Equity, Poverty and Access to GP services in Australia

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Abstract

This paper examines equity and access to general practitioner services in Australia.

Two data sources sere used: the 2001 National Health Survey undertaken by the Australian Bureau of Statistics and 2001 Medicare administrative data.

It was found that those with higher health need receive more services and those with higher income pay more for their services. The two groups which stand out as underserved are Indigenous Australians and rural communities, with the latter also facing high costs of GP care.

It was estimated that regional Australians would benefit from about 8.6 million additional GP visits per year if they had the same access to care as Australians residing in major cities. This would be a 16% increase for inner regional residents and a 31% increase for residents of more remote regional areas.

Background

Research in Australia on access and equity in use of GP services tends to focus on relative access in terms of utilisation rates for different groups of patients and on financial barriers to access, mainly reflected by bulk billing rates, which reflect the percentage of services provided at no out-of-pocket cost to the patient (e.g. Richardson, Peacock et al. (2006)[1]).

A commonly recognised problem is the maldistribution of the health workforce, with rural areas having less access to GP services even though on a range of measures, rural populations experience poorer health than those in capital cities.[2] Joyce and Wolfe (2005)[3] reported 1.75 general medical practitioners per 1,000 persons in major Australian cities, 1.18 per 1,000 persons in inner regional areas and between 1.08 and 0.82 per 1,000 persons in more remote areas. From 1996 to 2001, there was an increase in the number of general medical practitioners per capita, with the largest increase in outer regional areas (10%) but no change in remote areas. Nonetheless, large inequalities of access remained.

Turrell, Oldenburg et al. (2004)[4] showed that patterns of Australian general practice service utilisation varied between regions, with higher utilisation in lower socio-economic status areas in cities but the converse applying in rural areas.

Access Economics Pty Ltd (2002)[5] and Rosenman & Mackinnon (1992)[6] in models of Australian general practice (which included clearly endogenous variables but made no allowance for the endogeneity), concluded that low socio-economic status increased utilisation. Neither of these studies included a direct measure of health, although the socio-economic status measure potentially indirectly reflected health.

Furler, Harris et al. (2002)[7] and O'Dea & Kilham (2002)[8] addressed the 'inverse care law', and showed that while low income areas faced lower prices, and received more services overall, they received shorter consultations than wealthier areas. Young, Dobson et al. (2001)[9] and Young & Dobson (2003)[10] showed that costs of GP care were

higher for women in rural areas and that the main determinant of GP use was health. Khan, Hussain et al. (2004)[11] showed that, as well as urban–rural differences, the GP age, gender and country of training were relevant to bulk billing and the likelihood of bulk billing increased with a GP's caseload.

International evidence on access to medical services is varied, reflecting the complexity of the relationships in the GP market. Fell, Kephart et al. (2007),[12] for example, showed no effect of patient income on GP utilisation over a one year period. Curtis & McMinn (2007)[13] in another Canadian study found that, conditional on self-reported health, there was a bias towards people with higher SES attending a physician. Maurer (2007),[14] found with Italian data that the socio-economic gradient was different for those in good health and those in poor health. Nolan (2007)[15] showed that in Ireland "the only significant non-need factors are medical card eligibility and employment status".

The scope of the work undertaken in this paper includes an assessment of the equity of the distribution of GP services in Australia, a simulation to demonstrate how many additional GP services underserved areas would benefit from if regional areas had the same access to GPs as Australians residing in major cities. It also explores the determinants of high and low use of GP services, and examines the relative importance of different determinants of the levels of fees charged by GPs.

Methods and data sources

MedDemandMOD

The rationale for ***MedDemandMOD*** was to develop a model of demand for general medical practitioner services that captured more than the typical age/sex supply of services. Rather, it was designed so that it could capture the impact of demographic determinants such as age, sex and regional factors such as remoteness, economic factors such as family income and socioeconomic indices such as SEIFA and indicators of need such as health status.

The 2001 National Health Survey (NHS) undertaken by the Australian Bureau of Statistics is used as the data source***.*** The NHS has the advantage of being a nationally representative sample survey with a range of socio-economic and health determinants of medical demand.

One of the first challenges was to account for unmet demand. Although an imperfect measure, it was assumed that in capital cities, where there is the highest concentration of general medical practitioners, demand was fully met. The limitation is that any unmet demand in capital cities is not captured. The total demand in underserved areas was then estimated to be the services that would be consumed if persons from other areas had the same supply of medical services as persons in capital cities given their health status (which is poorer), their demographic characteristics and factors that might constrain their use, such as family income (to meet out of pocket costs) and the composite socioeconomic index, the SEIFA Index of Relative Socio-economic Disadvantage.

A multinomial logistic regression model was used to identify the variables that were significantly associated with the use of general medical practitioner services. The

variables that proved to be significant determinants of service use were age, sex, family income decile, remoteness, SEIFA and self reported health status ($p<0.01$).

To underpin the model, a matrix (called an array in SAS when stored in memory to provide efficient access to a multidimensional matrix) of the average use of general medical practitioner services was constructed. The variables which were found to be significant in the multinomial logistic function were used as the indices to the array. Some of the variables were collapsed to produce fewer categories so that there were relatively few cells with null values in the array. The total number of cells in the array was 648 (that is the number of permutations of the array variable categories.

To run simulation, code was written to support varying the values of the indices, thereby making it possible to simulate for example the extent of the potential increased in general practitioner visits in regional and remote areas if they had the same access as residents of major cities.

MedDemandMOD was developed in SAS on an IBM compatible PC platform.

For further information on ***MedDemandMOD*** see Schofield, McCrea and Shrestha (2008).[16]

The Medicare Model

For the Medicare Model, data has been drawn from the Medicare administrative system for an eight year period from 1996 to 2003. Data is available for 816 Statistical Local Areas (SLA)s (or aggregates of SLAs in the less populous areas). Information on the number of GPs, the number of services provided, the prices charged, the level of government insurance paid and the number of patients seen in defined geographic areas, has been combined with aggregate data from the Australian Population Census, mortality data and data from a range of ad hoc sources (e.g. numbers of hospital beds and numbers of private schools) to provide the basis of this analysis.

Structural equation modelling of demand and supply with GMM panel methods provided the results from this model reported in our demand paper[16] The same data has been used in this paper to address questions of access and equity using tabular methods and regression equations. The analysis was undertaken in STATA on an IBM compatible PC platform.

The major barriers to access to care are numbers of GPs available and the prices they charge. The number of GPs per se is not a useful measure given the diversity of part-time work patterns in different areas (the number of services per GP range from 750 to 15,700 across the SLAs in 2001), and any reasonable measure of Full Time Equivalent GPs will be highly correlated with the number of services provided. Prices charged by GPs, however, can provide major barriers to patient attendance.

Under the Australian Medicare system GPs are not limited in the fees that they may charge. The Medicare system provides a fixed government rebate for each service (broadly based on length of consultation). If the GP bills above the rebate, the patient generally pays the full amount and claims the rebate back from the Medicare agency. If the GP bills at the level of the rebate, with no cost to the patient, the GP claims the

rebate from the Medicare agency. This latter approach is referred to as bulk billing, and the bulk billing level provides a measure of access, as it reflects the proportion of GP services provided with no financial barrier. The price measures used in this study are the bulk billing rate in each area, and the mean net fee charged after the Medicare rebate.

There is no direct measure of poverty available, but measures of mean personal income, measures of socio-economic status, and measures of unemployment in an SLA are available. The lowest groups in these categories can be assumed to be relatively poor. The relative access to services across these and other dimensions (such as urban/rural) give an indication of the equity of the system.

There are two measures of medical need available in this study, the proportion of the population in each area with fair or poor self assessed health, and the crude mortality rate. The former is based on National Health Surveys with synthetic estimation of the proportions in each SLA. This measure is less reliable than the mortality rate, and proved very difficult to model, so the mortality rate was preferred. The crude mortality rate was used rather than an age adjusted rate as this reflects the actual demand on medical services, but means explicit age measures are less likely to be significant in the analyses.

The innovations in this study are in the use of a broader range of data to estimate the determinants of access to GP services, and in particular in this paper to accommodate endogeneity and border crossing. An important innovation is the inclusion of the ratio of the number of people employed in the SLA to the population of the SLA in the modelling. Many people use GPs near their place of work rather than near their homes, and this variable assists in reducing the impact of this border crossing on the estimation.[1]

Elsewhere we have used the panel structure of the data to further address border crossing issues and concerns with unobserved heterogeneity. Panel estimation is not appropriate here, as the fixed effects modelling required would not permit estimation of regional effects.

While we could avoid endogeneity issues by estimating reduced form equations, this would remove any explicit measurement of medical need as a determinant of service use. The modelling therefore retains mortality as an endogenous determinant, which is instrumented by the number of nursing home beds in an area. This instrument is strong (according to the Staiger and Stock (1997)[17] tests), covers 30% of the relevant variation, and is not correlated with the error terms of the main equation.

Independent variables in the regressions reflect the nature of the population of each SLA, and the nature of the GP population (age, gender, nature of registration). The latter are included as it is likely that they will directly influence prices charged, and through prices activity levels.

[1] The average ratio is lowest in inner regional areas and highest in most remote. The latter is not surprising, as many people live in remote areas only to work in agricultural or mining projects. The low figure on inner regional in part reflects that this is the area with the highest proportion of older people, but also suggests that there is travel from these cities to elsewhere for work.

A variable is included in each equation reflecting mean personal income in the SLA. Equations including indicators of socio-economic status instead of mean personal income showed a marginally better fit for services per capita, but a marginally worse fit for net fees. The income measure is used for parsimony.

The analysis is undertaken in two parts. Initially we provide simple tabular representation of the average values of the three access measures within relevant categories (income quintiles, remoteness categories etc) to provide a view comparable with that provided in the context of the MedDemandMod. Secondly we develop equations to estimate the determinants of each of the access variables.

Results

MedDemandMOD

Based on a univariate analysis, Australia has what appears to be an equitable distribution of GP services on many measures. People who are in the poorest health, are the oldest, who have the lowest family incomes or live in the most disadvantaged communities report the highest average number of GP visits per fortnight. The one measure where inequality is noted is remoteness where Australians living in major cities report higher use of GP services despite the poorer health of those who live in regional communities. Men report fewer GP visits than women, although this occurs regardless of the region in which they live suggesting that the gender difference is not necessarily related to access per se.

Table 1: Equitable GP access? Mean GP visits per capita per fortnight, Australia, 2001

Equity group	Mean GP visits
Remoteness	
Major city	0.24
Inner regional	0.22
Other regional	0.18
Index of Relative Socioeconomic Disadvantage	
First quintile (lowest)	0.31
Second and third quintiles	0.24
Fourth and fifth quitiles	0.20
Tercile of family income	
First tercile (lowest)	0.36
Second tercile	0.21
Third tercile	0.16
Health	
Excellent-very good	0.15
Good	0.24
Fair-Poor	0.45
Age	
15-19	0.12
20-44	0.17
45-64	0.25
65 and over	0.44
Sex	
Male	0.20
Female	0.26

However, when variables are looked at together it becomes clear that access is not as equitable as the univariate analysis initially suggests. Australians who are in the poorest health but who live in inner and outer regional and remote areas report lower access to GP services than those residing in major cities. Similarly the elderly who live outside major cities report lower GP use (table 2).

Australians who are live in more disadvantaged rural communities or who have the lowest family incomes and live in rural communities report using fewer GP services than Australians who are poor or live in a disadvantaged community in a major city.

However, there are some multidimensional measures on which access foes appear equitable. For example, the sickest and oldest Australians living in the most disadvantaged areas report greater GP use than those in more advantaged areas. In Australia, Medicare heavily subsidises GP services and provides incentives for GPs in undeserved areas to 'bulk bill" so that patients have no out of pocket costs. This policy

is reflected in the higher use of GP services by the sickest and Australians on the lowest incomes.

Table 2. Distributional equity: Mean GP visits per capita per fortnight, Australia, 2001

	Health status			Age			
Equity group	**Excellent-very good**	**Good**	**Fair-Poor**	**15-19**	**20-44**	**45-64**	**65 & over**
Remoteness							
Major city	0.16	0.25	0.48	0.14	0.18	0.28	0.46
Inner regional	0.14	0.22	0.45	0.08	0.17	0.22	0.43
Other regional	0.13	0.17	0.35	0.07	0.14	0.19	0.36
Index of Relative Socioeconomic Disadvantage							
First quintile (lowest)	0.17	0.30	0.54	0.15	0.23	0.33	0.50
Second and third quintiles	0.15	0.23	0.46	0.11	0.17	0.26	0.44
Fourth and fifth quintiles	0.14	0.22	0.38	0.11	0.15	0.22	0.41
Tercile of family income							
First tercile (lowest)	0.22	0.32	0.57	0.14	0.22	0.38	0.49
Second tercile	0.14	0.21	0.39	0.12	0.17	0.24	0.37
Third tercile	0.13	0.19	0.28	0.09	0.15	0.18	0.30

Table 2b. Distributional equity: Mean GP visits per capita per fortnight, Australia, 2001

	Index of Relative Socioeconomic Disadvantage			Tercile of family income		
Equity group	**1st quintile**	**2nd & 3rd quintiles**	**4th & 5th quintiles**	**1st tercile**	**2nd tercile**	**3rd tercile**
Remoteness						
Major city	0.33	0.25	0.21	0.38	0.22	0.17
Inner regional	0.29	0.22	0.19	0.33	0.19	0.15
Other regional	0.24	0.18	0.13	0.30	0.15	0.11

A multinomial logistic regression analysis was performed to analyse the association between the number of times a GP was visited in the two weeks prior to the survey and socio-demographic variables. Relative risk ratios of consulting GP one, two or three plus times compared to none were estimated (Table 3).

People in the 65 or more years of age group were significantly more likely to visit GP one or two times per fortnight than younger population, with the use of GP services increasing as age increased. Males were significantly less likely than females to visit a GP. People who live in the most disadvantaged areas or have the lowest family income were significantly likely to visit a GP more often than people in the less disadvantaged areas or people who have higher family income. People in regional communities were significantly less likely to visit GP than people in major cities.

Table 3: Association between the number of GP visits in the last 2 weeks and socio-demographic variables, relative risk ratios and their 95% CIs.

Variables	Number of times GP consulted per fortnight			Overall p-value
	One visit	Two visits	Three or more visits	
Age group				<0.0001
15 – 19	**0.46 (0.37 – 0.57)**	**0.35 (0.21 – 0.60)**	1.46 (0.62 – 3.46)	
20 – 44	**0.47 (0.41 – 0.54)**	**0.72 (0.54 – 0.96)**	1.12 (0.65 – 1.94)	
45 – 64	**0.58 (0.50 – 0.66)**	0.96 (0.73 – 1.26)	1.12 (0.66 – 1.90)	
65+	Reference	Reference	Reference	
Sex				<0.0001
Male	**0.74 (0.67 – 0.82)**	**0.71 (0.58 – 0.87)**	0.88 (0.59 – 1.30)	
Index of Relative Socioeconomic disadvantage				0.0013
First quintile	**1.25 (1.09 – 1.43)**	**1.54 (1.17 – 2.03)**	**1.86 (1.07 – 3.21)**	
Second/third quintile	1.10 (0.98 – 1.23)	**1.33 (1.05 – 1.70)**	1.30 (0.80 – 2.12)	
Fourth/fifth quintile	Reference	Reference	Reference	
Remoteness				<0.0001
Inner regional	**0.88 (0.78 – 0.99)**	**0.77 (0.60 – 0.99)**	**0.55 (0.32 – 0.95)**	
Other regional	**0.63 (0.54 – 0.74)**	**0.52 (0.38 – 0.71)**	0.75 (0.40 – 1.41)	
Major cities	Reference	Reference	Reference	
Cash income				<0.0001
First tercile	**1.25 (1.09 – 1.43)**	**1.80 (1.34 – 2.41)**	**2.36 (1.30 – 4.31)**	
Second tercile	1.09 (0.95 – 1.24)	1.23 (0.91 – 1.66)	1.23 (0.66 – 2.32)	
Third tercile	Reference	Reference	Reference	
Health status				<0.0001
Exec / V Good	**0.41 (0.36 – 0.46)**	**0.18 (0.14 – 0.23)**	**0.16 (0.10 – 0.27)**	
Good	**0.61 (0.54 – 0.70)**	**0.33 (0.26 – 0.42)**	**0.32 (0.20 – 0.49)**	
Fair / Poor	Reference	Reference	Reference	

MedDemandMOD was then used to simulate how many services Australians in disadvantaged groups might use if regional areas had the same access as persons in major cities given their other characteristics. That is, how many more services people in rural areas would use if they had the same access at Australians in major cities given their lower income, poorer health status and so on.

To ensure that the model was useful for policy analysis the model was benchmarked[2] to Medicare data (subsidised services). Substantial differences were noted particularly for the youngest age groups. There was less difference between the older age group as the NHS excludes persons in institutions such as hospitals and nursing homes leading to a relative undercount per person of the use of GP and other services by the elderly.

According to the Australian Bureau of Statistics (personal communication 3 June 2008, ABS Health and Disability Section) there were a number of possible reasons for this difference between survey data and administrative Medicare data. These include:

1. Seasonal differences in the use of services which appear in the Medicare data but are not captured during the lower billing period in which the NHS was undertaken in 2001.
2. Respondents potentially reporting unbilled services such as to pick up a prescription without a consultation or the GP speaking briefly to the practice nurse during a nursing consultation. Nurse practitioner visits are separately captured in Medicare data in later years.
3. Respondents potentially reporting pathology visits which were a follow-up to a GP visit in the same building.
4. GPs not charging when patients return to pick up test results.
5. Reported use of services on the NHS by persons who are residents but ineligible for Medicare rebates.

The model was run against the NHS data and again against NHS data where the GP visits were scaled down by age to match Medicare data. The number of visits was deflated by 41% for persons aged 15-19 years, 26% for persons aged 20-44 years, 20% persons aged 45-64 years, 4% for persons aged 65+ years, and 19% overall.

Based on the simulation, if persons in regional areas had the same access to GP services as those in major cities, they would benefit from about 8.6 million additional GP visits per year (6.7 million additional Medicare funded services) (Tables 5 and 6); about 4 million (a 16% increase) for inner regional residents and about 4.5 million for residents of other regional areas (a 31% increase). The average number of visits would rise from 7.1 to 8.4 per annum in inner regional areas and from 5.9 to 8.5 in other regional areas. Their use would then be higher than persons for persons living in major cities (who averaged 7.9 GP visits per annum), reflecting both the current lack of services and poorer health of rural Australians.

There would also be a rise in the number of services to Australian in the most disadvantaged areas (first quintile of the index of socioeconomic disadvantage (SEIFA)) of about 9%. There would also be a rise for the 2nd to 5th SEIFA quintiles, although not

[2] Benchmarking typically involves alignment of a model with an administrative data source for use in policy analysis.

as great, reflecting that there is less access to GP services in both socially disadvantaged and advantaged regional communities although the most disadvantaged areas may suffer the greatest shortages.

Interestingly, when averaged across al regions, Australians aged 15-19 years could experience a 14% increase in GP visits possibly reflecting the higher fertility rates of poorer and rural communities. However, both 15-19 year olds and persons aged 65 years resident in other regional areas could benefit from a 50% increase in GP visits reflecting the greater acuity of shortages in more remote areas.

Table 5: Annual GP services if access universally the same as in major Australian cities, 2001

Simulation variables	Base	Simulation	Difference		Base	Simulation	Difference	Difference
	No.	No.	No.	%	Mean	Mean	No.	%
Remoteness								
Major city	80,052,908	80,052,908	0	-	7.9	7.9	0	-
Inner regional	21,619,286	25,687,039	4,067,753	16	7.1	8.4	1.3	16
Other regional	10,201,620	14,726,648	4,525,028	31	5.9	8.5	2.6	31
Total	**111,873,814**	**120,466,596**	**8,592,782**	**7**	**7.5**	**8.1**	**0.6**	**7**
Index of Relative Socioeconomic Disadvantage								
First quintile (lowest)	25,489,100	28,045,279	2,556,179	9	9.8	10.8	1.0	9
Second and third quintiles	43,638,218	47,434,693	3,796,475	8	7.6	8.2	0.7	8
Fourth and fifth quintiles	42,746,496	44,986,624	2,240,128	5	6.5	6.8	0.3	5
Total	**111,873,814**	**120,466,596**	**8,592,782**	**7**	**7.5**	**8.1**	**0.6**	**7**
Tercile of family income								
First tercile (lowest)	41,727,322	44,808,839	3,081,517	7	11.0	11.8	0.8	7
Second tercile	46,884,006	50,861,513	3,977,507	8	6.8	7.4	0.6	8
Third tercile	23,262,486	24,796,243	1,533,757	6	5.4	5.8	0.4	6
Total	**111,873,814**	**120,466,596**	**8,592,782**	**7**	**7.5**	**8.1**	**0.6**	**7**
Health status								
Excellent-very good	38,835,888	41,493,998	2,658,110	6	5.0	5.4	0.3	6
Good	34,658,494	37,993,369	3,334,875	9	7.7	8.4	0.7	9
Fair-Poor	38,379,432	40,979,229	2,599,797	6	14.2	15.2	1.0	6
Total	**111,873,814**	**120,466,596**	**8,592,782**	**7**	**7.5**	**8.1**	**0.6**	**7**
Age								
15-19	6,729,944	7,853,730	1,123,786	14	5.1	6.0	0.9	14
20-44	41,969,512	44,309,949	2,340,437	5	6.0	6.3	0.3	5
45-64	36,049,624	39,861,185	3,811,561	10	8.2	9.0	0.9	10
65 and over	27,124,734	28,441,732	1,316,998	5	12.0	12.6	0.6	5
Total	**111,873,814**	**120,466,595**	**8,592,781**	**7**	**7.5**	**8.1**	**0.6**	**7**

Table 6 : Annual GP services if access universally the same as in major Australian cities, 2001 (benchmarked to Medicare)

Simulation variables	Base	Simulation	Difference		Base	Simulation	Difference	Difference
	No.	No.	No.	%	Mean	Mean	No.	%
Remoteness								
Major city	64,194,776	64,194,776	0	-	6.3	6.3	0	-
Inner regional	17,665,352	20,806,856	3,141,504	15	5.8	6.8	1.0	15
Other regional	8,290,409	11,882,188	3,591,779	30	4.8	6.9	2.1	30
Total	**90,150,537**	**96,883,820**	**6,733,283**	**7**	**6.0**	**6.5**	**0.5**	**7**
Index of Relative Socioeconomic Disadvantage								
First quintile (lowest)	20,690,586	22,612,536	1,921,950	8	8.0	8.7	0.7	8
Second and third quintiles	35,274,478	38,377,417	3,102,939	8	6.1	6.7	0.5	8
Fourth and fifth quintiles	34,185,473	35,893,867	1,708,394	5	5.2	5.4	0.3	5
Total	**90,150,537**	**96,883,821**	**6,733,284**	**7**	**6.0**	**6.5**	**0.5**	**7**
Tercile of family income								
First tercile (lowest)	35,596,121	38,013,898	2,417,777	6	9.4	10.0	0.6	6
Second tercile	36,817,177	39,947,259	3,130,082	8	5.4	5.8	0.5	8
Third tercile	17,737,239	18,922,663	1,185,424	6	4.1	4.4	0.3	6
Total	**90,150,537**	**96,883,820**	**6,733,283**	**7**	**6.0**	**6.5**	**0.5**	**7**
Health status								
Excellent-very good	30,320,815	32,350,715	2,029,899	6	3.9	4.2	0.3	6
Good	27,967,120	30,592,407	2,625,287	9	6.2	6.8	0.6	9
Fair-Poor	31,862,602	33,940,699	2,078,097	6	11.8	12.6	0.8	6
Total	**90,150,537**	**96,883,820**	**6,733,283**	**7**	**6.0**	**6.5**	**0.5**	**7**
Age								
15-19	4,004,182	4,672,812	668,630	14	3.1	3.6	0.5	14
20-44	31,178,311	32,916,975	1738663.68	5	4.5	4.7	0.2	5
45-64	28,981,735	32,046,001	3,064,267	10	6.6	7.3	0.7	10
65 and over	25,986,309	27,248,032	1,261,723	5	11.5	12.1	0.6	5
Total	**90,150,537**	**96,883,820**	**6,733,284**	**7**	**6.0**	**6.5**	**0.5**	**7**

The Medicare model

In all preliminary modelling the proportion of overseas born people in the SLA (which varies from 2.2 per cent to 52.5 per cent with a mean of 21.7 per cent) proved highly significant. As the proportion overseas born is related to better health, the positive relationship estimated with service utilisation was counter-intuitive. This result proved to be due to areas with high proportions of overseas born being lower socio-economic status areas. There is a significant correlation of 0.20 between the percent of the population overseas born and the mean personal income. The inclusion of the percentage of overseas born in all equations diluted both income and regional effects, with little influence on other parameters. The equations reported here exclude the overseas born parameter to clarify the income and regional effects.

The distance a patient must travel to see a GP can be approximated in this data, but is not exogenous, with the distance to a GP being related to the number of GPs in an area, which is itself related to prices which can be charged in the area. Distance is therefore not explicitly included in these equations. The remoteness categories used however do reflect on the distances patients must travel.

Table 7 below shows the size of the remoteness categories.

Table 7: Remoteness Categories

Region	Number of SLAs	Population in 2001	Total Area (1,000 square km)
Major Cities	281	13.1 million	30
Inner Regional	230	3.9 million	381
Outer Regional	215	1.9 million	1,461
Rural	54	0.3 million	1,289
Remote	36	0.2 million	4,475
Total	816	19.4 million	7,635

The summary tables (Table 8) show that, as would be expected, the least healthy areas use the most services, the most wealthy areas are charged at the highest rate, and the more remote an area the fewer the services provided and the higher the fees charged, except in the most remote areas.

While the results broadly follow the patterns expected, there are inconsistencies. Many of these are due to effects of interactions, mainly with urban/rural effects. The tables at Attachment A expand part of Table Y to show the results for income and socio-economic status separately in each region.

Table 8: Access and Barriers to GP Services in Australia, 2001

Classification	Mean number of services per capita	Mean net fee charged	Mean bulk billing rate
Remoteness			
Major city	5.6	$1.78	82.3%
Inner Regional	4.1	$3.45	56.7%
Outer Regional	4.0	$3.61	60.1%
Rural	3.0	$3.47	65.9%
Remote	2.1	$1.54	84.2%
Socio-economic quintile			
Lowest (least wealthy)	5.7	$1.12	85.5%
Second	4.7	$2.30	73.1%
Third	4.8	$2.33	72.0%
Fourth	5.1	$2.15	78.2%
Highest (most wealthy)	5.1	$3.30	70.7%
Quintiles of poor/fair self assessed health			
Lowest (most healthy)	4.5	$3.69	67.8%
Second	4.9	$2.72	71.8%
Third	4.6	$2.64	68.4%
Fourth	4.7	$3.27	73.2%
Highest (least healthy)	6.2	$0.97	88.8%
Quintiles of crude mortality rate			
Lowest (most healthy)	4.4	$1.64	82.4%
Second	5.1	$2.01	80.1%
Third	5.4	$2.24	78.3%
Fourth	5.2	$2.14	75.6%
Highest (least healthy)	5.4	$2.93	65.8%
Quintiles of Concession Card Holding			
Lowest (least needy)	4.8	$3.02	74.0%
Second	5.1	$2.30	77.7%
Third	4.9	$2.06	77.7%
Fourth	5.2	$2.04	75.6%
Highest (most needy)	5.3	$1.84	76.0%
Quintiles of Mean Personal Income			
Lowest (most needy)	5.3	$1.51	79.5%
Second	4.9	$2.30	72.0%
Third	4.9	$1.90	77.9%
Fourth	5.1	$2.28	77.4%
Highest (least needy)	5.2	$3.06	74.2%
Quintiles of GPs per square kilometre			
Lowest (least GPs)	3.4	$3.42	58.3%
Second	4.3	$2.65	68.8%
Third	5.0	$1.95	78.2%
Fourth	5.9	$1.40	84.6%
Highest (most GPs)	6.9	$2.20	81.5%

Classification	Mean number of services per capita	Mean net fee charged	Mean bulk billing rate
Quintiles of percent of population aged over 65			
Lowest (youngest population)	4.3	$1.79	81.2%
Second	5.4	$2.01	80.4%
Third	4.9	$2.21	76.7%
Fourth	5.4	$2.34	75.0%
Highest (oldest population)	5.4	$2.63	68.9%
Quintiles of percent overseas born			
Lowest (least overseas born)	4.0	$3.62	54.8%
Second	4.4	$2.80	68.1%
Third	5.0	$2.28	76.9%
Fourth	5.6	$2.16	80.4%
Highest (most overseas born)	6.3	$0.86	91.5%

As with the tabular analysis, the regression results are broadly as would be expected with more services for areas with higher mortality and more unemployed, and higher fees in areas with higher incomes.

The variables relating to numbers of hospital beds and the ratio of number of workers to population are effectively nuisance parameters in this analysis and are not discussed further. While the variables representing GP characteristic are interesting in their own right, they are not pertinent to issues of equity and again are not further discussed.

GP Utilisation

Table 9 shows that there are more services in areas of higher health need and in areas with more unemployed people. As discussed below Indigenous Australians receive fewer services under Medicare than other Australians. Somewhat surprisingly, conditional on income and health, concession card holding is related to lower service levels. The income effect however is significantly in the direction of more services for those with relatively low incomes.

The other significant dimension, after removing all other factors, is that apart from the most remote areas the non metropolitan provide significantly less services per capita than the major cities.

Table 9: Cross Sectional Modelling for 2001

	GP Services per capita (Mean 5.1)	Bulk billing rate (Mean 76.23%)	Net fee charged (Mean $2.21 in 1996 $)
Variable	**Coefficient**	**Coefficient**	**Coefficient**
Crude mortality rate	0.038***	0.040	-0.007
Percent of population female	0.082	-2.049***	0.197*
Percent of population aged 65 or over	-0.061	-0.634	0.077
Percent of population with post school qualifications	0.013	0.364**	0.013
Percent of population Indigenous Australians	-0.060***	-0.008	0.023
Percent of workforce unemployed	0.368**	1.498	0.009
Percent of population aged 15 or over working in "blue collar" industries	-0.019	-0.210*	0.020
Ratio of employed to 100 population	0.014***	-0.023*	0.004**
Number of hospital beds per capita	0.002	-0.239***	0.024***
Number of GPs per 1000 population in the State	-1.15	-14.767	1.551
Percent of GPs vocationally registered	-0.009*	-0.178***	0.008
Percent of GPs who are female	-0.017***	-0.177**	0.011
Percent of GPs aged 60 or over	-0.002	0.273***	-0.028***
Percent of GPs aged under 40	0.009*	0.013	-0.002
Number of concession cards per 100 population	-0.042**	-0.114	-0.004
Mean personal income ($1996)	-0.007**	-0.120***	0.015***
Inner Regional Areas	-1.703***	-27.647***	2.239***
Outer Regional Areas	-1.624***	-28.190***	2.677***
Rural Areas	-1.400***	-23.306***	2.206***
Remote Areas	-0.718	-9.118	0.449
Constant	4.242	270.114***	-17.570***
N	816	816	816

Crude mortality rate is endogenous, nursing home beds per capita used as instrument
Omitted region Major Cities

** = significant at 10%; ** = significant at 5%; *** = significant at 1%*

NOTE:If reduced form equations are estimated using fixed effects panel modelling over eight years, similar results are found. The main exceptions are: the numbers of GPs per 100 population are highly significant, increasing activity and reducing costs; concession card holding is highly significant in the expected directions, and the proportion of workers in blue collar industries shows lower rather than higher charging

Bulk billing and net fees

There are two surprising results with respect to billing, with areas with more female patients apparently billed more and areas with more educated patients apparently billed less, conditional on the other factors in the equation. Neither of these variables are significantly correlated with the bulk billing rate if assessed bivariately.

The main results on billing, however, are that wealthier areas are billed at higher rates, and non-metropolitan areas (other than the remote areas) are billed at higher rates. The level of concession card holding is not significant in these equations, perhaps because card holders tend to be older, unemployed or low income and these variables are also included in the equation. Card holding is used by many GPs to sort the patients who will or will not be bulk billed, and becomes significant with the expected sign if SEIFA variables are used rather than income measures, or if panel modelling is applied.

Indigenous access to services

Indigenous Australians have significantly higher health needs than other Australians (life expectancy at birth is approximately 17 years less for Indigenous Australians[18]) but expenditure per capita for medical services for Indigenous Australians is about 46 per cent of that for other Australians. The results here are consistent with the published data. The smaller effects estimated will be in part because medical services include more than GP services, and in part because some of the reduced use of services by Indigenous Australians is due to socio-economic and rurality effects explicit in the model. Overall health expenditure is estimated to be 17 per cent higher for Indigenous Australians18 than other Australians due to their much higher use of hospital services.

The reasons for the lower GP utilisation by Indigenous Australians are complex. Some medical services are not reflected in the Medicare system. While there may be financial barriers, Indigenous Australians face no higher costs than other Australians in the same regions and with the same backgrounds. One factor the data cannot reflect is that some remote communities are located at very large distances from medical care. Other factors may be cultural, with some Indigenous Australians preferring to attend medical services which are seen as culturally appropriate, and being disinclined to attend other medical services.

In the major cities, where 30% of Indigenous Australians reside, the unconditional volume effects are less extreme as shown in Table 10 below, while the price effects are clearer.

Table 10: Relationship of proportion of population Indigenous Australians and access measures in major cities.

	Quintiles of percent of population Indigenous Australians				
	First (Least)	Second	Third	Fourth	Fifth (Most)
Services per capita	5.6	5.8	5.5	5.3	5.9
Bulk billing rate	78.6%	84.0%	80.9%	85.2%	90.9%
Average net fee	$2.43	$1.52	$1.96	$1.20	$0.72

There are significantly fewer services and higher costs outside the major cities. The less extreme costs in the most remote areas are influenced in part by Aboriginal Medical Services which have 100 per cent bulk billing.

The lower activity levels and high charging in extra-metropolitan area are a natural outcome of the smaller numbers of GPs per capita in these regions, and the high travel and time costs for patients to attend GPs in the more rural areas. The fact that the remote areas do not appear significantly different to the major cities in the regressions

will be due to their relatively low death rates, high percentages of Indigenous Australians, and lower overall unemployment rate.

Discussion of the findings and issues for the future

The results from both tabular approaches and the regressions show that in Australia overall those with the highest health need receive the most GP services. They also show generally those with higher incomes face higher fees. While these results are in the "right direction", it is not possible to discern whether any group is receiving the correct quantity of services or to observe whether any group faces unreasonable financial barriers.

Two exceptions which are clear are that even after allowing for income and health need Indigenous Australians have lower usage of Medicare services than other Australians, and people outside the major cities also have lower utilisation and face higher prices than those in the major cities.

Multivariate analysis from MedDemandMOD demonstrates that regional Australia is underserved by about 8.6 million GP visits per year (6.7 Medicare funded services) and that there would be a 16% increase in doctor visits for inner regional residents and a 31% increase for residents of other regional areas if access was the same as in the major cities of Australia. Average visits per person would rise to be higher than for persons in the major cities reflecting both the current lack of services and poorer health of rural Australians. Accordingly, the greatest increase in the number of services would be to Australians in the most disadvantaged areas.

The effects observed from this analysis are the outcome of both policy and economic effects. The structure of Medicare encourages bulk billing, particularly for low income patients. If a patient is charged a gap they must pay the full fee and then reclaim the government rebate. For low income patients the full fee, even with a small gap, can be a significant imposition so there is an incentive for the GP to bulk bill. Equally importantly, however, GPs price discriminate using the possession of a concession card as a discriminator, because the card holders and non-card holders have different price elasticities of demand[19.]

In the period following 2001, overall GP activity levels declined, and bulk billing rates fell markedly. The government responded to these changes by increasing the Medicare rebates for GP services, and creating an incentive payment for services provided to concession card holders and children who were bulk billed. This has led to a recovery in the bulk billing rates, and has stopped the decline in activity levels per capita. It will also have amplified the observed effect of lower charging for lower income patients.

The results shown above would suggest that in the Australian health system, with the exception of non-metropolitan areas and Indigenous Australians, access to GP services by people in poverty was generally better than for other Australians and financial barriers were less than for other Australians. Whether this access was adequate cannot be determined for certain and the results of MedDemandMOD would suggest that they are not.

Equity of access to services in rural areas is limited as these are not attractive areas to GPs for many reasons. In some areas the populations are of such low density it is not financially viable for GPs to work in them. In areas which are more viable, patients may still face significant travel costs which reduce demand independent of GP charging. In the most remote areas, we might still see lower levels of per capita utilisation in rural areas almost regardless of GP numbers.

The Australian government has in place a range of incentive programs to encourage GPs to work in rural areas, in both short term and longer term placements. While these programs have had some success, and it is arguable that the numbers of services per capita in rural areas improved marginally over the period the national utilisation level fell, the gap between the major cities and the rural areas remains large. Solutions are difficult as the reasons GPs do not wish to work in rural areas are diverse. They are generally not financial reasons, but personal, family and professional, and as such difficult to overcome.

ATTACHMENT A

Tables A1-A3: Income quintiles and region

Table A1: GP Services per capita 2001 by SLA						
	Income quintile					
Region	First quintile (lowest income)	Second quintile	Third quintile	Fourth quintile	Fifth quintile (highest income)	All quintiles
Major city	6.69	5.74	5.50	5.30	5.42	5.61
Inner regional	4.35	4.35	3.57	3.77	2.29*	4.11
Outer regional	4.23	3.71	3.89	3.39	3.66	3.96
Rural	3.41	3.75	2.22	3.18*	2.47	3.00
Remote	2.01*	2.28*	1.63*	2.36*	2.31*	2.13
All regions	*5.26*	*4.89*	*4.92*	*5.05*	*5.25*	*5.08*
* indicates less than 10 SLAs contribute to mean						

Table A2: Mean fee per GP service 2001 by SLA, $A1996						
	Income quintile					
Region	First quintile (lowest income)	Second quintile	Third quintile	Fourth quintile	Fifth quintile (highest income)	All quintiles
Major city	$0.49	$1.26	$1.27	$2.02	$2.96	$1.78
Inner regional	$2.71	$3.58	$4.10	$4.44	$5.49*	$3.45
Outer regional	$2.65	$3.95	$4.64	$5.02	$5.45	$3.61
Rural	$1.59	$2.87	$3.09	$3.97*	$5.75	$3.47
Remote	$0.11*	$1.80*	$1.64*	$1.59*	$3.10*	$1.54
All regions	*$1.51*	*$2.30*	*$1.90*	*$2.28*	*$3.06*	*$2.21*
* indicates less than 10 SLAs contribute to mean						

Table A3: GP Bulk billing rates 2001 by SLA (%)						
	Income quintile					
Region	First quintile (lowest income)	Second quintile	Third quintile	Fourth quintile	Fifth quintile (highest income)	All quintiles
Major city	93.24%	84.75%	84.69%	80.30%	74.99%	82.34%
Inner regional	61.90%	56.25%	50.77%	49.33%	45.52%*	56.69%
Outer regional	66.10%	51.81%	57.54%	56.50%	57.04%	60.05%
Rural	81.93%	64.92%	67.55%	67.11%*	50.07%	65.87%
Remote	99.05%*	83.41%*	78.52%*	82.58%*	69.04%*	84.18%
All regions	*79.48%*	*72.04%*	*77.91%*	*77.37%*	*74.15%*	*76.24%*
* indicates less than 10 SLAs contribute to mean						

Tables A4-A6: Socio-eoconomic status quintiles and region

Table A4: GP Services per capita 2001 by SLA						
	Socio-economic index quintile					
Region	**First quintile (lowest income)**	**Second quintile**	**Third quintile**	**Fourth quintile**	**Fifth quintile (highest income)**	**All quintiles**
Major city	6.75	5.47	5.43	5.53	5.14	5.61
Inner regional	4.88	3.82	4.33	3.15	3.99	4.12
Outer regional	3.86	4.14	3.80	3.85	4.58	3.96
Rural	2.70	3.38	2.70	3.43	5.76	2.97
Remote	1.90	2.46	3.28	3.42		2.13
All regions	*5.72*	*4.65*	*4.84*	*5.08*	*5.08*	*5.08*
* indicates less than 10 SLAs contribute to mean						
Table A5: Mean fee per GP service 2001 by SLA, $A1996						
	Socio-economic index quintile					
Region	**First quintile (lowest income)**	**Second quintile**	**Third quintile**	**Fourth quintile**	**Fifth quintile (highest income)**	**All quintiles**
Major city	$0.44	$1.32	$1.41	$1.92	$3.26	$1.78
Inner regional	$2.80	$3.70	$3.64	$3.45	$3.77	$3.45
Outer regional	$3.03	$3.47	$4.23	$3.86	$7.18	$3.61
Rural	$2.09	$2.77	$5.60	$4.20	$0.57	$3.47
Remote	$1.06	$2.08	$3.00	$2.06		$1.54
All regions	*$1.12*	*$2.30*	*$2.34*	*$2.15*	*$3.30*	*$2.21*
* indicates less than 10 SLAs contribute to mean						
Table A6: GP Bulk billing rates 2001 by SLA (%)						
	Socio-economic index quintile					
Region	**First quintile (lowest income)**	**Second quintile**	**Third quintile**	**Fourth quintile**	**Fifth quintile (highest income)**	**All quintiles**
Major city	94.38%	84.29%	83.28%	81.20%	71.60%	82.34%
Inner regional	61.13%	54.35%	55.51%	58.83%	51.89%	56.69%
Outer regional	63.82%	63.34%	48.25%	62.03%	44.29%	60.05%
Rural	79.17%	70.57%	50.56%	50.58%	85.21%	65.87%
Remote	90.14%	77.77%	66.66%	68.15%		84.18%
All regions	*85.52%*	*73.08%*	*72.00%*	*78.22%*	*70.74%*	*76.24%*
* indicates less than 10 SLAs contribute to mean						

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