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PROJECTING THE IMPACT OF DEMOGRAPHIC CHANGE ON THE DEMAND FOR AND DELIVERY OF HEALTH CARE IN IRELAND

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2. ACUTE PUBLIC HOSPITAL SERVICES: CHALLENGES FOR REFORM IN THE CONTEXT OF THE 'PREFERRED HEALTH SYSTEM'

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2.1 Introduction

The starting point for this chapter differs to others in this report. In 2007, PA Consulting Group, in a report commissioned by the Health Service Executive (HSE), published projections for acute hospital bed capacity (PA Consulting Group, 2007a).[1] The projections presented in this report were estimated in the context of the Transformation Programme within which the HSE has clearly committed to an "integrated health system" (PHS) achieved through a redirection of health services from acute hospitals to primary and community care (Health Service Executive, 2006; 2008). This model is also consistent with the Health Strategy *Quality and Fairness: A Health System for You* published by the Department of Health and Children (2001).

The PA Consulting Group (2007a) report estimated that, if current practices regarding the use of acute hospital bed capacity were to continue, 19,822 public patient hospital beds would be required by 2020 (compared with the existing stock of 11,660 available in 2007 (PA Consulting Group, 2007a, p47). The alternative model estimated in this report was based on

[1]The acute hospital bed capacity projections presented in the PA Consulting Group (2007a) differentiate public and private hospital bed requirements. Our analysis in this paper is based on data from acute public hospitals which treat both public and private patients.

the preferred (or integrated) health system.[2] For this alternative model, the report estimates that just 8,834 public patient beds would be required by 2020.[3]

Given the adoption of the PHS as HSE policy and the projections for acute public patient hospital bed capacity presented in the PA Consulting Group (2007a) report, in this chapter we attempt to provide some analysis of a range of demand- and supply-side factors influencing acute public hospital services provision in moving to the PHS.[4] In particular, this chapter concentrates on two key assumptions which are integral to the PHS projections of acute hospital bed capacity put forward by the PA Consulting Group (2007a), specifically, the importance of increasing day case activity and reducing inpatient length of stay over the period of the projections.[5] Over three-quarters of the savings in bed numbers between the two models estimated by the PA Consulting Group (2007a) have been attributed to the proposed reduction in inpatient length of stay and increasing day case activity.[6] In the subsequent sections, the potential for increasing day surgery and reducing the duration of hospitalisations is considered by exploring the variability across hospitals, as well as exploring the effects of patient and hospital characteristics. The analysis in this chapter predominantly draws on data from the Hospital In-Patient Enquiry (HIPE) Scheme, which is described together with the methods in the following section.[7]

2.2 Data and Methods

The main data source on which this analysis draws is the Hospital In-Patient Enquiry. As the only source of national morbidity data available for acute public hospital services, the HIPE Scheme collects data on discharges from, and deaths in, acute hospitals throughout the Republic of Ireland. While day and inpatient activity is captured through HIPE, visits to Emergency Departments and outpatient clinics are not. Coverage of discharges from hospitals participating in HIPE has consistently been at 94 per cent or above since the mid-1990s.[8] The absence of a unique health identifier in the Irish health system means that the unit of measurement in HIPE and for this analysis is the discharge, not the patient.

This analysis principally focuses on discharges during 2006, captured by HIPE.[9] Estimates indicate that almost 97 per cent of discharges that occurred in 2006 were reported to HIPE (Health Research and

[2]As the 'Integrated Health System' was referred to as the 'preferred health system' (PHS) in the PA Consulting Group (2007a) report, this is the term most generally used in this chapter.

[3] While we take this report as the starting point for our analysis here, we do not in any way attempt any validation of the findings or the conclusions of the PA Consulting Group (2007a) report.

[4]For the purposes of this analysis, a hospital is defined as acute if the inpatient average length of stay is 30 days or less. Private hospitals are outside the scope of this review.

[5] Throughout this chapter, the terms 'day case' and 'day patient' are used interchangeably.

[6]Of these two factors, reducing inpatient length of stay alone accounts for almost 60 per cent of projected bed savings.

[7]The authors would like to express their gratitude to colleagues at the ESRI's Health Research and Information Division for their assistance in preparing this chapter. Specifically, we would like to thank Barbara Clyne, Jacqui Curley, Brian McCarthy, Shane McDermott, Deirdre Murphy, Sinead O'Hara and Eithne Sexton for their invaluable contributions.

[8]Underreporting of discharges tends to be more prevalent among large hospitals with high volumes of activity.

[9]In addition, data from 2000 were used for comparative purposes in subsequent sections.

Information Division ESRI, 2008).[10] In addition to administrative (for example, admission and discharge dates, and medical card and public/private status) and demographic (sex, age) data on discharges, clinical data on discharges in 2006 were recorded in HIPE using *The International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision, Australian Modification (ICD-10-AM).[11] In total, 20 diagnosis (one principal and up to 19 additional) codes and, where applicable, 20 procedure (one principal and up to 19 additional) codes could be recorded for these discharges.[12] As the focus of this chapter is acute public hospitals, a small number of hospitals outside of this classification were excluded.[13] In total, 51 acute public hospitals were included in the following analysis.[14]

As previously mentioned, the analysis in this chapter focuses on two assumptions central to the acute hospital bed capacity projections presented in the PA Consulting Group (2007a) report, i.e. the importance of increasing day case activity and reducing inpatient length of stay if the projections within the context of the PHS are to be achievable. In the first part of this analysis, day case rates are compared both within and across hospitals using a basket of procedures. The original basket of 20 procedures was developed by the Audit Commission in conjunction with the Royal College of Surgeons and subsequently revised in consultation with the British Association of Day Surgery to incorporate 25 procedures (Healthcare Commission, 2005) (see Appendix 2.1 for the approach adopted). For the purposes of this research, 24 of these procedures were adapted for Ireland using expert advice from the Clinical Coding Team in the Health Research and Information Division at the ESRI.[15]

The key parameter in the second analytical strand of hospitals' inpatient length of stay is standardised length of stay (first developed by Martin and Smith (1996)). This parameter is the ratio of the observed length of stay for each discharge to the length of stay that would be expected at a national level, given the discharge's age, sex and diagnosis related group (AR-DRG).[16] Thus, a value of unity indicates that a discharge's actual length of stay is exactly equal to that which would be expected; while a value greater (less) than unity implies that the actual length of stay was greater (less) than the national average for comparable cases.

[10] Day patient radiotherapy and dialysis encounters were collected in HIPE for the first time in 2006.

[11] This coding classification scheme applied to discharges from 1 January 2005. Prior to the move to ICD-10-AM, The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) was used. The move from ICD-9-CM to ICD-10-AM also entailed changes to coding guidelines (such as the definition of additional diagnoses). Consequently, the ICD-9-CM and ICD-10-AM coding schemes are not directly comparable. For a detailed discussion of updating the clinical coding classification in Ireland, see Murphy *et al.* (2004).

[12] The potential number of additional diagnosis and procedure codes captured by HIPE has increased from five (diagnoses) and three (procedures) prior to 2002 to nine (for both diagnoses and procedures) until 2005 when the number increased to 19 diagnosis and procedure codes.

[13] Eight public hospitals (predominantly long-stay hospitals) and two private hospitals were excluded. These hospitals accounted for a small proportion of total discharges reported to HIPE.

[14] To preserve anonymity, each hospital was randomly assigned a code between 1 and 51.

[15] The procedure 'termination of pregnancy' is not applicable for Ireland.

[16] The standardised length of stay for discharge i in age group j, sex k and AR-DRG x is the observed length of stay for discharge i divided by the national mean length of stay of discharges in age group j and sex k in AR-DRG x. The age groups were five-year categories (0-4 years, 5-9 years, etc.) up to 85 years and over. The Australian Refined Diagnosis Related Group (AR-DRG) system is a casemix classification system which enables the disaggregation of patients into homogeneous groups which are expected to undergo similar treatment processes and incur similar levels of resource use.

2.3 Overview of Day Case Activity Within the Acute Public Hospital

According to the PA Consulting Group (2007a) report, the number of public patient day beds required in the context of an operational PHS will amount to 3,160 by 2020. Given this volume of day beds, together with a projected population of over 5 million, acute public hospitals in 2020 would have the potential capacity to treat between 195 and 230 per 1,000 members of the population on a day case basis depending on bed occupancy rates.[17] These projected discharge rates for 2020 would represent growth of between 25 per cent and 47 per cent compared to the 2006 day case discharge rate of 156.2 per 1,000 (Health Research and Information Division ESRI, 2008). Although substantial, such levels of growth are not unprecedented among Irish acute public hospitals. Between 1995 and 2006, the day patient discharge rate increased by over 248 per cent from 44.9 per 1,000 (HIPE & NPRS Unit ESRI, 2002). Such substantial increases have been attributed to a range of factors including changes in clinical practice facilitated by the advancement of medical technology and the availability of resources (particularly day beds). In attempting to explore the challenges that may arise in achieving the objectives for day case activity for 2020, a more detailed analysis is presented here of variations in day case rates for specific procedures and at the individual hospital level.

A day patient in HIPE is defined as a planned case admitted and discharged as scheduled on the same day. The day case rate is measured here as the number of day patients treated, expressed as a percentage of the total number of day patients and elective inpatients combined. This follows the Audit Commission (2001) method for measuring day case performance.

Figure 2.1 shows the day case rate and day beds as a proportion of total beds by hospital for all elective discharges in 2006.[18] In this analysis, day beds are reported as a proportion of total beds to control for the size of the hospital in question and to give a more accurate picture of the hospitals' day case activity.

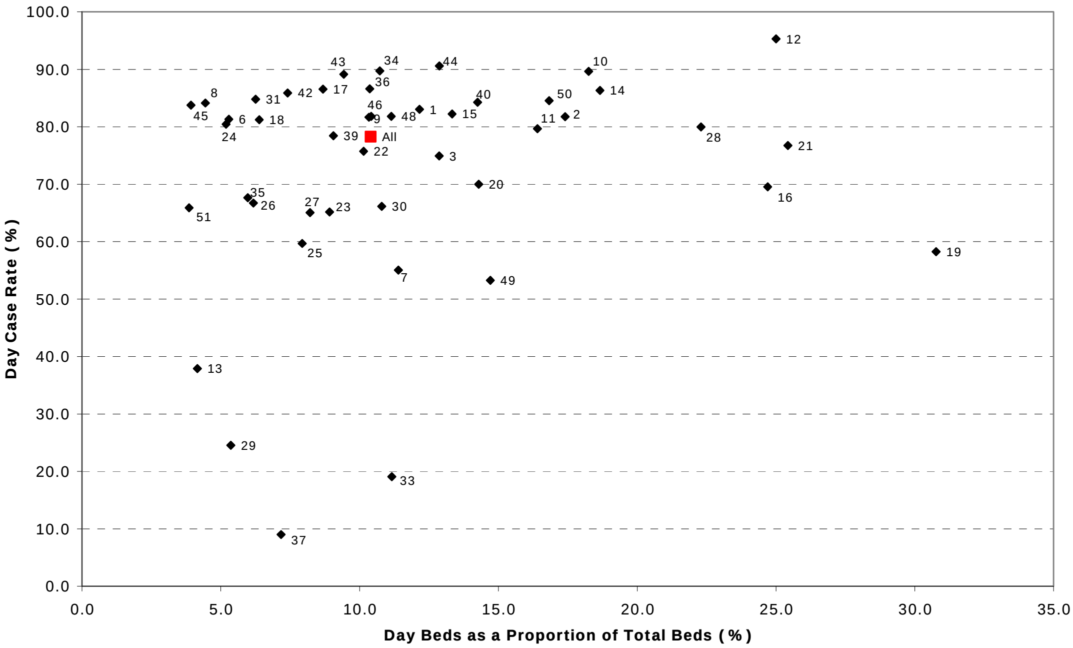
In 2006, the day case rate across the selected hospitals was 78.2 per cent of all elective activity and the day bed rate was 10.4 per cent. There is variation across hospitals. For example, in 2006, hospitals 48 and 7 had similar proportions of day beds with 11.1 and 11.4 per cent respectively but hospital 48 had a day case rate of 81.8 per cent and hospital 7 had a day case rate of 55.0 per cent.

The variation in day case rates across hospitals with similar proportions of day beds would suggest that the achievement of national objectives in relation to day case rates may need a more targeted intervention where the rates for individual hospitals are lower than would be expected given the capacity available.

[17] The discharge rate would be 195 per 1,000 at 85 per cent bed occupancy or 230 per 1,000 at 100 per cent bed occupancy.

[18] The number of day beds in 2006 was sourced from the Performance Management Unit, Health Service Executive.

Figure 2.1: Day Case Rate (%) and Day Beds as a Proportion of Total Beds (%) by Hospital, 2006



To probe further into the source of variation in day case activity at the hospital level, an analysis of day case rates within hospitals for individual procedures was undertaken. The following analysis, using HIPE data for 2006, employs a basket of 24 procedures (Basket 24) as a means of comparing day case performance across the 51 acute public hospitals included (Audit Commission, 2001).[19]

Table 2.1 shows the day case rate for the Basket 24 procedures in 2006 which were specified using the ICD-10-AM coding scheme. The overall day case rate is presented along with the median rate across the 51 hospitals. In addition, it shows the number of hospitals carrying out each procedure, though it should be noted that not every procedure is carried out in every hospital. For example, the procedure 'excision of ganglion' is carried out in 43 hospitals whereas 'correction of squint' is carried out in 11 hospitals. For two hospitals of the 51 included in the analysis, no Basket 24 procedures were performed.

Of the Basket 24 procedures, the highest volume procedures were 'dilation and curettage/hysteroscopy' with 7,997 procedures performed in 35 hospitals and 'extraction of cataract with/without implant' with 7,989 procedures performed in 11 hospitals. Almost three quarters of all 'dilation and curettage/hysteroscopy' procedures (73.9 per cent) and over half of all 'extraction of cataract with/without implant' procedures (56.8 per cent) were performed as day cases. The lowest volume procedure in the Basket 24 was 'operation for bat ears' with 220 procedures performed in 2006. There is variation in the day case rate across the 24 procedures, from a low of 0.4 per cent for 'tonsillectomy' to a high of 95.6 per cent for 'myringotomy with or without grommets'.

[19]See Appendix 2.1 for the approach adopted.

Table 2.1: Day Case Rate for Basket 24 Procedures, 2006

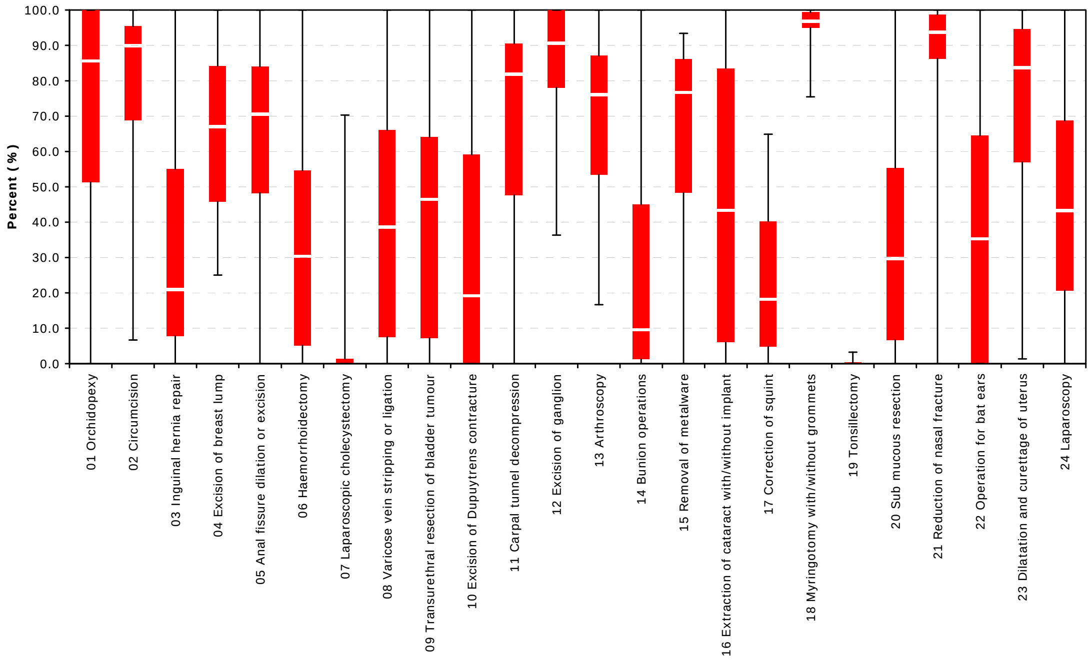
Specialty[a]		Number of Hospitals	Day Patients N	Day Patients Day Case Rate (Total %)	Day Patients Day Case Rate (Median %)	Total Discharges[b]
General surgery and urology	01 Orchidopexy	26	387	75.0	85.6	516
	02 Circumcision	38	2,537	87.0	89.9	2,916
	03 Inguinal hernia repair	38	1,162	32.3	21.0	3,603
	04 Excision of breast lump	36	1,228	56.2	67.1	2,184
	05 Anal fissure dilation or excision	37	479	73.6	70.6	651
	06 Haemorrhoidectomy	36	138	34.9	30.4	395
	07 Laparoscopic cholecystectomy	36	173	5.3	0.0	3,279
	08 Varicose vein stripping or ligation	35	1,228	49.7	38.6	2,471
	09 Transurethral resection of bladder tumour	23	243	38.9	46.4	625
	10 Excision of Dupuytren's contracture	25	83	26.9	19.1	309
Orthopaedics	11 Carpal tunnel decompression	35	955	77.0	81.8	1,240
	12 Excision of ganglion	43	346	85.2	90.6	406
	13 Arthroscopy	27	3,886	71.6	76.0	5,427
	14 Bunion operations	23	87	15.3	9.5	569
	15 Removal of metalware	27	2,675	78.0	76.7	3,429
Ophthalmology	16 Extraction of cataract with/without implant	11	4,538	56.8	43.4	7,989
	17 Correction of squint	11	126	24.3	18.2	519
Ear, nose and throat	18 Myringotomy with/without grommets	20	3,796	95.6	96.8	3,970
	19 Tonsillectomy	20	11	0.4	0.0	2,875
	20 Submucous resection	20	163	29.5	29.7	553
	21 Reduction of nasal fracture	19	1,024	89.4	93.8	1,146
	22 Operation for bat ears	17	120	54.5	35.3	220
Gynaecology	23 Dilation and curettage/hysteroscopy	35	5,911	73.9	83.7	7,997
	24 Laparoscopy	43	3,186	57.4	43.3	5,555
	Total	51	34,482	58.6	54.4	58,844

Notes: [a] Procedures are numbered and grouped by specialty in line with the Healthcare Commission (2005) where it is stressed that specialty groups are indicative and some procedures may be carried on in a different specialty.

[b] Includes day patients and elective inpatients.

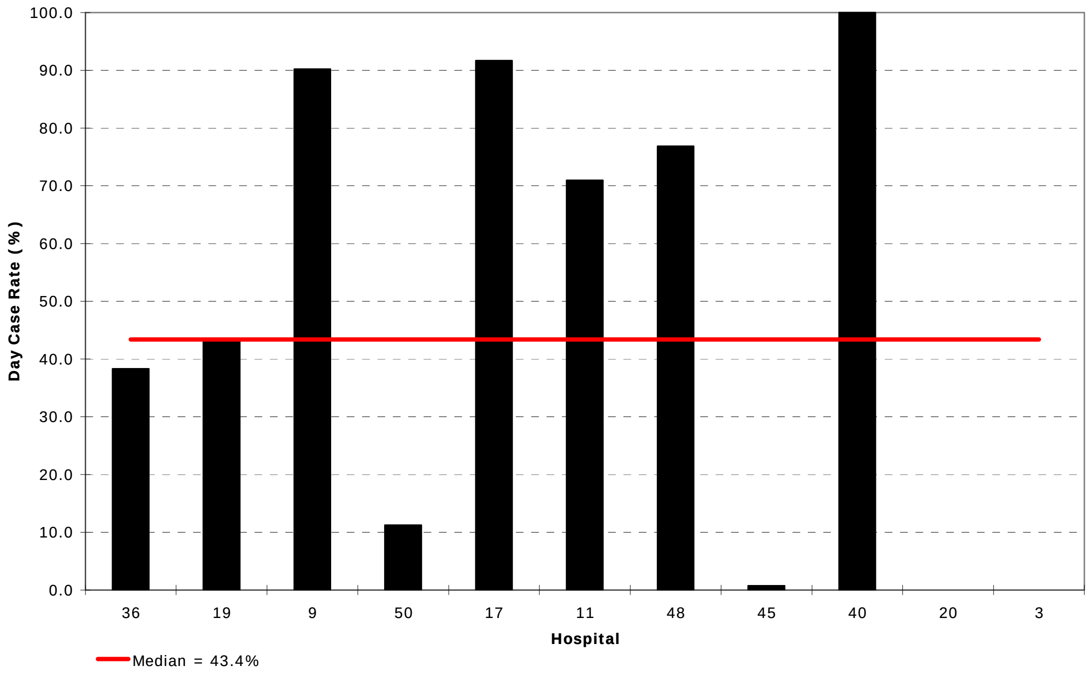
Figure 2.2 summarises the spread of day case rates across 49 hospitals for each of the Basket 24 procedures. When individual procedures from the Basket 24 are examined across all hospitals performing the procedure, it is clear that there is wide variation in day surgery rates for any particular Basket 24 procedure.

Figure 2.2: Day Case Rate (%) for Basket 24, 2006



For example, 'extraction of cataract with/without implant' is a high volume procedure with a median day case rate of 43.4 per cent (mean=56.8 per cent). In 2006, the procedure was performed on a day or inpatient basis in 11 hospitals; all of which performed more than 15 procedures in total (day and elective inpatients). Figure 2.3 shows the day case rate for each of the 11 hospitals where the procedure was performed. In 2006, the day case rate ranged from zero for hospitals 3 and 20 to 100 per cent for hospital 40. Even where hospitals are performing similar volumes of procedures as day cases, the day case rate can vary widely. Hospitals 11 and 19 performed 618 and 551 'extraction of cataract with/without implant' procedures respectively; however, hospital 11 had a day case rate of 71.0 per cent for the procedure whilst hospital 19 had a day case rate of 43.4 per cent. Similar variation, to a greater and lesser extent, can be found for all of the Basket 24 procedures.

Figure 2.3: Day Case Rate (%) for 'Extraction of Cataract With/Without Implant', 2006



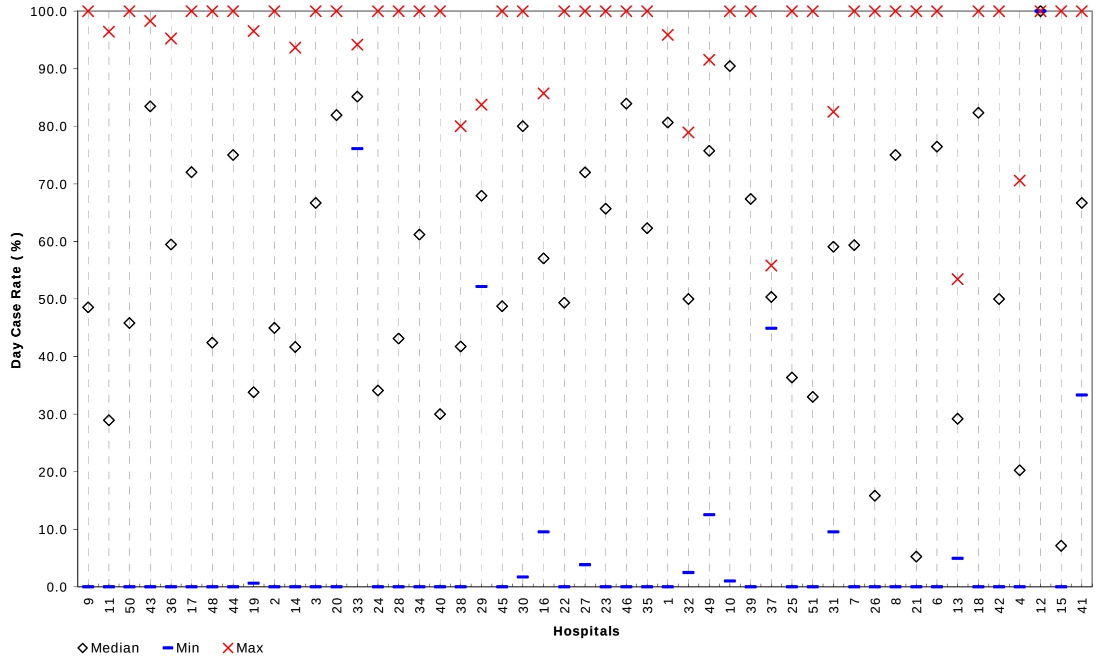
Given the low day case rates for procedures such as 'laparoscopic cholecystectomy' the appropriateness of the Basket 24 and its application in an Irish context may be called into question. However, although the average day case rate for this procedure is 5.3 per cent, many hospitals are achieving day case rates far in excess of this. In 2006, three hospitals (6, 34 and 43) achieved day case proportions above 20 per cent.[20]

Figure 2.4 shows the minimum, maximum and median day case rate across the Basket 24 procedures for each hospital, in descending order of the total number of procedures performed. It is clear that, as well as large variations in the day case rate for the Basket 24 procedures in hospitals, there was also variation in the day case rates between the procedures within the hospitals in 2006. A particular hospital can have a high day case rate for one procedure and a low rate for another. For example, hospital 11 has a day case rate of 20.7 per cent for 'orchidopexy' and 62.6 per cent for 'circumcision'.

Few of the hospitals performed well for all of the procedures delivered from the Basket 24, and those that did perform well are generally not performing a wide range of the procedures. For example, hospital 33 appears to perform well as the minimum, maximum and the median for the Basket 24 are over 75 per cent. However, this hospital carries out just 2 of the Basket 24 procedures. The majority of the 49 hospitals, performing one or more of the Basket 24 procedures, have at least one procedure for which all discharges are day cases and at least one for which all discharges are elective inpatients.

[20]Hospital 6 achieved a day case rate of 23.4 per cent out of a total of 141 procedures performed. Hospital 34 achieved a day case rate of 21.6 per cent out of 97 procedures performed. Hospital 43 achieved a day case rate of 70.3 per cent out of a total of 111 procedures performed.

Figure 2.4: Day Case Rate for the Basket 24 Procedures by Hospital, 2006



The number of additional day cases that could potentially be achieved in 2006 if each hospital was performing at the upper quartile level was calculated for each of the Basket 24 procedures. If all hospitals in 2006 were performing this set of day case procedures at the upper quartile day case rate for each Basket 24 procedure, the number of day cases, in place of elective inpatient cases, would have been 15.2 per cent (8,926 cases) greater than that actually achieved in 2006. The savings varied between procedures with 'cataracts' procedures allowing for the greatest scope in the reduction of elective inpatient cases and consequently beds days. If all hospitals carrying out 'cataracts' in 2006 achieved the 2006 upper quartile day case rate of 83.6 per cent, it would have meant 2,137 of the elective inpatients being treated instead as day cases. Thus, of the potential additional 8,926 day cases, 23.9 per cent are accounted for by 'cataracts' patients.

If such performance were possible, this would in turn lead to a fall in the number of elective inpatient bed days. If we make the assumption that all hospitals achieved the upper quartile day case rate in 2006 and the average length of stay for the remaining elective inpatients remained the same as it was prior to the day case improvements, there would have been 20,636 (21.7 per cent) fewer elective inpatient bed days required. If a day case rate of 100 per cent were achieved for each of the Basket 24 procedures 36,367 bed days (38.2 per cent) would have been saved in 2006.

This evidence presented here supports the assumption that there is potential to increase day case activity as part of the PHS model. The variation observed between hospitals and across procedures would suggest, however, that the achievement of the proposed targets may necessitate customisation of this policy for individual hospitals and for specific procedures.

2.4 Overview of Inpatient Length of Stay Within the Acute Public Hospital Sector

A reduction in inpatient length of stay in acute public hospitals is a key assumption underlying the projection by PA Consulting Group (2007a) that public patient bed requirements may be reduced by 2020 in the context of the PHS.[21] The importance attributed to this development may be deduced from the fact that almost 60 per cent of the difference in the public patient bed capacity projections for the 'current use' and the PHS models are attributed to a reduction in inpatient length of stay.

The purpose of this section is to use hospital inpatient discharge data from HIPE to investigate the demand- and supply-side factors that may influence the duration of hospitalisation. The complex interactions between patient characteristics and the parameters of the hospital system prompted Martin and Smith (1996) to issue a warning to policy makers looking for "easy ways" to reduce utilisation of hospital services.

For acute Irish public hospitals, inpatient average length of stay has fallen from 7.2 days in 1995 to 6.3 days in 2006 (Health Research and Information Division ESRI, 2008).[22] In order to present some context for the length of stay targets proposed for the PHS in the PA Consulting Group (2007a) report, this section benchmarks hospitals' current performance on inpatient length of stay for selected procedures against that required under the PHS in 2020. Given the data available in the PA Consulting Group (2007a) report, this analysis focuses on the following subset of conditions and procedures which are likely to become increasingly important as the population ages:

- Acute myocardial infarctions (AMIs);
- Arrhythmias;
- Hernia repairs;
- Hip procedures;
- Diabetes.[23]

Table 2.2 reports the average length of stay for acute inpatients as reported to HIPE in 2006 and projected under the PHS in 2010 and 2020. In an attempt to ensure comparability with the analytical approach used in PA Consulting Group (2007a), this Table focuses on inpatients with a length of stay of 30 days or less. For each of the five conditions, the move to the PHS requires substantial reductions in inpatient length of stay

[21] While reducing inpatient length of stay enables hospitals to treat more patients with a given number of beds, it does not necessarily follow that there will be a concomitant fall in total costs. In a systematic literature review, Clarke (1996) argued that a disproportionately large share of the costs of inpatient stays is accumulated during the early part of the stay when intensive treatment and investigation occur. The effect of early discharge on clinical outcomes and patient satisfaction must also be considered (Spencer *et al.*, 2004; Clarke, 1996).

[22] For acute inpatients (that is, those with a length of stay of 30 days or less), the average length of stay has fallen from 5.5 days in 1995 to 4.8 days in 2006.

[23] The AR-DRG codes for AMIs are F41A, F41B, F60A, F60B, F60C. The AR-DRG codes for Arrhythmias are F70A, F70B, F71A and F71B. The AR-DRG codes for hernia repairs are G08A, G08B and G09Z. The AR-DRG codes for hip procedures are I03A, I03B and I03C. The AR-DRG codes for diabetes are K60A and K60B. This categorisation was adopted in the PA Consulting Group (2007b) report.

between 2006 and 2020 of the order of approximately 25 per cent for hip procedures, 30 per cent for diabetes, about 40 per cent for arrhythmias and hernia repairs, and over 47 per cent for AMI. That the achievement of these objectives may be challenging may be deduced from the finding that during the period 1995 to 2006, the national acute inpatient average length of stay fell by about 13 per cent.

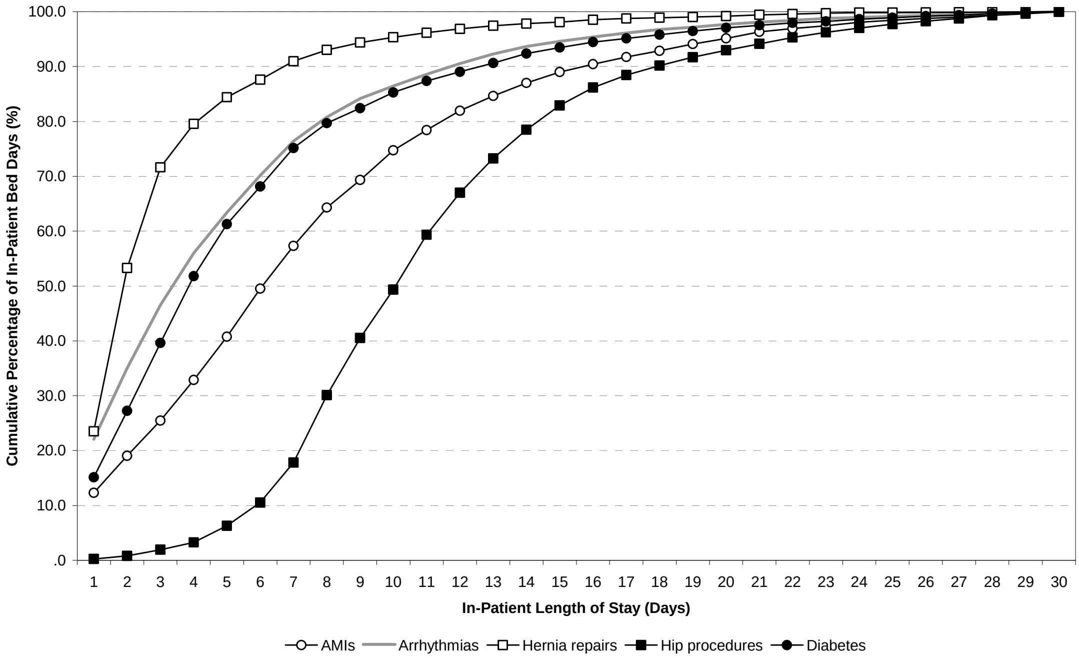
Table 2.2: Average Length of Stay for Acute Inpatients, Recorded for 2006 and Projected for 2010 and 2020

	Number of Acute Inpatients in 2006	Average Length of Stay (Days)		
		2006 *(Observed)*[a]	2010 *(PHS Target)*[b]	2020 *(PHS Target)*[b]
AMIs	4,270	7.8	6.1	4.1
Arrhythmias	6,625	5.4	4.7	3.2
Hernia Repairs	3,997	3.5	2.9	2.2
Hip Procedures	5,040	11.5	11.5	8.6
Diabetes	4,060	5.9	6.1	4.1

Note: [a] These figures were calculated by the authors and, therefore, may be slightly different to those reported by PA Consulting Group (2007b). However, these differences are unlikely to substantially affect the subsequent analysis.
Source: [b] PA Consulting Group (2007b).

To enable an assessment of variation in this indicator for these conditions at the hospital level, Figure 2.5 illustrates the cumulative distribution of acute in-patient average length of stay across all hospitals. It is interesting to note that the duration of hospitalisation for approximately one out of every two acute in-patient discharges with diabetes, arrhythmia, or hernia repair actually surpassed the 2020 target. For AMIs and hip procedures, however, only about one-third and two-fifths of acute in-patient discharges, respectively, achieved or surpassed the 2020 target under the PHS. This would suggest therefore, that optimisation of progress towards the 2020 target would be enhanced if efforts to reduce in-patient length of stay focussed more on areas such as AMIs and hip procedures, though there are still potential improvements to be made in the other three areas.

Figure 2.5: Cumulative Distribution of Acute Inpatient Length of Stay for Five Conditions, 2006



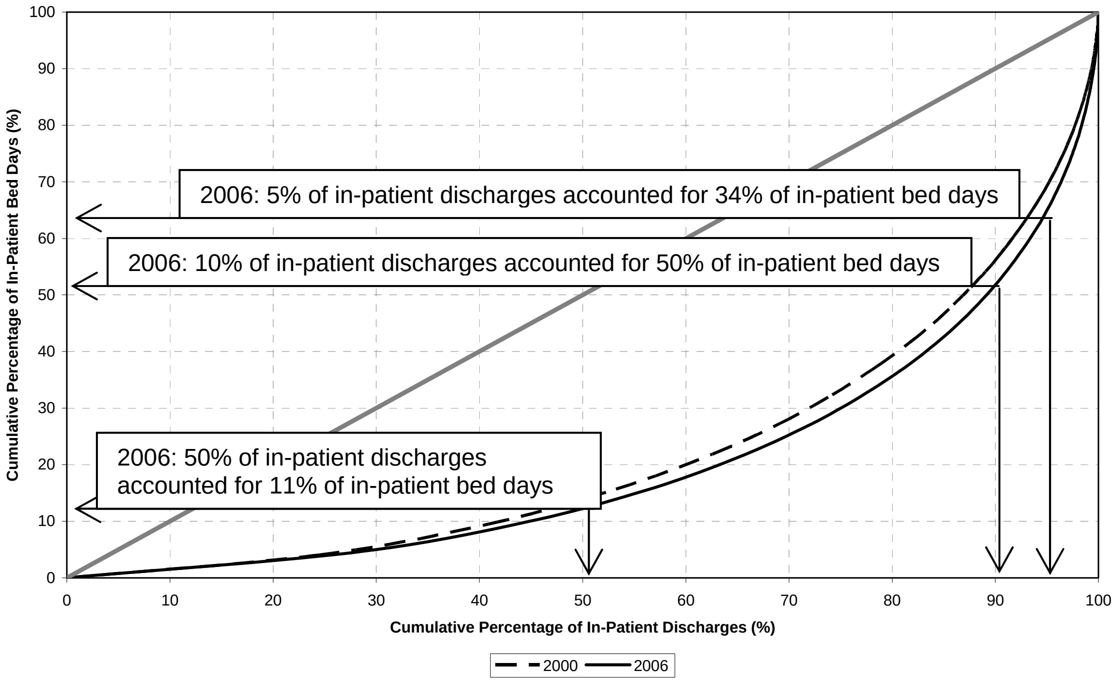
The remainder of this section examines how demand-side factors, such as patients' demographic characteristics, affect length of stay by comparing high users with other users. In what follows, "high users" are described as those in-patient discharges in the 90th percentile of the in-patient bed days distribution.[24] On the basis of this definition, there were 56,533 high users in 2000 who accounted for 45.8 per cent of total in-patient bed days. The absolute number of high users was slightly higher in 2006 (61,899) and they accounted for a higher percentage of bed days (49.8 per cent).[25]

Figure 2.6 compares the cumulative distribution of in-patient bed days and discharges in 2000 and 2006. If there was a one-to-one relationship between in-patient bed days and discharges (for example, 40 per cent of discharges accounted for 40 per cent of bed days), the data would lie along the solid grey diagonal line in the figure. Instead, the lines for 2000 and 2006 indicate an unequal relationship, with a small proportion of in-patient discharges using a disproportionately large share of bed days. Thus, in 2000, approximately 88 per cent of in-patient discharges used as many bed days as the remaining 12 per cent of in-patient discharges (that is, 50 per cent of total in-patient bed days were used by 88 per cent of in-patient discharges, and the other 50 per cent of bed days were used by the remaining 12 per cent of discharges).

[24]Recall that this analysis is based on discharge level data. Therefore, a single patient may account for a number of high user discharges.

[25]For comparison, 10 per cent of inpatients in Scotland accounted for 59 per cent of overall inpatient bed days in 2003/4 (National Health Service Scotland, 2005).

Figure 2.6: Cumulative Distributions of Inpatient Discharges and Bed Days, 2000 and 2006



In Figure 2.6, the 2006 line was positioned slightly further away from the diagonal than the 2000 line. This indicates a marginal increase in the existing inequality between in-patient bed days and discharges in 2006 compared to 2000 (which is also evident from the fact that in 2006, approximately 89 per cent of in-patient discharges used as many bed days as the remaining 11 per cent).

The characteristics of high users are compared to other users in 2000 and 2006 in Table 2.3. There were obviously stark differences between the two groups in their average length of stay: in 2006, high users were, on average, staying in hospital for over eight times as long as other users. As age has been consistently found to be an important determinant of length of stay (see, *inter alia*, McMullan *et al.,* 2004; Spencer *et al.,* 2004; Rochon *et al.,* 1996), it is not surprising that high users tend to be much older, on average, than other users (62.1 years versus 40.0 years in 2000 and 64.2 years versus 40.8 years in 2006). The high user group is also characterised by a higher proportion of medical card holders (GMS).

Pre-existing illnesses have a substantial impact on length of stay (Rochon *et al.,* 1996; Roe *et al.,* 1998)). In this analysis, the proportion of discharges with more than 2 diagnoses provides an indication of the level of comorbidity. About eight out of every ten high users had more than 2 diagnoses recorded, which in both years was far higher than the corresponding percentage for other users. A substantially higher proportion of high user discharges underwent more than two procedures. Moreover, the proportion of high users grouped into the highest category of resource intensity was more than double that for other users in 2006.[26] Finally, Table

[26]Resource intensity is determined by the level of complexity associated with the AR-DRG to which the case is assigned.

2.3 also shows that, although the percentages are small in absolute terms, high users were more likely to be discharged to long-stay accommodation.

Table 2.3: Characteristics of High Users and Other Users, 2000 and 2006

		2000		2006	
		High Users	Other Users	High Users	Other Users
N[a]		56,533	460,365	61,899	513,776
Inpatient bed days (%)		45.8	54.2	49.8	50.2
Inpatient average length of stay (days)	Mean	25.3	3.7	28.5	3.5
	(SD)	25.0	2.8	32.4	2.8
	Median	18.0	3.0	20.0	2.0
	(IQR)	(15.0, 27.0)	(1.0, 5.0)	(15.0, 30.0)	(1.0, 5.0)
Age (years)	Mean	62.1	40.0	64.2	40.8
	(SD)	22.7	25.3	22.7	25.2
GMS (%)[b]		57.1	40.4	70.8	42.7
Public (%)[c]		78.6	75.7	78.1	72.9
Surgical diagnosis related group (%)[d]		34.6	24.1	31.1	23.7
Highest resource intensity category (%)[e]		-	-	39.9	17.0
More than 2 diagnoses (%)[f]		77.6	43.3	85.2	47.7
More than 2 procedures (%)[f]		49.2	19.8	62.9	19.3
Discharged to long-stay accommodation (%)[g]		12.3	1.7	15.8	2.3

Notes: SD, standard deviation. IQR, interquartile range between the 25th and 75th percentiles.
a Refers to number of discharges, not patients.
b Entitlement to a medical card changed in July 2001. Medical card status 'unknown' were included in the calculation of these percentages.
c Refers to public/private status on discharge. Does not relate to the type of bed occupied by the discharge.
d Certain DRGs are considered to be surgical for the purposes of assigning discharges to groups of homogeneous discharges.
e Based on the resource intensity of the DRG to which a discharge is allocated. This categorisation became available with the move to AR-DRGs in 2005 and, therefore, was not available for 2000.
f In 2000, diagnoses and procedures were coded using ICD-9-CM. A potential maximum of six (one principal and up to five secondary) diagnosis codes and four (one principal and up to three secondary) procedure codes could be reported to HIPE in 2000. Since 1 January 2005, ICD-10-AM is used to code diagnoses and procedures in HIPE. A total of 20 potential diagnosis and procedure codes could be reported to HIPE in 2006.
g Includes convalescent home, nursing home or long-stay accommodation.

The ten AR-DRGs with the highest number of inpatient discharges for high users and other users in 2006 are reported in Table 2.4. The top ten AR-DRGs for high users accounted for almost one-fifth of total inpatient bed days for all high users and 17.2 per cent of high user discharges.

The top ten AR-DRGs for high users shows that inpatient bed days among this group were predominantly used for chronic conditions, or acute episodes associated with chronic conditions – for example, stroke and chronic obstructive airways disease. Acute conditions were more likely to be recorded among other users.

The AR-DRGs associated with the higher levels of severity (as denoted by a fourth character of 'A' in the AR-DRG code) were more common among high users. That high users are complex discharges was also evident from the higher mean casemix units assigned to these cases.[27] High users in the top ten AR-DRGs were four times more resource intensive than the average across all AR-DRGs, while the corresponding other users were 60 per cent less complex than the national average.

Table 2.4: Top Ten AR-DRGs by Inpatient Bed Days for High Users and Other Users, 2006

AR-DRG	Description	In-Patient Discharges	In-Patient Bed Days	In-Patient Casemix Units	
		N	N	N	Mean
High users					
A06Z	Tracheostomy or Ventilation >95 hours	1,698	92,857	27,427	16.2
E65A	Chronic Obstructive Airways Disease W Catastrophic or Severe CC	1,334	33,969	2,414	1.8
I03C	Hip Replacement W/O Catastrophic or Severe CC	1,061	19,667	2,981	2.8
F62B	Heart Failure and Shock W/O Catastrophic CC	1,052	23,389	1,461	1.4
E75A	Other Respiratory System Diagnosis Age>64 W CC	1,017	26,148	1,586	1.6
B70C	Stroke W/O Catastrophic or Severe CC	966	28,823	1,836	1.9
E62A	Respiratory Infections/Inflammations W Catastrophic CC	966	32,436	2,703	2.8
E62B	Respiratory Infections/Inflammations W Severe or Moderate CC	936	25,273	1,643	1.8
I03B	Hip Replacement W Cat or Sev CC or Hip Revision W/O Cat or Sev CC	813	22,798	3,334	4.1
B70B	Stroke W Severe CC	805	29,665	2,189	2.7
Total – Top 10		**10,648**	**335,025**	**47,574**	**4.5**
Total – High Users		**61,899**	**1,763,992**	**191,730**	**3.1**
Other Users					
O60B	Vaginal Delivery W/O Catastrophic or Severe CC	33,031	99,828	15,870	0.5
O66A	Antenatal & Other Obstetric Admission	20,482	44,404	6,098	0.3
O01C	Caesarean Delivery W/O Catastrophic or Severe CC	12,508	64,814	13,028	1.0
F74Z	Chest Pain	12,111	31,491	3,769	0.3
O66B	Antenatal & Other Obstetric Admission, Sameday	10,383	10,383	882	0.1
O60C	Vaginal Delivery Single Uncomplicated W/O Other Condition	9,874	23,552	3,589	0.4
G66B	Abdominal Pain or Mesenteric Adenitis W/O CC	8,298	18,642	2,352	0.3
D63B	Otitis Media and URI W/O CC	8,277	16,827	2,284	0.3
G67B	Oesophagitis, Gastroent & Misc Digestive Systm Disorders Age>9 W/O Cat/Sev CC	7,926	25,679	3,012	0.4
G68B	Gastroenteritis Age <10 W/O CC	6,457	11,667	1,994	0.3
Total – Top 10		**129,347**	**347,287**	**52,878**	**0.4**
Total – Other Users		**513,776**	**1,777,768**	**382,077**	**0.7**

To summarise, in 2006 approximately 10 per cent of discharges accounted for about half the bed days used in acute public hospitals. These discharges, the so called high users, were older and sicker than other users. The high users were being treated for more complex conditions which were often associated with chronic conditions. While treatment in other care settings may be equally or more appropriate for many in this group,

[27] Casemix units are calculated by weighting discharges according to their level of resource intensity.

this analysis would suggest that an attempt to reduce bed day utilisation within the acute public hospital sector will have to ensure that an appropriate response to the needs of this potentially vulnerable group are specifically addressed.

2.5 Supply-Side Determinants of Length of Stay: Variability in Inpatient Average Length of Stay by Hospital

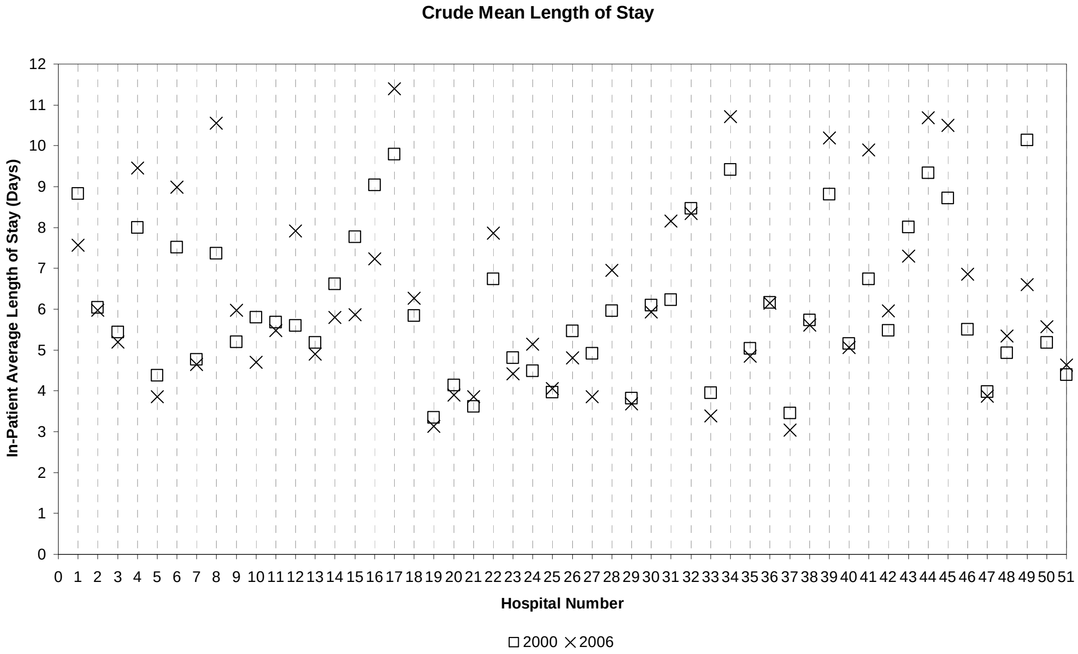
Research has found that unexplained variation in length of stay across hospitals persists after controlling for patient characteristics (Peterson *et al.,* 2002). The supply-side influences on length of stay are predominantly centred on those pertaining to the hospital (including, for example, teaching status (Yuan *et al.,* 2000), physician practices (McMullan *et al.,* 2004) and funding (Yuan *et al.,* 2000; Theurl and Winner, 2007).

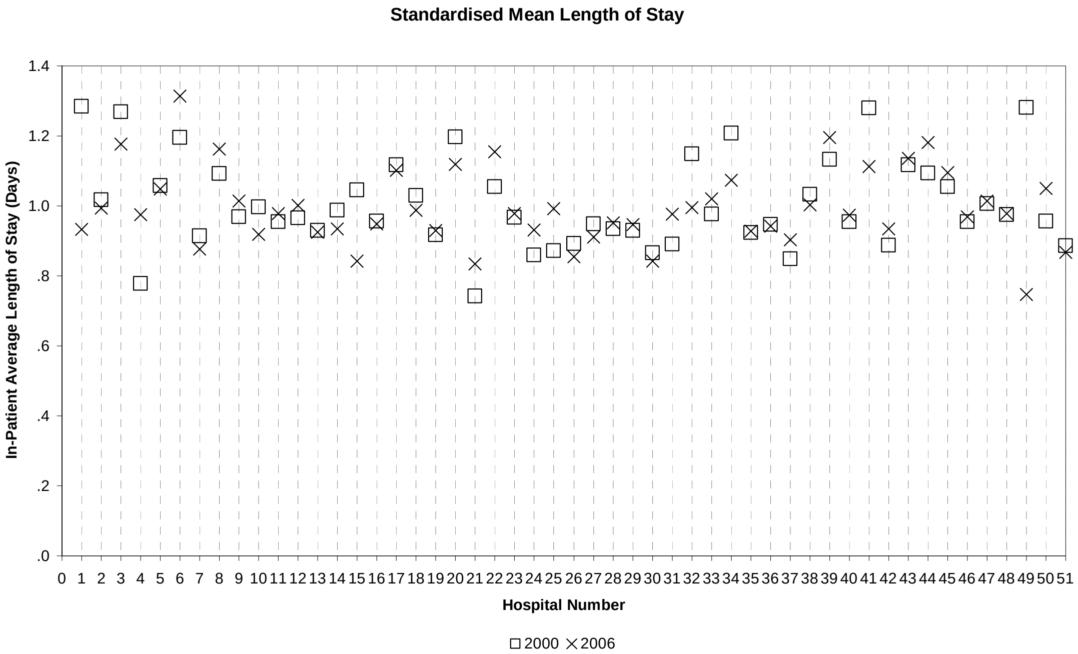
The crude mean length of stay for each of the 51 acute public hospitals included in this analysis in 2000 and 2006 is shown in Figure 2.7. The crude mean length of stay ranged from 3.3 to 10.1 days in 2000 and from 3.0 to 11.4 days in 2006. The unadjusted figures do not control for differences in the case mix across hospitals. They do demonstrate, however, that while average length of stay at a national level declined over the period, this downward trend was not experienced by all hospitals (only 28 of the 51 hospitals shown in Figure 2.7 recorded a decline in mean length of stay between 2000 and 2006).

The mean standardised length of stay, also presented in Figure 2.7, makes some attempt to control for differing patient profiles across hospitals. Of the 51 hospitals, 21 (41.2 per cent) had a mean standardised length of stay above unity in 2000; by 2006 this number had slightly declined to 19 (37.3 per cent) hospitals. However, there was also a marginal increase in the share of inpatient discharges accounted for by those hospitals with a mean standardised length of stay of greater than unity (from 35.0 per cent of total inpatient discharges in 2000 to 40.5 per cent in 2006).

In both 2000 and 2006, the lowest mean standardised length of stay for any hospital was 0.7, indicating that the mean length of stay in that hospital was approximately 30 per cent below what would have been expected given the case mix of that hospital's discharges. At the other extreme, the highest hospital mean standardised length of stay was 1.28 in 2000 and 1.31 in 2006, suggesting that in these cases the mean length of stay was 28 per cent and 31 per cent respectively above what would have been expected.

Figure 2.7: Crude and Standardised Mean Length of Stay, 2000 and 2006





Given the considerable variation in the standardised length of stay across hospitals, it is interesting to explore the association between length of stay and hospital type. The mean standardised length of stay is shown in Figures 2.8 and 2.9 for general (voluntary, regional and county) hospitals and special hospitals in both 2000 and 2006. All voluntary, regional and county hospitals provide general hospital services, as distinct from special hospitals which provide treatment in a particular specialty (for example, maternity, paediatrics, etc.). Voluntary, regional and county hospitals differ in terms of governance and management structure and the level at which services may be provided. These hospitals may also differ in terms of their teaching status.

In both years, voluntary and special hospitals consistently had a higher than expected mean length of stay given the composition of their discharges. For voluntary hospitals, the mean length of stay was 8 per cent and 10 per cent higher than the expectation (based on the national average) in 2000 and 2006 respectively. A potential confounding factor may be that this group contains five of the eight teaching hospitals in Ireland (as classified for the purposes of the National Casemix Programme). Teaching hospitals have been shown to have longer lengths of stay, partly perhaps related to their role in providing training and medical education, and undertaking research activities (Yuan *et al.,* 2000). Special hospitals also had a longer length of stay than expected on average (2 per cent and 1 per cent above unity in 2000 and 2006 respectively). Conversely, the mean standardised length of stay was consistently lower in regional and county hospitals in both years.

Figure 2.8: Mean Standardised Length of Stay by Hospital Type, 2000

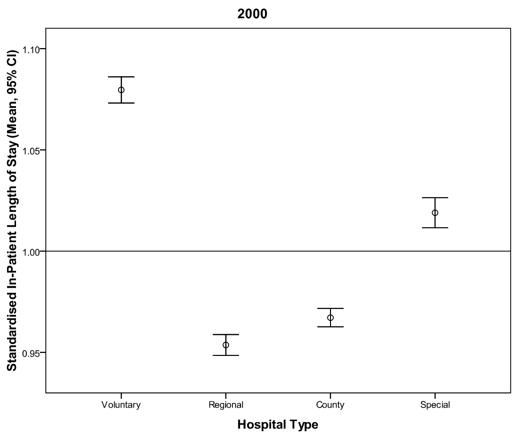
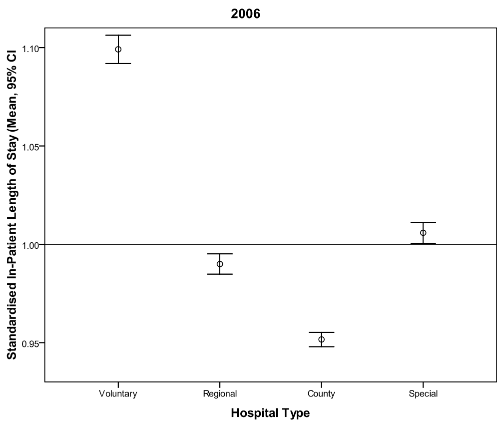


Figure 2.9: Mean Standardised Length of Stay by Hospital Type, 2006



Notes: CI, confidence interval.
In 2001, one hospital changed its status from a voluntary to a county hospital. For the purposes of this analysis, this hospital was categorised as a voluntary hospital in 2000 and a county hospital in 2006.

The analysis presented here shows that 'hospital type' has a bearing on patient length of stay. While voluntary and special hospitals are shown to have a mean standardised length of stay that is higher than expected, the standardised mean length of stay for regional and county hospitals is lower than expected. In pursuing the objective of reducing average length of stay, this analysis suggests that performance improvements may need to be tailored to the specific characteristics of, and circumstances facing, individual hospitals. The considerable deviation across individual hospitals in both crude and standardised length of stay warrants further investigation.

2.6 Conclusions

While future population growth will undoubtedly impact on the demand for health services, perhaps more important from the perspective of acute hospital services is that the population is ageing. By 2021, those aged 65 years and over are projected to increase their share of the overall population from 11 to 15 per cent, while the population aged 85 years and older will more than double (Morgenroth, 2008).

The PA Consulting Group (2007a) report was commissioned by the HSE to estimate acute hospital bed capacity requirements for Ireland for 2020. When estimated on the basis of current utilisation patterns, this study estimated that 19,822 public patient hospital beds will be required by 2020 while the projections based on the Preferred Health System model estimate that just 8,834 public patient beds will be required by 2020. Over three-quarters of the savings in public patient bed numbers between the two models have been attributed to the proposed reduction in in-patient length of stay and increasing day case activity. Given the crucial role proposed for these two factors in facilitating the achievement of reductions in acute hospital bed capacity in the context of the PHS, this chapter has been concerned with identifying those issues which may be critical to the achievement of these objectives.

In assessing the potential for increasing day case activity towards the levels proposed in the PA Consulting Group (2007a) report, the analysis presented here examined variations in day case activity relative to available capacity at the hospital level and at the level of specific procedures. The variation in day case rates across hospitals with similar proportions of day beds would suggest that the achievement of national objectives in relation to day case rates may need a more targeted intervention where the rates for individual hospitals are lower than would be expected given the capacity available.

The day case rates for the individual procedures in the internationally-recognised Basket 24 (adapted for Ireland) were reviewed and shown to vary across the hospitals in which they were performed. The number of additional day cases that could potentially be achieved in 2006 if each hospital was performing at the upper quartile level was calculated for each of the Basket 24 procedures. If all hospitals in 2006 were performing this set of day case procedures at the upper quartile day case rate for each Basket 24 procedure, the number of day cases, in place of elective in-patient cases, would have been 15.2 per cent (8,926 cases) greater than that actually achieved in 2006. The savings varied between procedures with 'cataracts' procedures allowing for the greatest scope in the reduction of elective in-patient cases and consequently beds days.

The evidence presented here supports the assumption that there is potential to increase day case activity as part of the PHS model. The variation observed between hospitals and across procedures would suggest, however, that the achievement of the proposed targets may necessitate customisation of this policy for individual hospitals and for specific procedures.

The potential to reduce in-patient average length of stay was assessed from the perspective of demand and supply. On the demand side, the top 10 per cent of inpatient discharges used almost 50 per cent of in-patient bed days. These discharges, the so called high users, were older and sicker than other users. The high users were being treated for more complex conditions which were often associated with chronic conditions. While treatment in other care settings may be equally or more appropriate for many in this group, this analysis would suggest that an attempt to reduce bed day utilisation within the acute public hospital sector will have to ensure that an appropriate response to the needs of this potentially vulnerable group are specifically addressed.

When variations in average length of stay for specific procedures were assessed, it became evident that many hospitals were achieving, or surpassing, the 2020 targets in 2006. There was, however, substantial variation by procedure and by hospital suggesting that optimisation of progress towards the achievement of the 2020 targets at the hospital system level may benefit from a performance management approach focussed on specific procedures and individual hospitals.

On the supply side, there is considerable variation in average length of stay across hospitals and hospital groups. Controlling for discharge characteristics, the mean standardised length of stay for voluntary and special hospitals was higher than expected while that for regional and community hospitals was lower than expected.

While there are undoubtedly benefits to an integrated model of health care provision as proposed by the HSE, reducing the over-reliance on hospitals inherent in the Irish health care system will be a challenge not only for the acute public hospital sector but for the health care system as a whole. The variation observed in the volume and mix of day case rates in the analysis presented here indicates very clearly that any national policy aimed at increasing day service rates will have to be specifically targeted at the individual hospital level. Targeting specific procedures may also be required. With regard to average length of stay, the variation in length of stay observed by hospital type, together with the fact that many of the so called 'high users' are elderly, medical card holders suffering from multiple morbidity/chronic conditions is indicative of the complexity faced in attempting to address this issue.

The implementation of the policy of community-based, integrated care will also be important for any initiative aimed at moderating future demand for hospital services. Given projected population growth, together with the ageing of the population, ongoing study is required to ensure that there is adequate provision of the required services in the community and the acute hospital sector to meet potentially increasing demand over the coming decades.

Appendix 2.1: Basket of Procedures

To get a clearer picture of day case activity, it is common practice to use a list of selected surgical procedures which are frequently performed as in-patient procedures but which are increasingly practised in a day setting (De Lathouwer and Poullier 1998; De Lathouwer and Poullier 2000; Wasowicz *et al.* 2000; Healthcare Commission 2005; Auditor General for Wales 2006). The list of procedures used varies from study to study but there are a number of procedures which are common to many studies, these include cataract surgery, varicose vein ligation and stripping, hernia repair and myringotomy amongst others.

According to the Audit Commission (2001), it was usual for the day case rate to be reported as an aggregate either across NHS Trusts or for a particular specialty. It was felt that this aggregation did not take into account the differences in the nature and complexity of the cases treated. In 1990, the Audit Commission, in association with the Royal College of Surgeons, developed a basket of 20 surgical procedures to provide a more consistent measure of performance. The procedures included in the original basket of procedures (Audit Commission, 2001, p 3):

- are commonly performed, so account for a large volume of surgery;
- are suitable for treatment as day cases; and
- would not generally be performed for an outpatient, thus focusing attention on the potential to treat more in-patients as day cases.

The original list of 20 procedures was revised in association with the British Association of Day Surgery in 2000. Some procedures were amended or excluded and, given technological advancements over the period, additional procedures were added. The new Audit Commission 'Basket 2000' contains 25 procedures. The list of procedures was chosen to include representative procedures from each of the main surgical specialties (general surgery, urology, orthopaedics, ophthalmology, ear, nose and throat, and gynaecology). As one procedure, 'termination of pregnancy', is not applicable in the Irish case the group of procedures will be referred to as the 'Basket 24' procedures.

Based on the method outlined by the Audit Commission, a procedure is included in the Basket 24 where:

- the definition code appears as a principal procedure; or
- the definition code appears as a secondary procedure and the principal procedure is one of the acceptable principal procedures; and
- there are no exclusion codes present as either a principal or secondary procedure.[28]

The Audit Commission Basket 25 procedures were originally specified using expert advice from clinicians and from what is now the NHS Classifications Service. The procedure codes were specified from the OPCS Classification of Interventions and Procedures (OPCS-4), which is the clinical coding scheme used by the NHS in the UK. For the analysis contained in this report, ICD-9-CM and ICD-10-AM codes were identified by the Clinical Coding Support Team in the Health Research and Information Division in the ESRI to be the closest match to those used by the Audit Commission. The codes used here are available from the authors on request.

[28] To avoid the potential double counting where a definition code is found in both principal and secondary positions, the discharge is allocated to the procedure identified as the principal procedure.

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