



**Australian Government**  
**Productivity Commission**

Public and Private Hospitals:  
Multivariate Analysis

Supplement to  
Research Report

May 2010

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**Publications Inquiries:**

Media and Publications  
Productivity Commission  
Locked Bag 2 Collins Street East  
Melbourne VIC 8003

Tel: (03) 9653 2244  
Fax: (03) 9653 2303  
Email: [maps@pc.gov.au](mailto:maps@pc.gov.au)

**General Inquiries:**

Tel: (03) 9653 2100 or (02) 6240 3200

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# Foreword

The Commission recently completed a Research Report for the Government on the performance of public and private hospitals. The report examined relative costs, hospital-acquired infections and other aspects of hospital performance. It also dealt with informed financial consent and the indexation of the income threshold for the Medicare Levy Surcharge.

As part of that study, the Commission undertook a ‘multivariate analysis’ of the relative efficiency of public and private hospitals. Such analysis can take account of differences in the characteristics of a hospital’s patients and activities undertaken. Due to delays in accessing data, the analysis was confined to the single year 2006-07. This supplementary report includes three additional years of data, as well as some methodological enhancements. While still ‘experimental’, the present estimates of the relative performance of public and private hospitals are consequently more reliable.

A number of parties assisted the Commission in this study. The Australian Bureau of Statistics and the Australian Institute of Health and Welfare provided data and undertook some analysis. Others participated in a roundtable or provided referee comments. The Commission thanks all who contributed.

The study was overseen by Commissioner David Kalisch. The staff research team was headed by Ilias Mastoris and based in the Commission’s Melbourne office.

Gary Banks AO  
Chairman

May 2010



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# Abbreviations and explanations

## Abbreviations

ABS	Australian Bureau of Statistics
ACERH	Australian Centre for Economic Research on Health
ACSQHC	Australian Commission on Safety and Quality in Health Care
AHSA	Australian Health Service Alliance
AIHW	Australian Institute of Health and Welfare
ALOS	Average length of stay
AR-DRG	Australian Refined Diagnosis-Related Group
ASGC	Australian Standard Geographical Classification
CEPA	Centre for Efficiency and Productivity Analysis
CHA	Catholic Health Australia
COAG	Council of Australian Governments
DEA	Data Envelopment Analysis
DRG	Diagnosis-related group
HCI	Hospital cost index
HCP	Hospital Casemix Protocol
HSMR	Hospital-Standardised Mortality Ratio
ICD-10-AM	International Classification of Diseases, Version 10, Australian Modification
ICU	Intensive-care unit
MDC	Major Diagnostic Category
MIAESR	Melbourne Institute of Applied Economic and Social Research
NHA	National Healthcare Agreement
NHCDC	National Hospital Cost Data Collection
NHMD	National Hospital Morbidity Database

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NHPF	National Health Performance Framework
NPHEd	National Public Hospital Establishments Database
OLS	Ordinary least squares
PC	Productivity Commission
PHEC	Private hospital establishments collection
SDF	Stochastic distance function
SEIFA	Socio-Economic Indexes for Areas (Relative Socio-economic Advantage and Disadvantage)
SFA	Stochastic frontier analysis

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# Glossary

Acute care	Clinical services provided to admitted or non-admitted patients, including managing labour, curing illness or treating injury, performing surgery, relieving symptoms and/or reducing the severity of illness or injury, and performing diagnostic and therapeutic procedures. Most episodes involve a relatively short hospital stay.
Acute hospital	Establishments which provide at least minimal medical, surgical or obstetric services for admitted patient treatment and/or care, and which provide round-the-clock comprehensive qualified nursing service as well as other necessary professional services. They must be licensed by a state/territory health department, or controlled by government departments. It also includes hospitals specialising in dental, ophthalmic aids and other specialised medical or surgical care.
Admitted patient	A patient who has undergone a formal admission process in a hospital to begin an episode of care. Admitted patients may receive acute, sub-acute or non-acute care services.
Adverse event	The unintentional harm arising from an episode of healthcare and not due to the disease process itself.
Allocative efficiency	How well resources are allocated across different uses so as to generate the greatest community wellbeing at a given point in time.
Average length of stay	The average number of patient days per admitted patient episode. Patients admitted and separated on the same day are allocated a length of stay of one day.
Australian Refined Diagnosis-related Groups	An Australian system of Diagnosis-related Groups (DRGs). Version 5.0/5.1 is based on the fifth edition of ICD-10-AM. See Diagnosis-related groups.

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AR-DRG partitions	Individual AR-DRGs are assigned to a ‘surgical’, ‘medical’ or ‘other’ partition on the basis of the type of procedure involved. A separation is classified as ‘surgical’ if it includes an operating room procedure. A separation is classified as ‘other’ if it includes a procedure performed outside of an operating room. A separation is classified as ‘medical’ if it does not include any type of procedure.
Casemix	The range and types of episodes of care (the mix of cases) treated by a hospital.
Casemix-adjusted	The adjustment of data to account for differences in the number and type (complexity) of cases. Casemix adjustment is an important step to achieving comparable measures of efficiency across hospitals and jurisdictions.
Cost efficiency	The degree to which outputs are produced at least possible cost. It incorporates technical efficiency.
Cost weight	The average costliness of an AR-DRG relative to all other AR-DRGs, such that the average cost weight for all separations is 1.
Data envelopment analysis	A linear programming technique used to identify the best-practice frontiers of entities, such as hospitals and firms.
Depreciation	Reduction in the value of an asset due to usage or obsolescence.
Diagnosis-related group	A system used to classify hospital admissions into groups with similar clinical conditions (related diagnoses) and similar resource usage (hospital services).
Dynamic efficiency	How well resources are allocated to achieve the greatest possible community wellbeing over time.
Effectiveness	How successful a hospital is in achieving a particular objective, such as reducing in-hospital mortality.
Efficiency	Economic efficiency, in its broadest sense, refers to how well resources are used to benefit the wellbeing of the community as a whole. It comprises productive efficiency, allocative efficiency, and dynamic efficiency.

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Elective surgery	Any surgery that a patient's doctor or health professional considers to be necessary but which can be delayed by at least 24 hours. In Australia, elective surgical procedures are defined in the Medicare Benefits Schedule.
Episode of care	The period of admitted patient care between a formal or statistical admission and a formal or statistical separation, characterised by only one care type.
Hospital	A healthcare facility established under Commonwealth, state or territory legislation as a hospital or a freestanding day procedure unit and authorised to provide treatment and/or care to patients.
Hospital-acquired infection	An infection that appears during the course of care at a hospital or healthcare facility and is the result of that care. Also referred to as nosocomial infection.
Hospital Casemix Protocol	A data collection of the episodes of admitted patient care, benefits and charges for privately insured patients. It includes clinical, demographic and financial information for privately insured admitted patient services.
Hospital-standardised mortality ratio	The ratio of the actual number of in-hospital mortalities to the number of in-hospital mortalities predicted for a hospital with the same characteristics.
Hospital cost index	An index of hospital costs published by the Australian Bureau of Statistics.
Input-oriented technical efficiency	The extent to which the quantity of inputs can be reduced without also reducing the quantity of outputs or increasing the use of another input.
Intensive-care unit	An area or environment in a hospital that provides the highest level of critical care and monitoring.
International Classification of Diseases	The World Health Organisation's internationally-accepted classification of diseases and related health conditions. The current version ICD-10 forms the basis of Australia's ICD-10-AM.
Length of stay	The period from admission to separation, less any days spent away from the hospital.

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Major Diagnostic Categories	A high-level grouping of patients used in the AR-DRG classification. They correspond generally to the major organ systems of the body.
Multivariate analysis	A statistical analysis technique in which two or more variables are analysed simultaneously.
Non-admitted occasion of service	Occasion of examination, consultation, treatment or other service provided to a non-admitted patient in a functional unit of a health service establishment. Services may include emergency department visits, outpatient services (such as pathology, radiology and imaging, and allied health services, including speech therapy and family planning) and other services to non-admitted patients.
Non-admitted patient	A patient who has not undergone a formal admission process, but who may receive care through an emergency department, outpatient or other non-admitted service.
Output-oriented technical efficiency	The extent to which the quantity of outputs can be increased without also reducing the quantity of another output or increasing the use of another input.
Overall technical efficiency	Technical efficiency defined under constant returns to scale. Can be specified as output-oriented or input-oriented technical efficiency.
Partial performance indicator	An indicator of a particular aspect of a hospital's performance that does not take account of other aspects of performance.
Patient days	The aggregate number of days of stay (calculated as separation date minus admission date) for all overnight-stay patients who were separated from hospital during the year. Periods of approved leave are subtracted from these calculations. Same-day patients are each counted as having a stay of one day.
Principal diagnosis	The diagnosis chiefly responsible for occasioning an episode of admitted-patient care.
Private hospital	A privately owned and operated institution, catering for patients who are treated by a doctor of their own choice. Patients are charged fees for accommodation and other

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	services provided by the hospital and relevant medical and paramedical practitioners.
Private patients	Patients admitted to a hospital who decide to choose the doctor(s) who will treat them and/or to have private ward accommodation. They are charged for medical services, food and accommodation.
Procedure	A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training, and/or requires special facilities or equipment available only in an acute-care setting.
Public contract hospital	For this study, a health care provider facility established under state or territory legislation as a hospital and on behalf of the government, to provide hospital services free of charge to all eligible patients.
Public hospital	For this study, a health care provider facility established under state or territory legislation as a hospital and operated by the government, to provide hospital services free of charge to all eligible patients.
Public patient	A patient admitted to a hospital who has agreed to be treated by doctors of the hospital's choice and to accept shared accommodation. This means the patient is not charged.
Quality	A measure of the quality of clinical care and patient safety in a hospital, and is measured by indicators such as in-hospital mortality and unplanned re-admission rates. It is synonymous with 'effectiveness' in this study.
Technical efficiency	A measure of the efficiency that relates a hospital's outputs to its input use. Can be specified as 'input-oriented technical efficiency', and 'output-oriented technical efficiency'.
Total operating expenditure	Expenditure on a hospital's goods and services which are used up during the year. Includes salaries and wages, expenditure on drug, medical and surgical supplies, and repairs and maintenance. Does not include investment expenditure, or the depreciation of capital.
Same-day establishments	Day centres, hospitals and freestanding day surgery centres that provide a course of acute treatment on a full-day or

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	part-day non-residential attendance basis at specified intervals over a period of time. Freestanding day surgery centres are approved by the Commonwealth for the purposes of basic table health insurance benefits.
Separation	<p>An episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death), or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute to rehabilitation).</p> <p>Separation also means the process by which an admitted patient completes an episode of care either by being discharged, dying, transferring to another hospital or changing type of care.</p>
Stochastic frontier analysis	A statistical regression technique used to determine the frontier of best-practice entities such as firms and hospitals.
Sub-acute and non-acute care	Clinical services provided to patients suffering from chronic illnesses or recovering from such illnesses. Services include rehabilitation, planned geriatric care, palliative care, geriatric care evaluation and management, and services for nursing home type patients. Clinical services delivered by designated psychogeriatric units, designated rehabilitation units and mothercraft services are considered non-acute.
Unplanned hospital readmission	An unexpected hospital admission for treatment of: the same condition for which the patient was previously hospitalised; a condition related to one for which the patient was previously hospitalised; or a complication of the condition for which the patient was previously hospitalised.
Unplanned hospital readmission rate	The number of unplanned readmissions to the same hospital that occur within a given period after separation, divided by the total number of separations (excluding deaths), including day stay patients.
User cost of capital	The opportunity cost of the capital used to deliver hospital services. That is, the return that could be generated if the funds were employed in their next best use.