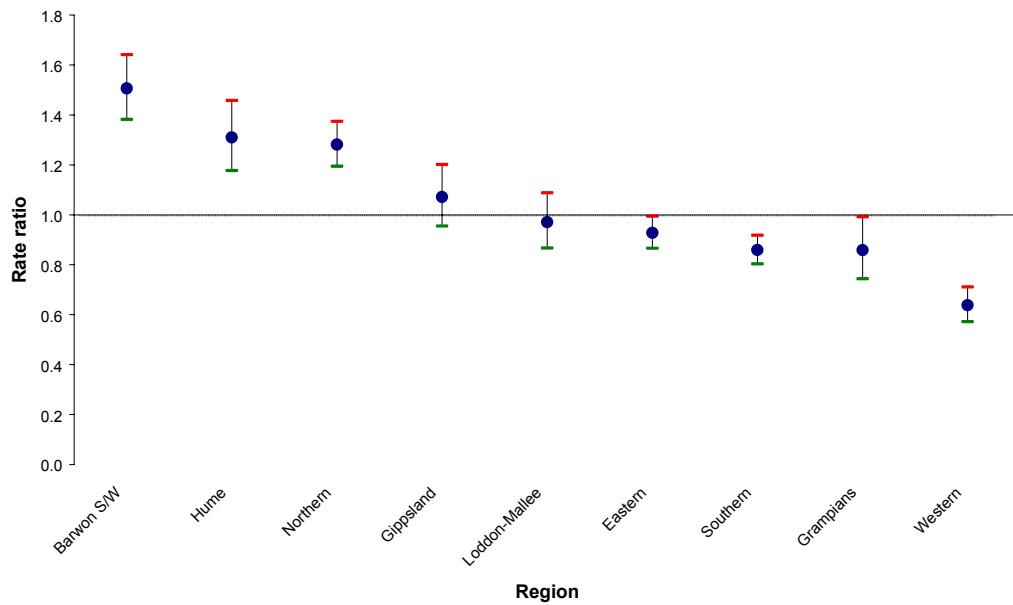


Compared to Victoria, Barwon South Western has the highest rate ratio of admission for influenza and pneumococcal pneumonia (fig 13) as well as pneumococcal pneumonia (fig 14).

**Figure 13 Influenza and Pneumococcal Pneumonia ACSC Admission Rate Ratios for Regions (Victoria=1), 99/00**



**Figure 14 Pneumococcal Pneumonia ACSC Admission Rate Ratios for Regions (Victoria=1), 99/00**



#### 4.4 Variations across PCPs

The rates of admissions for influenza and pneumococcal pneumonia, and pneumococcal pneumonia, average bed days and co-morbidity scores for various PCPs for the year 1999-2000 are summarised in tables 3-4.

**Table 3: Rates of admission and 95% confidence intervals, average bed days and comorbidity score for influenza and pneumococcal pneumonia 99/00**

		1999/2000					
Region	Primary Care Partnership	Number of admissions	Rate per 1000 persons	lower 95% CI	upper 95% CI	Average Bed-days	Average Comorbidity
Loddon Mallee	Swan Hill/ Gannawarra/ Buloke	54	1.19	0.87	1.52	5.37	0.67
Barwon S/W	Barwon	167	0.66	0.55	0.76	8.95	1.19
Western Metro	Brimbank/ Melton	129	0.65	0.53	0.76	4.45	0.56
Hume	Moirra/Strathbogie/ Greater Shepparton	66	0.64	0.48	0.80	8.08	1.17
Hume	Mitchell/ Murrindindi	21	0.58	0.33	0.83	7.29	0.90
Grampians	Central Grampians	19	0.57	0.30	0.84	5.58	1.16
Barwon S/W	Southern Grampians/ Glenelg	24	0.56	0.34	0.79	4.92	1.00
Hume	Alpine/Delatite/ Wanqaratta	41	0.56	0.39	0.73	6.93	0.59
Loddon Mallee	Mildura	28	0.55	0.35	0.76	4.11	1.11
Gippsland	South Coast health Services Consortiumium	35	0.55	0.36	0.74	8.14	1.17
Gippsland	Wellington	25	0.55	0.33	0.77	9.16	0.56
Loddon Mallee	Campaspe	21	0.54	0.30	0.78	8.67	0.62
Northern Metro	Banyule/ Nillumbik	89	0.52	0.41	0.63	11.54	1.36
Northern Metro	North Central Metropolitan	144	0.50	0.42	0.58	10.18	1.31
Southern Metro	South East	137	0.46	0.38	0.54	9.01	0.77
Western Metro	WestBay	103	0.46	0.37	0.55	7.93	0.74
Loddon Mallee	Mt Alexander/ Central Goldfields/ Macedon Ranges	29	0.43	0.27	0.60	8.34	0.79
Hume	Indigo/ Towong/ Wodonga	20	0.39	0.22	0.57	7.65	1.15
Barwon S/W	South West	25	0.39	0.23	0.54	7.44	1.00
Southern Metro	Inner South	121	0.38	0.31	0.45	9.66	1.06
Eastern	Outer East	121	0.36	0.30	0.43	8.5	0.98
Western Metro	Inner West	56	0.36	0.26	0.45	9.25	0.93
Gippsland	Central West	38	0.36	0.24	0.47	7.18	1.34
Gippsland	East Gippsland	17	0.35	0.17	0.54	12.82	1.00
Southern Metro	Middle South	92	0.35	0.28	0.43	12.84	1.16
Eastern	Monash/ Whitehorse/ Manningham	151	0.34	0.29	0.40	9.37	1.13
Grampians	Central Highlands	43	0.33	0.23	0.44	7.53	0.77
Northern Metro	Hume/ Moreland	81	0.32	0.25	0.39	9.43	0.96
Eastern	Boorondara	62	0.32	0.23	0.40	9.39	0.98
Grampians	Wimmera	15	0.30	0.14	0.46	10.6	0.73
Loddon Mallee	Bendigo/Loddon	30	0.29	0.19	0.40	7.97	0.57
Southern Metro	Frankston and Peninsula	75	0.28	0.22	0.35	11.99	1.23

The rates of admissions for influenza and pneumococcal pneumonia varied from a low of 0.28/1000 (0.22-0.35) in Frankston and Peninsula to a high of 1.19/1000 (0.87-1.52) in Swan Hill/Gannawarra/Buloke in 1999/2000 (table3).

The rates of admission for pneumococcal pneumonia were lowest in Brimbank/Melton, 0.11/1000, (0.06-0.17) and highest in Barwon, 0.48/1000 (0.40-0.57) and Mildura, 0.48, (0.29-0.67) in 1999/2000 (table 4).

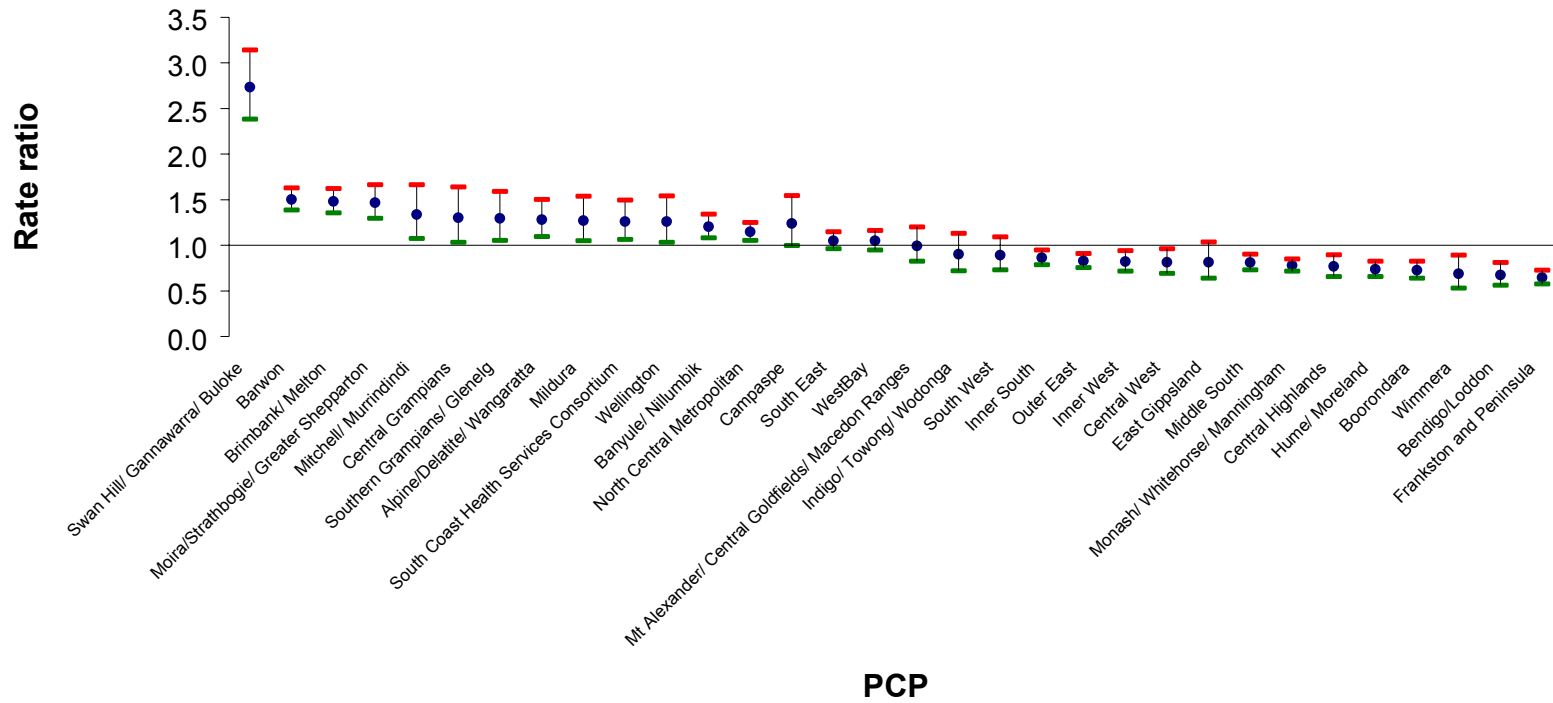
**Table 4: Rates of admission and 95% confidence intervals, average bed days and comorbidity score for pneumococcal pneumonia 99/00**

		1999/2000						
<i>Region</i>	<i>Primary Care Partnership</i>	<i>Number of admissions</i>	<i>Rate per 1000 persons</i>	<i>lower 95% CI</i>	<i>upper 95% CI</i>	<i>Average Bed-days</i>	<i>Average Comorbidity</i>	
Barwon S/W	Barwon	125	0.48	0.40	0.57	9.58	1.31	
Loddon Mallee	Mildura	25	0.48	0.29	0.67	4.16	1.24	
Northern Metro	Banyule/ Nillumbik	78	0.46	0.36	0.57	12.42	1.46	
Hume	Moira/Strathbogrie/ Greater Shepparton	42	0.40	0.28	0.52	9.74	1.26	
Hume	Alpine/Delatite/ Wangaratta	29	0.39	0.25	0.53	8.14	0.66	
Northern Metro	North Central Metropolitan	110	0.39	0.32	0.46	11.95	1.54	
Gippsland	South Coast health Services Consortium	26	0.38	0.23	0.53	9.88	1.38	
Hume	Mitchell/ Murrindindi	13	0.37	0.17	0.58	10.08	0.77	
Gippsland	Wellington	17	0.37	0.19	0.55	9.82	0.71	
Loddon Mallee	Swan Hill/ Gannawarra/ Buloke	14	0.30	0.14	0.46	8.14	1.36	
Barwon S/W	South West	18	0.28	0.15	0.41	8.72	1.11	
Gippsland	Central West	29	0.27	0.17	0.36	7.83	1.48	
Grampians	Central Highlands	33	0.26	0.17	0.34	9.06	0.97	
Southern Metro	Inner South	85	0.25	0.20	0.31	11.74	1.25	
Eastern	Monash/ Whitehorse/ Manningham	116	0.25	0.21	0.30	11.13	1.40	
Eastern	Outer East	82	0.25	0.19	0.30	10.01	1.10	
Southern Metro	South East	70	0.25	0.19	0.31	13.1	1.14	
Western Metro	Inner West	38	0.24	0.16	0.32	12.58	1.11	
Eastern	Boorondara	51	0.24	0.17	0.31	10.39	1.20	
Grampians	Central Grampians	9	0.22	0.08	0.37	6.78	1.78	
Loddon Mallee	Mt Alexander/ Central Goldfields/ Macedon Ranges	15	0.22	0.11	0.34	8.47	0.93	
Southern Metro	Middle South	58	0.22	0.16	0.28	15.79	1.59	
Northern Metro	Hume/ Moreland	54	0.22	0.16	0.28	12.26	1.31	
Southern Metro	Frankston and Peninsula	58	0.21	0.16	0.27	13.76	1.41	
Loddon Mallee	Bendigo/Loddon	21	0.21	0.12	0.30	8.81	0.67	
Barwon S/W	Southern Grampians/ Glenelg	9	0.20	0.07	0.33	6.33	1.11	
Hume	Indigo/ Towong/ Wodonga	10	0.20	0.07	0.32	8	1.30	
Loddon Mallee	Campaspe	7	0.17	0.04	0.30	7.57	1.14	
Gippsland	East Gippsland	9	0.17	0.06	0.28	20.56	1.11	
Western Metro	WestBay	35	0.16	0.11	0.22	12.34	1.37	
Grampians	Wimmera	8	0.16	0.04	0.27	8.63	0.38	
Western Metro	Brimbank/ Melton	18	0.11	0.06	0.17	11.94	1.17	

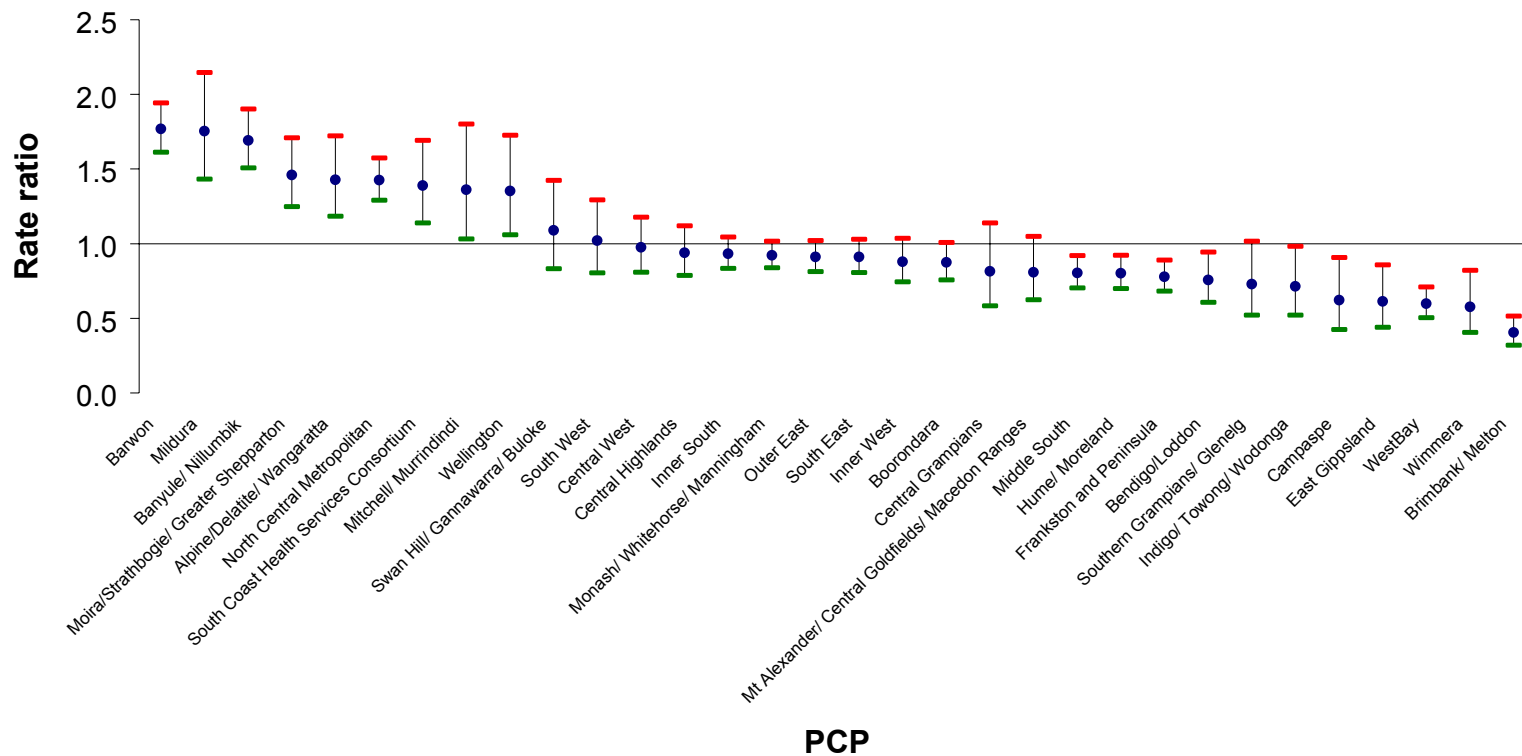
The average bed days varied from 4.11 in Mildura to 12.84 in Middle South for influenza and pneumococcal pneumonia, and 4.16 in Mildura to 20.56 in East Gippsland for pneumococcal pneumonia in 1999/2000. The average comorbidity scores during the same time period varied from 0.56 in Wellington and Brimbank/Melton to 1.36 in Banyule/Nillumbik for flu and pneumonia, and 0.67 in Bendigo/Loddon to 1.78 in Central Grampians for pneumococcal pneumonia.

There were thirteen PCPs for influenza and pneumococcal pneumonia (fig 15) and nine PCPs for pneumococcal pneumonia (fig 16) where rates were significantly higher than Victoria.

**Figure 15 Influenza and Pneumococcal Pneumonia ACSC Admission Rate Ratios for PCP's  
(Victoria=1), 99/00**



**Figure 16 Pneumococcal Pneumonia ACSC Admission Rate Ratios for PCPs (Victoria=1), 99/00**



## 4.5 Key Findings

- There were about two thousand admissions for influenza and pneumococcal pneumonia in Victoria in 1999-2000. Sixty three percent (n=1,312) of these were due to pneumococcal pneumonia.
- The average number of bed days was 9.03 for influenza and pneumococcal pneumonia, and 11.26 for pneumococcal pneumonia, respectively.
- A forty percent reduction in number of admissions for influenza and pneumococcal pneumonia would lead to a reduction of 7,304 bed days in Victoria. A similar reduction in the proportion of admissions for pneumococcal pneumonia would free 5,782 bed days in Victoria.
- The rates for influenza and pneumococcal pneumonia, and pneumococcal pneumonia are consistently higher in rural areas compared to the metropolitan precinct.
- Barwon South Western has the highest admission rates for influenza and pneumococcal pneumonia, as well for pneumococcal pneumonia.
- There were thirteen PCPs for influenza and pneumococcal pneumonia which had admission rates significantly higher than Victoria. They were, from highest to lowest, Swan Hill/Gannawarra/Buloke, Barwon, Brimbank/Melton, Moira/Strathbogie/Greater Shepparton, Mitchell/Murrindindi, Central Grampians, Southern Grampians/Glenelg, Alpine/Delatite/Wangaratta, Mildura, South Coast Health Services Consortium, Wellington, Banyule/Nillumbik, and North Central Metropolitan.
- The average comorbidity score (1.02) for these thirteen PCPs is similar to that of Victoria.
- These thirteen PCPs contribute to about forty per cent of all admissions for influenza and pneumococcal pneumonia in Victoria, which is thirty eight per cent of total bed days.
- A forty percent reduction in number of admissions for influenza and pneumonia across all PCPs in Victoria equates to approximately \$5.5 million of hospital expenditure.
- There were nine PCPs for pneumococcal pneumonia which had admission rates significantly higher than Victoria. They were, from highest to lowest, Barwon, Mildura, Banyule/Nillumbik, Moira/Strathbogie/Greater Shepparton, Alpine/Delatite/Wangaratta, North Central Metropolitan, South Coast Health Services Consortium, Mitchell/Murrindindi, and Wellington.
- The average comorbidity score for these nine PCPs is 1.31 compared to 0.80 which is the average for Victoria.

- These nine PCPs contribute about thirty five percent of all admissions for pneumococcal pneumonia in Victoria, which is thirty three percent of total bed days.

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