THE NATIONAL MENTAL HEALTH STRATEGY AND GEOGRAPHICAL ACCESS TO MENTAL HEALTH SERVICES: SOME EMPIRICAL RESULTS

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ABSTRACT: In 1992 the Australian Government adopted the National Mental Health Strategy in an attempt to improve the provision of mental health services. A component was to improve geographical access to hospital-based mental health services. This paper is concerned with determining if this objective has been achieved. Time-series data on patients (at a regional level) with mental illness in the State of Queensland are available for the years from 1968-69 to 2002-03. A change in regional classification by the Australian Bureau of Statistics complicates the analysis by precluding certain empirical tests such as converging utilisation rates by region. To overcome this problem, it was decided to apply concepts of concentration and equality that are commonly employed in industrial economics to the regional data. The empirical results show no evidence of improving regional access following the National Mental Health Strategy: in fact the statistical results show the opposite, i.e. declining regional access.

1. INTRODUCTION

The purpose of this paper is to determine if access to specialised psychiatric services has improved in the years since the adoption of the National Mental Health Strategy in 1992. Part of the background to this national policy initiative on mental illness have been scandals, and consequential inquiries by various governments such as the "Deep Sleep" enquiry at the privately-owned Chelmsford Hospital in Sydney (New South Wales Royal Commission into Deep Sleep Therapy, 1990) and the inquiry associated with Ward 10B at the (government-owned) Townsville General Hospital (Queensland Commission of Inquiry into the Care and Treatment of Patients in the Psychiatric Unit of the

Townsville General Hospital, 1991). At the national level there has also been the Burdekin *Report* (National Inquiry Concerning the Human Rights of People with Mental Illness, 1993).

One of the objectives of the National Mental Health Strategy was to improve access to inpatient hospital services for the mentally ill. However it should not be thought that this objective related to the traditional "mental hospital": in fact other objectives of the Strategy involved "downsizing" the historical mental hospitals, and "mainstreaming" acute care for mental illness to general hospitals. One statement of the "access" objective is as follows: *"To decentralise the provision of psychiatric hospital services to ensure adequate access across all areas/regions to* ***general*** *hospital inpatient services..."* (Australian Health Ministers, 1992a, p.23) (emphasis added). Other statements on the same issue have been expressed in terms of resources rather than services. For example, it was stated that the strategies *"are designed to assist in the more equal distribution of mental health personnel throughout urban and rural areas..."* (Australian Health Ministers, 1992b, p.10) and *"to provide support to primary [health] carers by ensuring that they have access to specialist mental health resources, particularly in rural and remote areas"* (Australian Health Ministers, 1992a, p.26). Furthermore the Burdekin *Report* also made recommendations on services in rural and isolated areas (National Inquiry Concerning the Human Rights of People with Mental Illness, 1993). In its whole-of-government response the Commonwealth recognised the difficulties of *"accessing appropriate mental health services"* and agreed *"to improve access"* (Department of Housing, Local Government and Human Services and Department of Attorney-General, 1994).

It should not be thought that the specification of "access" in these documents is serendipitous: "access" is an issue that is addressed in various policy documents relating to Australia's general health care arrangements. Consider "Principle 2" and "Principle 3" in the intergovernmental agreements, now called Health Care Agreements (previously called Medicare Agreements) between the Commonwealth Government and the governments of the states/territories. These two "Principles" are as follows:

> *Access to the public hospital services [is] to be on the basis of clinical need*

and

> *To the maximum practicable extent, a state will ensure the provision of public hospital services equitably to all eligible persons, regardless of their geographical location* (Australian Government Solicitor, 1998, pp.9-10).

This emphasis on access can also be found in statements by politicians, e.g. the (then) Minister for Community Services and Health (Dr Neal Blewett), wrote as follows: *"The introduction of Medicare in February 1984 was designed to ensure that all Australians have access to medical and hospital services on the basis of need"* (Blewett, 1988, p.106).

The structure of this paper is as follows: Section 2 provides a brief account of the diffuse literature on access in the health sector. Section 3 depicts some of the data employed in this study. Section 4 describes the method of estimation employed, and Section 5 presents the empirical results. Section 6 concludes.

2. THE LITERATURE ON ACCESS

Although there is some occasional reference to other sectors, for example to education (Coleman, 1968), and to the telephone system (Gills, Jenkins and Leitzel, 1986), most papers on access refer to the health sector. In fact, some of the earliest work, of a conceptual kind, came from Donabedian (1973) and from Andersen (Andersen, 1968; Aday and Andersen, 1974; 1975), two of the outstanding students of the health sector. Both of these writers view "access" in the context of their over-arching conceptions of the inter-relationships that exist between components of the health sector. Prior to this work "access" was more a political slogan rather than a concept to be measured (Aday and Andersen, 1974, p.208). In Andersen's case, access is a dimension, in part, of his behavioural model of health service utilisation (Andersen, 1968). (It is this conceptual framework that had been the continuing thread in Andersen's long career (Andersen, 1995, and Pescosolido and Kronfeld, 1995). Andersen's behavioural model conceives of measures such as medical need (low health status), enabling resources (income, insurance etc) and pre-disposing characteristics (family size, age, gender, race, occupation etc) as explanatory variables for health service utilisation. Andersen subsequently wrote that the purpose of this model was *"... to discover conditions that either facilitate or impede **utilisation**"* (Andersen, 1995, p.4) (emphasis added). Thus Andersen's conception quickly leads to the terminology associated with "barriers to access", where access is measured by utilisation.

Although most students of policy often imply that "barriers to access" are detrimental in some sense, it is relevant to observe that such barriers can be the creation of policy, in that governments often quite deliberately ration welfare services. It has been argued that such rationing takes two forms, *viz.* financial rationing (at the level of governments' budgets) and service rationing (at the level of service providers) (Judge, 1978, p.5). See also Foster (1983). Another manifestation of this same phenomenon is the literature on "targeting welfare". See Mitchell, Harding and Gruen (1994).

It is also relevant to note that Andersen's behavioural model has implicit definitions of **types** of access, *viz.* "potential access" (the presence of enabling resources), "realized access" (the actual use of services), and "equitable and inequitable access are defined according to which predictors are dominant" (Andersen, 1995, p.4). Andersen also has a categorisation of access in terms of "process" and "outcome".

Donabedian begins by conceiving of the medical care system operating in a socio-cultural environment (Donabedian, 1973, Figures III.1 and III.2). A component of this system (Figure IV.1) is concerned with how resources are transformed into services produced, and hence consumed by consumers. "Accessibility" is regarded as **an intervening factor** which affects "the capacity of resources to produce services". Donabedian then argues that "availability or presence of resources" (Andersen's process measures) is not the same as accessibility: accessibility "comprises those characteristics of the resource that facilitate or obstruct use..." (p.419). He argues that accessibility can be

disaggregated into socio-organisational barriers (sex, race, fees, income, diagnosis etc) and geographic barriers ("the friction of space") which can be measured in a number of ways (travel distance, travel time, travel costs etc).

Another multi-attribute definition of access is provided by Penchansky and Thomas (1981). Although their general definition is "... the degree of 'fit' between the clients and the system" (p.128), they then provide a disaggregation, "a set of more specific areas of fit" (p.128). Their five-fold dimensions of access are as follows: availability, accessibility, accommodation, affordability and acceptability.

Thus, it is clear that access is, for all three studies mentioned above, multi-dimensional in nature: access will always require an adjective such as "potential", "economic", "geographical" etc. This view is also implicit in the (US) Institute of Medicine's objective, *viz. "to develop **a set of indicators** for monitoring access to personal health care services at the national level over time"* (Millman, 1993, p.1) (emphasis added). The view of that 17-member committee was that *"access is a shorthand term used for a broad set of concerns that center on the degree to which individuals and groups are able to obtain needed services from the medical care system"* (Millman, 1993, p.32).

It is useful to consider some of the issues that have been discussed under the heading of economic access. First, income and insurance coverage have long been considered as economic determinants of access to health care. An early study by Davis and Reynolds (1976) demonstrated clearly that (US) Medicare and Medicaid had *"... a major impact on helping covered persons receive needed medical care services"* (p.416). More recently, health insurance coverage has been highlighted in terms of utilisation of mental health services (Katz, Kessler, Frank, Leaf and Lin, 1997). In fact, the issue of access to care rising under health insurance was a major motivation for the introduction of Australia's national health insurance scheme, Medicare. The (then) Minister for Community Services and Health wrote that Medicare was *"... to ensure that all Australians have access to medical and hospital services on the basis of need. Two million Australians who previously had no health care are now covered..."* (Blewett, 1988, p.106). The importance of health insurance coverage has been emphasised in many studies, e.g. Salkever (1975) and more recently, Blendon, et al. (2002). Price effects are all-pervasive (Scheffler, et al., 1996).

Another part of the economic literature that is relevant is that on "equity" in the health sector: the literature on this question is enormous, a recent contribution being van Doorslaer, Koolman and Puffer (2002). This is a complex literature that involves public finance-type concepts of equity (horizontal and vertical), concepts of need and, in the present context, an index of equality. In other words an answer is sought to the following: "what phenomenon is to be subject to 'equality?'" For some, the answer is "access" (Mooney, 1983).

Clearly there are other variables to which the equity objective could be applied, e.g. equality of public expenditure per capita (or per capita utilisation), equality of use or utilisation, equality of cost (or price), and equality of outcome, in this case health status. See Le Grand (1982), Mooney (1983) and Culyer and

Wagstaff (1993). It is not our purpose here to enter this debate. For a spirited debate on "access" *vs* utilisation see Mooney, et al. (1991), Culyer, van Doorslaer and Wagstaff (1992a), Mooney, et al. (1992) and Culyer, van Doorslaer and Wagstaff (1992b).

The commonly expressed value judgement, that health care should be distributed equally to people in equal need, is in fact a restatement of equality of use (Le Grand, 1982, p.46). This value judgement has also been described as "the horizontal version of the egalitarian principle," i.e. it requires *"... that people in equal need of care are treated equally, irrespective of characteristics such as income, place of residence, race, etc."* (van Doorslaer, Koolman and Puffer, 2002, p.226).

In large measure the vertical dimension of the value judgement of equality of utilisation or the egalitarian principle (persons with unequal needs should be treated unequally, which is usually taken to mean that persons with greater needs should receive more health care resources) is rarely analysed.

It is interesting to observe that although there have been several attempts to create special-purpose indices of access, based on severity and waiting time (Simon, et al., 1979), the probability of entry into the health system, given need (Salkever, 1975, and Ettner, 1993), and hospital utilisation data for different groups (McDermott, Plant and Mooney, 1996), such measures have not been widely applied.

The above discussion clearly indicates that "access" requires an adjective, given its different meanings (Gulliford, Figueroa-Munoz and Morgan (2003). Surveys of the relevant parts of the "access" literature are available: see Goddard and Smith (2001) for "equity of access", Hughes (2003) for economic access, Holley (1998) and Haynes (2003) for geographical access. This paper falls into the latter box.

Before proceeding it is relevant to consider some important issues associated with mental health services. First, not everyone is subject to mental illness, and hence a concern for access to mental health services relates only to that sub-set of the population subject to mental illness. Thus we are not concerned with access *per se*, but rather access contingent on mental health need. This comment applies when we consider data at the individual (or unit-record) level. However, when considering aggregated (or grouped) data, which is the case when considering data at the regional level, the analysis of such grouped data can proceed by concentrating on the mental health services data alone, **if** the need for such services is uniform across the regions being analysed.

Empirically, it has been determined that the need for mental health services (measured by the prevalence of mental illness) is virtually uniform across space. For example, Burgess, et al. *(*2002), using data from the Australian Bureau of Statistics study of the prevalence of mental illness (ABS, 1998) found that the variation in prevalence for two distinct groupings of mental illnesses varied from 19.8 to 23.5 percent of the relevant populations in the 76 Australian regions analysed. See also the US study by Blazer, et al. (1985). The (slightly) higher rates of mental illness occur in urban areas, and the usual explanation for this (based on anecdotal evidence) is that people with serious mental illnesses in rural

areas (schizophrenia, borderline personality disorder, etc) migrate to urban areas to be near more (or better) psychiatric services. Support for this explanation has been provided by an analysis of psychoses in the US National Comorbidity Study (Kendler, et al., 1996). Thus, the following analysis will be concerned with mental health services alone, given the (virtual) geographical uniformity of need.

3. SOME DESCRIPTIVE DATA

The Queensland Office of the Australian Bureau of Statistics (ABS) was an (Australian) pioneer in the collection of "hospital morbidity" data, coded by references to the *International Classification of Diseases*. This coding system, of course, enables us to determine how many patients were subject to "Mental Disorders" from 1968-69, the first year of data availability. These data are also presented in the regional classification routinely implemented by the ABS, and also subsequently followed by Queensland Health from 1992-93, when the collection was transferred from the ABS. It is important to realise that the regional data relate to the regional location of patients, not the region in which they were treated. In other words, the data set is not subject to the problem of "border-crossing", i.e. when people from Region A are treated in a hospital in Region B. Although the services are provided in Region B, they are attributed to Region A, because the person who receives the treatment comes from Region A. Thus, in all calculations reported here the numerator (patients) and denominator (total population) relate to the same regions: there is no "apples and oranges" problem. This data set, in this sense, is comparable to the concept "Estimated Resident Population", employed by the ABS since the 1971 census, i.e. "returning" people to their usual place of residence despite their actual location on census night.

There are several complications in the ABS data on the geographical distribution of hospital-based mental health services in the period analysed here. First, the data were recorded on a calendar-year basis until 1992, and then on a financial-year basis from 1992-93. All data have been transformed into the latter structure by division and sequential re-addition. A second complication arises from the use of a new category of location/residence (interstate and overseas) in 1974. The empirical analysis to be reported below is restricted to the data for Queensland residents, i.e. interstate and overseas visitors are excluded. A third complication, namely missing observations, has been handled by standard processes (such as linear interpolation).

Yet another data complication arises from the fact that the ABS, in 1974, changed its geographical classification of the State of Queensland (Australian Bureau of Statistics, 1974). The level of aggregation lower than that of the state/territory (employed by the ABS) is the Statistical Division (SD), and, prior to 1974, there were 14 SDs in Queensland: from 1974 there have been 11 SDs. This reclassification affected all SDs. These changes complicate the time-series data with which we are concerned and Table 1 indicates a three-fold regional classification (South-East Queensland, Coastal and Inland) that overcomes some problems associated with this re-classification. Table 1 also indicates the "old"

and "new" names of the component SDs.

Table 1. Two ABS Regional Classifications for QLD

The Pre- 1974 Classification	The Post- 1974 Classification
South-East Queensland	**South-East Queensland**
Brisbane SD	Brisbane SD
Moreton SD	Moreton SD
Maryborough SD	Wide Bay-Burnett SD
Downs SD	Darling Downs SD
Coastal Queensland	**Coastal Queensland**
Rockhampton SD	Fitzroy SD
Mackay SD	Mackay SD
Townsville SD	Northern SD
Cairns SD	Far North SD
Peninsular SD	
Inland Queensland	**Inland Queensland**
Roma SD	
South-Western SD	South-West SD
Central-Western SD	Central-West SD
Far-Western SD	
North-Western SD	North-West SD

Notes: ABS - Australian Bureau of Statistics, and SD - Statistical Division.
Source: Australian Bureau of Statistics (1974).

3.1 Rates per 10,000 Population

The change in regional classification by the ABS creates a serious "apples and oranges" problem associated with time-series data at the regional level. A common procedure would be to analyse regional utilisation data (say a rate per 10,000 people) and determine if they converge through time. The altered regional boundaries preclude such an empirical analysis.

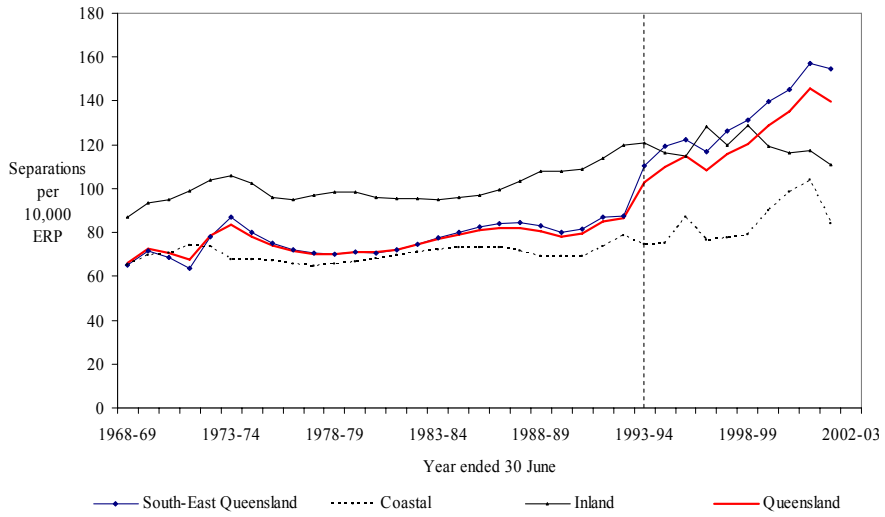
It might be thought that this problem, created by the changed regional classification, could be solved by aggregating the regions into larger entities. Figure 1 presents the utilisation rates for the 35 years from 1968-69 to 2002-03 using the three aggregate regions (South-East Queensland, Coastal Queensland and Inland Queensland) in Table 1. (These data have been extracted from ABS published sources, using the Mental Illness chapter heading in ICD8, ICD9 and ICD10.)

However, there is a dilemma associated with this aggregation process: while aggregation solves the "apples and oranges problem", it involves loss of detail, or information, about "access", the key measure that is the subject of this paper.

Before we proceed further it may be useful to present some summary statistics and descriptions of the data employed in this analysis. See Table 2.

The changed ABS regional classification system requires us to adopt a different research strategy. Another way to proceed is to apply some concepts (concentration and equality) and measures (the first-firm concentration ratio, the

four-firm concentration ratio, the Hirschman-Herfindahl index and the Gini coefficient of inequality) that are routinely used in Industrial Economics.



Source: As for Table 2.

Figure 1. Mental Patient Hospital Separations per 10,000 Estimated Resident Population by Geographic Location

3.2 Regional Concentration

Attention is now directed to the issue of concentration. In this context we are interested in measures of concentration, such as those routinely used in industrial economics where the issue of measuring market/industry concentration is standard fare (Clark, 1985; Carlton and Perloff, 2000). However the focus is not on firms but on regions, specifically the ABS specification of regions in Queensland.

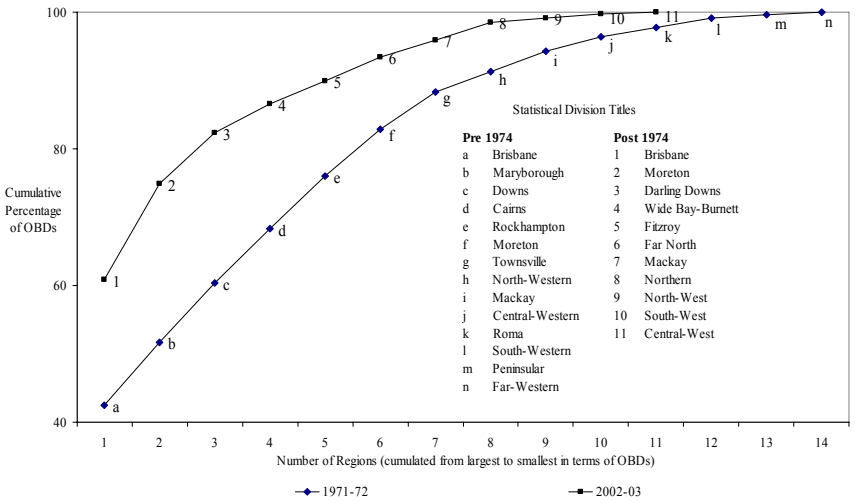
A useful way to describe regional concentration of any activity is to apply the concept (from industrial economics) of the concentration curve. In this context the concentration curve indicates the cumulative percentage of patients treated by numbers of regions, where the regions are ranked from largest to smallest in terms of patients. Such a curve, beginning at the origin, reaches its maximum point (100 per cent) when all regions are enumerated (14 or 11 in the period analysed here). Given that the regions with which we are concerned are not equal in size (number of patients), the relevant concentration curves are not linear: they are concave from below. Also a concentration curve can be constructed for each year for which data are available. Two concentration curves are indicated in Figure 2 (for the years 1971-72 and 2002-03). The choice of these two years will be explained below.

Table 2. Summary Statistics on Patients Treated in All Queensland Hospitals, and the Queensland Population, 1968-69 to 2002-03

Region	Statistical Division (SD)		Mean	Minimum	Maximum	Standard Deviation
South-East Queensland	Brisbane	Patients	13,080.0	5,369.0	31,465.0	7,610.5
		Population	1,225,268.5	833,400.0	1,689,100.0	263,348.7
	Moreton	Patients	2,916.1	622.0	7,536.0	1,903.0
		Population	406,090.1	151,850.0	747,364.0	187,295.9
	Maryborough/ Wide Bay Burnett	Patients	1,605.6	1,022.0	2,667.0	453.7
		Population	179,964.7	132,805.0	239,746.0	35,156.8
	Downs/Darling Downs	Patients	1,579.4	838.0	3,858.0	559.4
		Population	178,838.3	144,920.0	212,942.0	20,707.0
Coastal Queensland	Rockhampton/ Fitzroy	Patients	1,208.0	756.0	2,321.0	329.7
		Population	153,110.9	108,320.0	183,515.0	23,560.0
	Mackay	Patients	767.3	250.0	1.768.0	341.6
		Population	98,712.9	59,100.0	139,647.0	22,995.0
	Townsville/ Northern	Patients	1,039.8	609.0	1,989.0	309.5
		Population	165,229.4	108,500.0	200,174.0	26,939.8
	Cairns/ Far North	Patients	1,344.1	802.0	2,042.0	393.6
		Population	163,913.4	111,310.0	227,309.0	38,949.2
	Peninsular	Patients	67.4	50.0	81.0	12.1
		Population	11,706.3	10,250.0	12,850.0	1,098.7
Inland Queensland	Roma	Patients	197.8	175.0	220.0	18.3
		Population	19,354.5	18,000.0	21,100.0	1,378.5
	South Western/ South-West	Patients	267.3	146.0	328.0	52.3
		Population	25,611.3	10,880.0	29,710.0	5,862.6
	Central-Western/ Western-Central	Patients	166.3	88.0	281.0	52.8
		Population	15,310.0	12,135.0	27,280.0	4,646.6
	Far Western	Patients	47.1	37.0	60.0	9.7
		Population	4,351.2	3,950.0	5,040.0	407.4
	North Western/ North-West	Patients	404.8	243.0	546.0	74.2
		Population	39,017.0	34,051.0	46,960.0	3,443.4

Notes: (i) The first-mentioned names for SDs are those for the pre-1974 fourteen categories, and the second-mentioned names are those for the post-1974 eleven categories. (ii) The three SDs which were deleted in 1974 (and for which recorded data related only to the years to 1973-74) were Peninsular, Roma and Far-Western. (iii) The data reported here are on a financial year basis.

Sources: Population data, (i) Australian Bureau of Statistics (various d). (ii)Australian Bureau of Statistics (various e). (iii) Australian Bureau of Statistics (various f). (iv) Australian Bureau of Statistics (various g). (v) Information supplied by the Queensland Statistician's Office, 8 December 2003.
Hospital morbidity data, (vi) Commonwealth Bureau of Census and Statistics (various). (vii) Australian Bureau of Statistics (various b). (viii) Australian Bureau of Statistics (various c). (ix) Information supplied by Queensland Health from the Queensland Hospital Admitted Patient Data Collection, 28 January 2003 and 3 December 2003.



Note: OBDs – occupied bed days. **Source:** As for Table 2.

Figure 2. Two Regional Concentration Curves For (General) Hospital Occupied Bed-Days for Mental Health Patients, Queensland, 1971-72 and 2002-03

A way to make some more quantitative statements about the regional concentration of hospital treatment of patients with mental illness is to calculate regional concentration ratios (RCRs) from the data that underlie the regional concentration curves. (An RCR is a direct analogue of a market, or industry, concentration ratio.) The regional concentration ratio is the proportion of total patients treated in the i^{th} region, where i is an arbitrary number. In the work to be reported below, we choose $i = 1$ and $i = 4$. Thus we refer to these two measures as RCR_1 and RCR_4.

It is important to note that RCR_1 is the regional share of the largest SD, i.e. "Brisbane", and RCR_4 is the regional share of the four largest SDs, i.e. the four SDs that comprise the region specified above in Table 1 as "South-East Queensland".

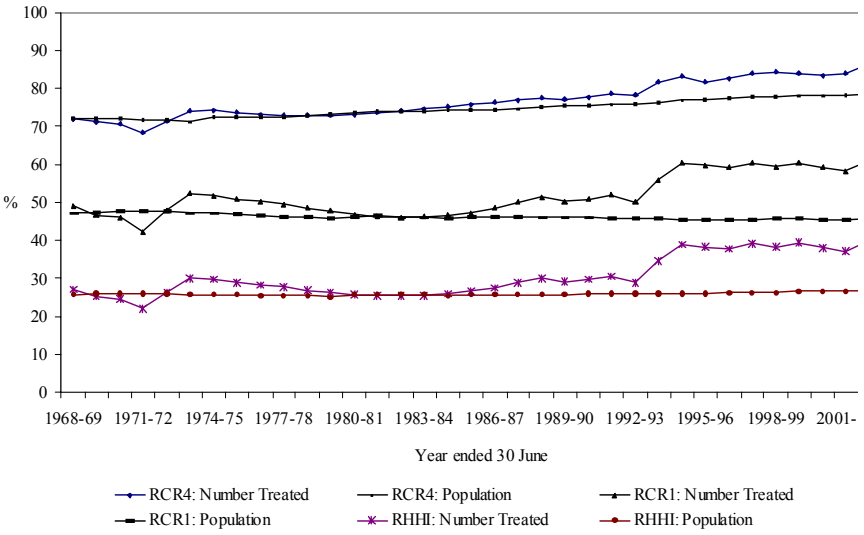
It can be argued (correctly) that the choice of $i = 1$ and 4 is arbitrary: thus, such concentration ratios involve the analysis of single points on the regional concentration curves. What is sacrosanct about these arbitrary, but commonly-employed points?

Another commonly-used measure of concentration that takes into account **all** points on the concentration curve is the Hirschman-Herfindahl index (HHI). For an account of the origins of this index, see Hirschman (1964). This (regional) index is defined as follows:

$$RHHI = s_1^2 + s_2^2 + \cdots + s_n^2 = \sum_{i=1}^{n} \left(NP_i / NP_n \right)^2 \qquad (1)$$

where s_i (in the regional context) is the share of the i^{th} region of all the patients

treated for mental illness in Queensland, n is the number of regions, NP_i is the number of patients in region i and NP_n is the number of patients in the n regions. (The notation "R" in equation (1) indicates a regional measure rather than a measure in an industry context.) The *RHHI* can take values between zero and unity. In this regional context if the *RHHI* = 1, then one region will provide all patients for mental illness hospitalisations and all other regions will provide zero. The other extreme value for the *RHHI*, zero, is approached as the number of regions approaches infinity. For details see Hannah and Kay (1977), Martin (1994) and Church and Ware (2000). Figure 3 plots measures of regional



concentration of mental health patients for Queensland.

Source: As for Table 2.

Figure 3. Three Measures (RCR1, RCR4 AND RHHI) of Regional Concentration of (General) Hospital Occupied Bed-Days for Mental Health Patients and the Total Population, Queensland, 1968-69 to 2002-03

It is now relevant to explain the two concentration curves (for the two separate years) depicted in Figure 2. On the basis of the RHHI, we can determine the extent of regional concentration for each of the 35 years for which we have data. The "highest" curve (for 2002-03) represents the most concentrated regional concentration and the "lowest" curve (for 1971-72) represents the least regionally concentrated distribution of hospital-days for mental illness.

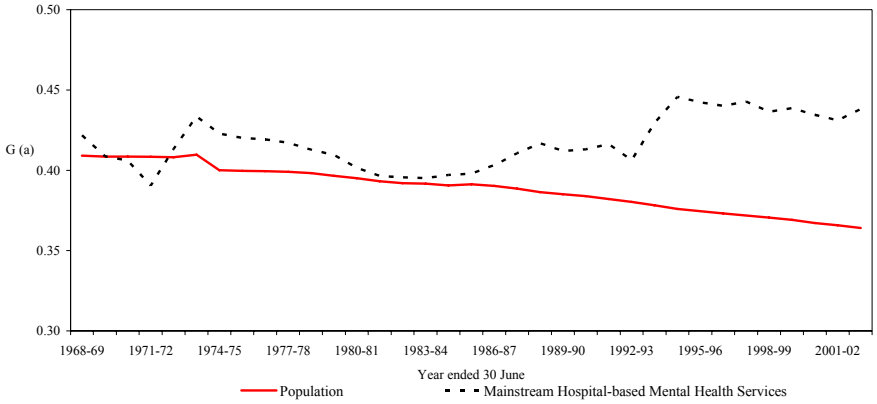
Thus far the focus has been on the measurement of regional concentration of hospital treatments for mental illness. Attention is now directed to a different, but related, concept, i.e. equality.

3.3 Regional Equality

Equality and concentration are related in that if a concentration curve (in the space of Figure 2) were linear, then this would indicate equally sized regions in terms of mental illness patients in hospitals. Clearly given the data on concentration reported above there is little indication of anything approaching regional equality. However it is useful to undertake some analysis of inequality.

Inequality measures ignore numbers of regions (an absolute measure) and are concerned with the Lorenz curve (a relative concept) and related measures (such as the Gini coefficient). In this context the Lorenz curve measures the cumulative percentage of patients treated in hospital for mental illness against the cumulative **percentage** (**not** number) of regions.

By construction the ranking of regions is from smallest to largest, the reverse of the procedure undertaken in the context of the regional concentration curve. Figure 4 presents Gini coefficients for both population and mental health services for the 35 years from 1968-69.



Note: (a) The Gini Coefficient. **Source:** As for Table 2.

Figure 4. Gini Coefficients of Inequality of Regional Distributions of Mainstream Hospital-based Mental Health Services and the Total Population, Queensland, 1968-69 to 2002-03

4. METHOD

If the objective of improving geographical access had been achieved then one would expect, post-1992-93, a statistically significant difference in some measures of concentration for hospitalisation (for mental disorders), by geographical region, compared to the pre-National Mental Health Strategy state of affairs. In other words we are interested in finding a structural break in a regression equation.

There are two possible methodologies that can be employed to specify an equation such as mentioned above. The first is the construction of a causal

model in which one variable is related to a set of other variables. A variable (say, quantity of medical services) is related to a set of other variables (own-price, prices of substitutes/complements, income, health insurance arrangements etc. The second general type of model, a time-series model does not involve a causal relationship between one variable and other variables: instead current (or future) movements in a variable are based on the past values of the single variable being examined. The characteristics of such a model are neatly captured in the following statement:

> *...we can attempt to construct a model for a time-series which does not offer a structural explanation for its behaviour in terms of other variables but does replicate its past behaviour in a way that might help us forecast its future behaviour. A time-series model accounts for patterns in the past movements of a variable and uses that information to predict its future movement. In a sense a time-series model is just a sophisticated method of extrapolation. (Pindyck and Rubinfeld, 1991, p.414)*

It is important to note that governments often make policy changes in situations where there is a paucity of information on "how the world works" or the empirical relationships that exist in the "real world". In fact one of the pioneering papers on intervention analysis (Box and Tiao, 1975) was concerned, in part, with an evaluation of government regulations (regulation of the content of petrol, design regulations about engines etc) to reduce air pollution in Los Angeles. Lack of knowledge on empirical, causal relationships exists in many policy contexts and there is no alternative to the use of a time-series model. Some other examples of this "policy in a vacuum" context are the effect of legislation compelling car occupants to wear seatbelts (Bhattacharyya and Layton, 1979), the effect of gun control legislation (Deutch and Alt, 1977), deterrent mechanisms for skyjacking (Cauley and Im, 1988), and advertising programs on the danger of drink-driving (Murray, Starn and Lastovicka, 1993). For an overview see Enders (1995).

5. EMPIRICAL RESULTS

5.1 Data and a Testable Hypothesis

As pointed out previously the usual type of analysis involving two variables (in this case occupied bed-days in hospitals for patients with mental illness by region and population by region) cannot be applied due to the changed regional classification during the period for which data are available. These two variables are typically combined via the calculation of a utilisation rate, such as occupied bed-days per 10,000 people.

The previous discussion (Section 3.2 and Section 3.3) was confined to a consideration of the mental illness variable, occupied bed-days in general hospitals for patients with a diagnosis of mental illness. No emphasis was placed on the population variable. However this is somewhat misleading: the alternative measurement strategy (analysing regional concentration and equality) requires the analysis of **both** variables. More particularly, what this means is that the three measures of concentration (discussed in the context of the hospital

morbidity measure of mental illness) are to be applied also to the regional population data.

We are now able to state a testable hypothesis concerning improved regional access to mental health services in general hospitals: if regional access to hospital-based mental health services improved after the implementation of the National Mental Health Strategy, then in a time-series equation of a measure of regional concentration, a post-Strategy dummy variable would have a negative sign as the mental health regional concentration measure approached the population regional concentration measure. If the sign of the coefficient on the dummy variable were zero, it would mean that there had been no effect on regional access, and a positive sign on the coefficient of this intervention dummy variable would indicate that geographical access had decreased in the post-Strategy period.

Given that we have three regional measures of concentration of hospital morbidity for mental illness, and three corresponding regional measures of population concentration, the empirical work involves the analysis of six time-series data sets. These six data sets are indicated in Figure 3. Note that for most of the period analysed here the hospital morbidity concentration measures lie above the regional population concentration measure, thus indicating that there is a "regional access problem". If the various measures of regional concentration of hospital morbidity and population coincided, then there would be **no "**regional access problem".

Casual empiricism suggests that the three measures of regional concentration (RCR1, RCR4 and the RHHI) of both hospital morbidity and population move together: this gives us some confidence that the three **measures** are measuring the same **concept**. Casual empiricism also suggests that there is a recent (post-1993-94) difference in regional concentration of the hospital morbidity measure, and that this difference involves a rising level of regional concentration.

5.2 The Regional Concentration Measure

As a first step in the analysis, means of all data pre-1993-94 and means for post-1993-94 data were calculated, and tests for differences were undertaken between these two periods. The results (not reported here but they are available on request) showed significant differences between the two periods, for the three hospital morbidity measures. The next step was to calculate regression equations for the six time-series data sets indicated in Figure 3. The general strategy was to test for statistical significance of intercept and slope dummy variables, pre- and post- the implementation of the National Mental Health Strategy.

Although there was political agreement on the content of the National Mental Health Strategy in the early months of 1992, the Strategy became operative on 1 January 1993. Given bureaucratic time lags, it is conceivable that "nothing much happened" in terms of implemented changes until 1993-94. Thus this analysis will recognise the post-intervention period as being since 1993-94, with 1993-94 being regarded as a "transition year". The pre-intervention period is from 1968-69 to 1992-93. We regard 1993-94 as a "transitional year" which is modelled by a "transitional" dummy variable unique to that year. The full effect of the

Strategy is measured from 1994-95. More specifically the testing methodology is to undertake statistical tests on coefficients obtained by estimating equation (2), assuming $t = 0$ in 1993-94 with units of one year.

$$y = \begin{cases} \alpha_1 + \beta_1 t & (t \leq \text{1992-93}) \\ \alpha_1 + \Delta DV_{TRAN} & (t = \text{1993-94}) \\ \alpha_1 + \Delta DV_{TRAN} + \alpha_2 DV_{NMHS} + \beta_2 t & (t \geq \text{1994-95}) \end{cases} \quad (2)$$

where y is one of three measures of regional concentration (RCR1, RCR4 or the HHI) of hospital patients with mental illness, or three measures of regional concentration of the Queensland population;
α_1 is the intercept term (in 1968-69);
β_1 is the slope of the equation when ($t \leq$ 1992-93);
Δ is a coefficient on a transition dummy variable (DV_{TRAN}), taking the value of unity post-1993-94, and zero otherwise;
α_2 is a coefficient on an intercept dummy variable (DV_{NMHS}), to measure the impact of the National Mental Health Strategy, taking the value of unity post-1994-95, and zero otherwise;
β_2 is the slope of the equation when ($t \geq$ 1994-95). The notation employed here is α for intercept terms, Δ for transition parameters and β for regression coefficients of time variables, and
t is time, zeroed in 1993-94 with units of one year.

Initially equation (2) was applied routinely to all six data sets: not surprisingly the dummy variables on the three measures of population concentration were not important. Consequentially, three simple, linear equations were estimated without any intervention dummy variables. The residuals of all six estimated equations were found to be subject to serial correlation, as indicated by the Durbin-Watson statistic. Autoregressive (AR) terms of orders one and two were inserted in all equations and this process was successful in purging the residuals of serial correlation: not all equations required an AR2 term, whereas all required AR1 and no equation required an AR3, or higher, term. Although these AR terms are not reported here, they are available on request.

The linear equation for the RHHI measure of regional population concentration did not pass the heteroscedasticity test. In addition all three linear (population) equations failed the Ramsey Reset (specification) test. Although the three plots of the regional population concentration measures seem unexceptional (see Figure 3), closer examination of all three raw series (RCR1, RCR4 and the RHHI) indicated that all three series were heteroscedastic, mainly in the period to about 1984-85, thus suggesting a non-linear functional form was required. The heteroscedasticity was successfully handled by applying a {1 2 2 2 1} centred moving average, and a satisfactory trend was obtained by fitting a quadratic equation (centred on 1993-94) for the RCR1 and the RHHI data, and a cubic equation for the RCR4 data set. Thus, the following equations were

estimated for the three measures of regional population concentration:

$$y = \alpha_1 + \beta_3 t + \beta_4 t^2 \quad (3)$$

where y is the RCR1 and RHHI measures of population concentration, and t is time (from 1968-69 to 2002-03)
and

$$y = \alpha_1 + \beta_3 t + \beta_4 t^2 + \beta_5 t^3 \quad (4)$$

where y is the RCR4 population measure, and t is time, as defined for equation (3).

Our preferred equations are reported in Table 3, there being three linear equations for the three mental health measures (Columns 1, 3 and 5) and three non-linear equations for the three regional population measures, being a quadratic for the RCR1 measure and the RHHI measure (see columns 2 and 6), and a cubic equation for RCR4 (see Column 4). These six equations perform very well in terms of goodness of fit (as measured by adjusted R^2) and all equations pass the F-test at the one per cent level. Moreover, for consistency with the models applied to the hospital morbidity series for mental health, when effects due to DV_{TRAN} and DV_{NMHS} are introduced into the polynomial equations for the population series, no significant estimates of the effects (as is to be expected) are realised (CC_4: $F_{2,\,27} = 0.09$, $p = 0.92$; CC_1: $F_{2,\,28} = 0.37$, $p = 0.70$; HHI: $F_{2,\,28} = 0.16$, $p = 0.86$).

The diagnostic tests reported in Table 3 (for serial correlation, heteroscedasticity, normality of the residuals, specification and integration of the residuals) indicate that the estimated equations are free of statistical pathologies. Thus, there is some reason to have confidence in the results reported in this table.

Given the central question that is addressed in this paper attention is now focussed on the various dummy variables reported in Table 3. As pointed out previously, if the regional access of hospitalised mental health services had improved, an intercept dummy variable in equation (2) would have a negative sign, as the measures of concentration of hospital-provided mental health services would approach the concentration measures of the general population. Alternatively, if the change in practice was not of a "one-off" kind, but was gradual, then one would expect that there would be a negative slope for the equations in the post-intervention period, thus also producing a statistically significant change-in-slope coefficient.

The coefficient on the "transition" dummy variable, Δ, for the transition year (1993-94), is statistically significant but has the wrong sign: thus the transition year is characterised by **increasing** regional concentration of mental health services provided in "mainstream" general hospitals. The same interpretation applies to the coefficients on the other intercept dummy variable, α_2, which also have positive signs for the three measures of regional concentration: if "access" had improved on a regional level, this coefficient should have a negative sign. The "wrong" sign indicates that "bringing hospital-provided mental health

Table 3. Regression Results on Three Measures of Regional Concentration of Hospital Patients with Mental Illness and the Queensland Population, 1968-69 to 2002-03

	One-Region Ratio (RCR1): Patients with Mental Illness (1)	One-Region Ratio (RCR1): Queensland Population (2)	Four-Region Ratio (RCR4): Patients with Mental Illness (3)	Four-Region Ratio (RCR4): Queensland Population (4)	Hirschman-Herfindahl Index: Patients With Mental Illness (5)	Hirschman-Herfindahl Index: Queensland Population (6)
α_1 (Intercept, $t \leq$ 1992-93)	49.48*** (37.84)	-	77.04*** (101.24)	-	28.58*** (27.05)	-
α_1 (Intercept, t = 1968-69)	-	45.69*** (503.08)	-	76.45*** (1047.08)	-	26.02*** (480.06)
β_1 (Slope, $t \leq$ 1992-93)	0.06 (0.72)	-	0.28 (5.57)	-	0.10 (1.41)	-
β_3 (Coefficient on t = 1968-69 to 2002-03)	-	-0.03** (-2.21)	-	0.25*** (31.30)	-	0.06*** (7.90)
β_4 (Coefficient on t , t = 1968-69 to 2002-03)	-	0.002*** (2.66)	-	-0.001 (-1.08)	-	0.002*** (5.29)
β_5 (Coefficient on t^3, t = 1968-69 to 2002-03)	-	-	-	-0.0002*** (-2.99)	-	-
Δ (Transition intercept DV, (t = 1993-94)	6.31*** (3.77)	-	4.79*** (4.21)	-	5.75*** (4.10)	-
α_2 (Intercept DV, ($t \geq$ 1994-95)	4.25** (2.34)	-	0.59 (0.46)	-	4.14*** (2.72)	-
β_2 (Slope, ($t \geq$ 1994-95)	0.01 (0.04)	-	0.05 (0.19)	-	0.10 (0.32)	-
β_2-β_1 (Change in slope, pre- 93-94, and post-94-95)	-0.05 (-0.13)	-	-0.24 (-0.98)	-	-0.001 (-0.00)	-
$\Delta + \alpha_2 + \beta_2 + \beta_1$ (Change in level between 92-93 and 94-95)	- (4.90)	-	- (4.18)	- (3.07)	- (5.62)	-
$\alpha_1+\Delta+\alpha_2+9\beta_2$ (Level in 2002-03)	60.16*** (32.58)	45.62*** (176.29)	82.84*** (72.27)	78.62*** (291.26)	39.35*** (26.40)	26.75*** (134.54)
Convergence [(i)]		14.36*** (7.74)		4.22*** (3.59)		12.61*** (8.38)

Table 3 (continued)

	One-Region Ratio (RCR1): Patients with Mental Illness (1)	One-Region Ratio (RCR1): Queensland Population (2)	Four-Region Ratio (RCR4): Patients with Mental Illness (3)	Four-Region Ratio (RCR4): Queensland Population (4)	Hirschman-Herfindahl Index: Patients With Mental Illness (5)	Hirschman-Herfindahl Index: Queensland Population (6)
Goodness of Fit						
$\overline{R}^{2}$ [(a)]	0.87	0.87	0.90	0.87	0.90	0.80
F [(b)]	($F_{4,28}$) 21.58 ***	($F_{3,29}$) 1033.66	($F_{4,28}$) 7..68***	($F_{2,30}$) 43.17***	($F_{4,28}$) 34.38 ***	($F_{2,30}$) 36.03***
Diagnostic Tests						
Durbin-Watson 1[(c)]	0.75	0.28	0.90	0.95	0.80	1.17
Durbin-Watson 2[(c)]	2.04	2.00	1.84	2.03	1.98	2.01
Hetroscedasticity χ^{2} [(d)]	0.96	0.09	0.002	0.63	1.17	2.39
Normality (Jacque-Bera) [(e)]	0.459	1.06	0.461	1.70	0.09	2.49
Ramsey Reset (F)	2.27	0.14	1.19	0.40	1.32	1.06
Integration of residuals [(f)]						
ρ	-35.94	-29.71	-31.90	-36.46	-35.63	-35.81
τ	-5.88	-5.01	-5.32	-6.21	-5.74	-6.10

Notes: (a) $\overline{R}^{2}$ is the multiple coefficient of determination, adjusted for degrees of freedom. (b) F is an F- test of the joint hypothesis that the coefficients on all explanatory variables equal zero. (c) Durbin-Watson is a test for first-order serial correlation in the residuals: DW1 is a test on the equation without AR terms, and DW2 is a test on the equation with the relevant AR terms inserted. (d) Engel's Lagrange multiplier ARCH test, based on χ^2, of the hypothesis that autoregressive conditional heteroscedasticity is absent from the residuals. (e) The Jacques-Bera test (χ^2) for normality of the residuals. (f) ρ and τ provide the Phillips-Perron Unit Root test for stationarity, with zero mean, of the residuals. (g) Two and three asterisks indicate statistical significance at the five and one per cent levels, respectively. (h) Data in parentheses are large sample t-statistics. (i) This is a test of "Convergence" between the concentration measure of patients with mental illness and the concentration measure for population, i.e. a test of $(\alpha_1+\Delta+\alpha_2+9\beta_2)_{PMI} - (\alpha_1+\Delta+\alpha_2+9\beta_2)_{POP} = 0$, where PMI is patients with mental illness, and POP is population.

Sources: As for Table 2.

services closer to the people" has not taken place: in fact the reverse has occurred. Thus there is no evidence of a "one-off" regional access improvement process having occurred.

Testing for regional access improving in a gradual way rather than in a one-off, or discrete, way has two dimensions. First, the expected sign on the post-1994-95 slope coefficient is negative. Empirically the post-1994-95 slope

coefficients for all three measures of regional concentration are positive, but not statistically significant: thus the slopes are effectively zero. Thus, there is no evidence of any negative gradient in the post 1994-95 period. See also the results for the change-in-slope coefficients. The second test is a "convergence" test. The complex term (the last coefficient in Table 3) enables us to test that the predicted values of concentration of mental health services for the last year of the data sets, 2002-03, are equal to the predicted values of the three measures of regional concentration of population. For all three measures of regional concentration and concentration of mental health services, the hypothesis that there is equality is firmly rejected on the basis of a *t*-test.

5.3 Measures of Equality

It was pointed out briefly, in the previous discussion of the concentration measures employed in this study, that if equality occurred then the concentration curves (such as those in Figure 2 above) would be linear. Rather than return to the concentration curves to determine if there has been a movement to equality between the regions, a different approach will be adopted.

There is a long-standing tradition in economics of employing the Lorenz curve, and an associated measure of inequality (the Gini Coefficient), in the analysis of inequality. This approach, although predominantly applied to income and wealth distributions (Atkinson, 1973; 1975; Bronfenbrenner, 1971; Creedy, 1998), can be applied to distributions of other variables such as height, IQ and specific commodities, such as mental health services.

Figure 4 presents the calculated Gini Coefficients for the regional mental health hospital morbidity data, and the regional population data for Queensland, that have been analysed in this paper. The coefficients have been calculated for each of the 35 years to 2002-03. It is relevant to note that the Gini Coefficient can take values between zero and unity, zero being a case of perfect equality and unity being a case of perfect inequality. Note that each of the series for population and hospital-based mental health services lie between these two extreme values of the Gini Coefficient. Note also that there is a temporal decline in the Gini Coefficient for the regional distribution of the Queensland population, albeit slight. On the other hand there is some volatility in the Gini Coefficient for the hospital morbidity series over the 35-year period, although the 1990s period is characterised by rising inequality between regions.

However from the point of view of this study what is notable is that there is no evidence of the two series converging. If the two series converged then there would be evidence of the distribution of mental health treatments in hospitals aligning with the regional distribution of the population. If the two measures of inequality were to coincide there would be no issue of policy concerning the geographical issue.

6. CONCLUSION

This paper has been concerned with an evaluation of a specific policy objective of the National Mental Health Strategy, i.e. improving the geographical access of patients to "mainstream" hospital-provided mental health services.

This objective is concerned with an "imbalance" of services at a regional level in Australia, the quantities of such services being lower in rural/remote regions compared to the urban regions of the nation. Such inequality of service provision adversely affects the welfare of people, based on their geographical location.

Data availability has restricted the analysis to the State of Queensland: Queensland's hospital morbidity collection is long-standing and provides a unique time-series data set that can be employed to answer the question addressed in this paper. However, a change in the regional classification employed by the ABS precludes the use of population-rated utilisation data to determine if regional access has improved since the advent of the National Mental Health Strategy. Thus an alternative testing procedure has been adopted, which involves applying some concepts and measures commonly employed in industrial economics and the economic analysis of inequality. More specifically, we use (regional) concentration ratios and the Hirschman-Herfindahl Index as measures of concentration, and the Gini Coefficient as a measure of equality.

As formulated here, if the National Mental Health Strategy had improved regional access to "mainstream" hospital services for the mentally ill, there would be a negative coefficient on a post-Policy dummy variable in a time-series equation of the three regional concentration measures employed here. The statistical results provide no support for this hypothesis: in fact the results indicate the opposite conclusion. The analysis of the regional distribution data is not confined to concentration: attention is also directed to the (related) issue of equality of services. The empirical results indicate that regional inequality has also risen since the early 1990s.

It is a natural reaction to spend some time pondering this strange result: politicians and senior public servants in the mental health sector have devised a National Strategy with clearly articulated policies and objectives, and one of those objectives is not only not achieved, but the key variables move in the opposite direction. What could explain this behaviour?

A possible answer to this question is that the data employed here are flawed (i.e. subject to measurement error) or inappropriate. There is no reason to believe that measurement error is serious, but the second possibility needs to be recognised. The regional classification employed (the ABS's Statistical Divisions) may not be appropriate (because of aggregation) to capture small changes in access. However, given the absence of an alternative regional classification there is no empirical way to determine the validity of this argument.

In economics, since the pioneering work of Niskanen (1968; 1971), there has been a focus on various dimensions of bureaucratic behaviour. Niskanen was concerned, in part, with the objective pursued by the senior bureaucrats in charge of a public agency, in his case the key decision-makers in the (US) Department of Defence. His argument was that their objective was to maximise their budget, irrespective of the goals of others (politicians, citizens). This was an outward manifestation that they pursued their own interest, not the interests of consumers, citizens etc. In terms of dealing with their political masters, a key variable was

information and/or data, which they kept to themselves: knowledge was power. Since the pioneering studies by Niskanen the literature on bureaucracies has exploded. For surveys see, for example, Mueller (1989) and Wintrobe (1997).

Could the strange empirical results described above be explicable in terms of such concepts from the theory of bureaucracy? Hospital services are dominated by public or private hospital chains, and the dominant bureaucrats of these chains may have their own agendas (or strategic plans) which may bear little resemblance to their publicly-announced agendas (or strategic plans). When the politicians and the senior public servants in mental health agree on a co-ordinated national plan for mental health services, and this conflicts with the existing bureaucratic objectives and directions, it is conceivable that, in reality, there will be divergence between the stated objectives and the actual objectives. Bureaucracies, whether public or private, may be like a battleship under full power: a change in objective or direction is not easy to accomplish.

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