



This is an abridged version; the full version is on [bmj.com](http://bmj.com)

University Department of Human Nutrition, Glasgow Royal Infirmary, Glasgow G31 2ER  
Matthew G Dunnigan  
senior research fellow

Public Health Policy Unit, School of Public Policy, University College London, London WC1H 9QU

Allyson M Pollock  
professor

Correspondence to: A M Pollock  
[allyson.pollock@ucl.ac.uk](mailto:allyson.pollock@ucl.ac.uk)

BMJ 2003;326:905-8

# Downsizing of acute inpatient beds associated with private finance initiative: Scotland's case study

Matthew G Dunnigan, Allyson M Pollock

## Abstract

**Objectives** To evaluate whether the projected 24% reduction in acute bed numbers in Lothian hospitals, which formed part of the private finance initiative (PFI) plans for the replacement Royal Infirmary of Edinburgh, is being compensated for by improvements in efficiency and greater use of community facilities, and to ascertain whether there is an independent PFI effect by comparing clinical activity and performance in acute specialties in Lothian hospitals with other NHS hospitals in Scotland.

**Design** Comparison of projected and actual trends in acute bed capacity and inpatient and day case admissions in the first five years (1995-6 to 2000-1) of Lothian Health Board's integrated healthcare plan. Population study of trends in bed rate, hospital activity, length of stay, and throughput in Lothian hospitals compared with the rest of Scotland from 1990-1 to 2000-1.

**Main outcome measures** Staffed bed rates, admission rates, mean lengths of stay, occupancy, and throughput in four adult acute specialty groups in 1990-1, 1995-6, and 2000-1.

**Results** By 2000-1, rates for inpatient admission in all acute, medical, surgical, and intensive therapy specialties in Lothian hospitals were respectively 20%, 6%, 28%, and 38% below those in the rest of Scotland. Day case rates in all acute and acute surgical specialties were 13% and 33% lower. The proportion of delayed discharges in staffed acute and post-acute NHS beds in Lothian hospitals exceeded the Scottish average (15% and 12% respectively;  $P < 0.001$ ).

**Conclusion** The planning targets and increase in clinical activity in acute specialties in Lothian hospitals associated with PFI had not been achieved by 2000-1. The effect on clinical activity has been a steeper decline in the number of acute beds and rates of admission in Lothian hospitals compared with the rest of Scotland between 1995-6 and 2000-1.

## Introduction

The use of the private finance initiative (PFI) in new replacement NHS hospitals is associated with substantial reductions in the number of beds across the areas in which the hospitals are located. The full business cases for the 15 first wave PFI hospitals in England and Scotland projected reductions in acute beds of about 30% (median 29%; range 5-44%) in the five or so years before the new hospitals would be opened.<sup>1,2</sup> These reductions were based on anticipated improvements in service efficiency, including shorter lengths of stay, earlier discharge from acute beds, and greater use of community facilities. Although many of the first wave PFI hospitals have now opened, there has been no evaluation of their planning assumptions or of whether the benefits of the new investment have been realised through increased efficiency.

The new Royal Infirmary of Edinburgh is the most costly first wave acute hospital funded by PFI. It formed the cornerstone of Lothian Health Board's 1996 integrated healthcare plan. The original plan, which projected a reduction in total acute bed capacity across Lothian of 28% (from 2093 to 1513 beds) from 1995-6 to 2002-3, was revised in 2000 to a projected 24%.<sup>3,4</sup> This revised reduction was based on the new PFI hospital having 10% (774 to 695) fewer adult acute beds than its predecessor, the closure of five acute hospitals, and reductions in bed numbers in the three remaining acute hospitals.

We evaluated whether the plan's targets for service delivery were fulfilled at the end of the first five years of implementation and established whether there was a "PFI effect" by comparing the impact of acute bed closures in Lothian and other Scottish NHS hospitals on clinical activity between 1990-1 and 2000-1. We also examined whether financial constraints contributed to the determination of targets for acute bed reductions in Lothian hospitals before and during implementation of the healthcare plan.

## Methods

**Sources of data**—Lothian's planning targets for changes in bed numbers and inpatient and day case admissions from 1995-6 to 2002-3 were supplied by Lothian Health Board.<sup>4</sup> Actual data on annual clinical activity, admissions, bed occupancy, throughput, and length of stay for 1990-1 to 2000-1 were supplied by the information and statistics division of the NHS in Scotland. The general register office, Scotland, provided estimated midyear populations for Lothian health board and the rest of Scotland.

**Analysis and statistical methods**—We compared changes in the number of hospital beds and inpatient and day case admissions to Lothian hospitals from 1995-6 and 2000-1 with the 2002-3 targets in the healthcare plan. We calculated staffed bed and admission rates per 1000 resident population for Lothian and other Scottish NHS hospitals for the years 1990-1, 1995-6, and 2000-1. Mean length of stay, occupancy, and throughput were calculated by specialty group for Lothian and other Scottish NHS hospitals. Relative admission rates for acute specialties indicate the percentages by which Lothian rates exceeded or fell below rates in other Scottish NHS hospitals.

## Results

### Comparisons between 1995-6 and 2000-1 for Lothian against healthcare plan targets

**Bed targets**—By 2000-1, 81% (409 of 508) of the reductions in acute beds that Lothian health board planned for by 2002-3 had been achieved (see [bmj.com](http://bmj.com)).

**Inpatient and day case admissions**—The healthcare plan projected an increase of 21% (158 035 to 190 998) in admissions to all acute specialties. By

**Table 1** Staffed bed rates in acute specialties in Lothian Health Board and other Scottish NHS hospitals, 1990-1 to 2000-1, expressed as staffed beds per 1000 resident population

Specialty group	Staffed bed rates* (per 1000 population)						Percentage change			
	1990-1		1995-6		2000-1		1990-1 to 1995-6		1995-6 to 2000-1	
	Lothian	Other	Lothian	Other	Lothian	Other	Lothian	Other	Lothian	Other
All acute	3.1	3.3	2.4	3.0	1.9	2.7	-23	-9.1	-21	-10
Acute medical	1.1	1.1	0.9	1.0	0.76	0.99	-18	-9.1	-16	-1
Acute surgical	1.4	1.7	0.97	1.3	0.74	1.1	-31	-24	-24	-15
Intensive therapy	3.3	3.7	4.4	4.8	4.6	6.3	33	30	4.5	31
Geriatric assessment	0.66	0.49	0.86	0.68	0.84	0.66	30	39	-2.3	-2.9

\*Per 100 000 estimated midyear resident population of Lothian and rest of Scotland.

2000-1 the actual increase was 0.3% (158 035 to 158 495). Inpatient admissions to surgical specialties were projected to rise by 8%; actual admissions fell by 13% (74 894 to 65 141).

*Reduced length of stay*—Despite predictions that length of stay would fall, this happened only in medical specialties and increased in surgical specialties, intensive therapy, and geriatric assessment. The total reduction across all acute specialties was 0.1 days.

*Surgical day cases*—The healthcare plan projected a switch from inpatient to day case surgery. There was a 22% (from 55 to 43) fall in rates of admission for surgical inpatients. Admission rates for surgical day cases fell by 3.3% (from 30 to 29) over the same period.

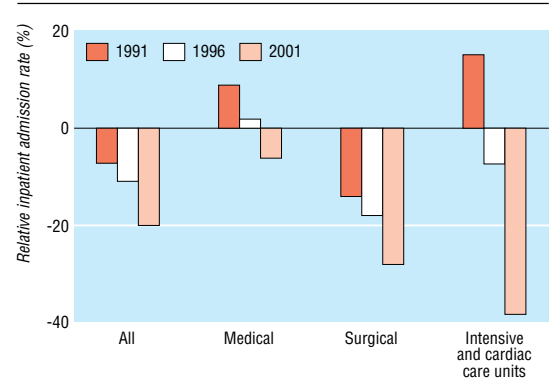
*Community facilities: the planned expansion*—The number of private nursing home beds in Lothian fell by 7% (from 3157 to 2935) compared with a 7% rise (from 18 609 to 19 947) in the rest of Scotland. The number of long stay NHS geriatric beds fell by 45% (from 805 to 441) compared with a 40% reduction (5333 to 3204) in the rest of Scotland. In January 2002, the proportion of delayed discharges in beds in acute and post-acute NHS specialties in Lothian hospitals was significantly higher than the Scottish average (15%; 543/3596 *v* 12%; 3116/25 752; *P* < 0.001).

*New care settings*—The healthcare plan anticipated an expansion in community provision. However, no community treatment centres were opened in Lothian. Acute inpatient care in the private sector in Scotland remains rare (around 70 inpatient beds), and a considerable transfer of elective surgery to this setting is unlikely.

**Clinical activity in 1990-1 and 2000-1 in Lothian compared with rest of Scotland**

*Staffed bed rates*—The number of staffed beds per 1000 resident population in all acute specialties in Lothian hospitals fell at twice the rate seen in other Scottish NHS hospitals. By 2000-1, staffed bed rates in all acute, medical, surgical, and intensive therapy specialties in Lothian hospitals, respectively, were 30% (1.9 *v* 2.7), 23% (0.76 *v* 0.99), 33% (0.74 *v* 1.1), and 27% (4.6 *v* 6.3) below those in the rest of Scotland. Staffed bed rates in geriatric assessment in Lothian fell from 35% (0.66 *v* 0.49) to 27% (0.84 *v* 0.66) above the rest of Scotland (table 1).

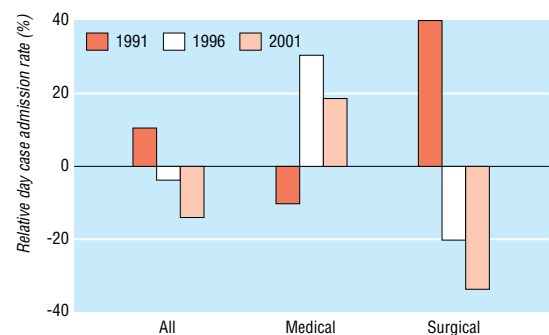
*Inpatient admission rates*—All differences in inpatient and day case admission rates between Lothian and other Scottish NHS hospitals were significant. By 2000-1, inpatient admission rates in all acute, medical, acute surgical, and intensive therapy specialties in Lothian hospitals, respectively, were 20% (105 *v* 131), 6.3% (45 *v* 48), 28% (43 *v* 60), and 38% (3.8 *v* 6.1) below those in other Scottish NHS hospitals (fig 1). (See also [bmj.com](http://bmj.com).)



**Fig 1** Relative inpatient admission rates in acute specialties in Lothian compared with Scottish NHS hospitals in 1990-1, 1995-6, and 2000-1 (Lothian/other Scottish=100)

*Day case admission rates*—Between 1990-1 and 2000-1, day case admission rates in all acute specialties in Scottish NHS hospitals (excluding Lothian hospitals) rose by 152% (31 to 78). Rates in Lothian hospitals rose by 100% (34 to 68) over this period, mainly reflecting a fivefold rise in acute medical specialties. By 2000-1, day case admission rates in Lothian hospitals in all acute and surgical specialties were 13% (68 *v* 78) and 33% (29 *v* 43) below those in other Scottish NHS hospitals (fig 2).

*Trends in performance*—Between 1990-1 and 1995-6, mean length of stay (days) in all acute specialties in Lothian and other Scottish NHS hospitals fell by 22% (7.4 to 5.8) and 13% (7.0 to 6.1) respectively. Between 1995-6 and 2000-1, mean length of stay fell by 1.7% (5.8 to 5.7) and 3.3% (6.1 to 5.9). In surgical and intensive therapy specialties mean length of stay rose by 8.7% (4.6 to 5.0) and 23% (2.6 to 3.2) in Lothian hospitals



**Fig 2** Relative day case admission rates in acute specialties in Lothian compared with Scottish NHS hospitals in 1990-1, 1995-6, and 2000-1 (Lothian/other Scottish=100)

compared with a fall of 3.9% (5.1 to 4.9) and no change (2.7 to 2.7) in the rest of Scotland. Occupancy levels were higher in Lothian than in other Scottish NHS hospitals by 2000-1. Throughput per staffed acute bed in all acute, medical, and surgical specialties rose by 46%, 76%, and 40%, respectively, in Lothian hospitals compared with 30%, 45%, and 34% in the rest of Scotland between 1990-1 and 2000-1 (table 2).

## Discussion

### Planning targets for Lothian's healthcare plan

Our evaluation of the service plans underpinning the planned reductions in acute beds in a major PFI hospital development shows that, while by 2001 most (80%) of the bed closures planned across Lothian had been achieved, the service was unable to accommodate the projected increase in hospital admissions due to severe constraints in capacity.<sup>3 4</sup> By 2000-1 inpatient and day case admissions in all acute specialties rose by only 3% compared with a projected increase of 21% by 2002-3, while admissions to surgical specialties fell by 13% compared with a projected increase of 8%. Capacity constraints that prevented increases in hospital admissions were the result of length of stay remaining static in acute specialties and increasing across surgical, intensive therapy, and geriatric assessment specialties. The increase in length of stay in acute surgical and intensive therapy specialties suggests that sicker patients are being admitted.

The service plans did not result in an expansion of community provision, and long stay geriatric beds and private nursing home beds continued to close over this period. The lack of capacity in the community is evident in the proportion of delayed discharges in Lothian hospitals (mainly in long stay NHS beds), which rose significantly above the Scottish average.

Until the publication of the national beds inquiry for England in 2000, the general consensus was that further NHS bed reductions could be achieved by improvements in performance.<sup>5</sup> It is notable that at no time in the history of the NHS have acute bed closures

approached 30% over a five year period. By the time the national beds inquiry for England had overturned the consensus on bed closures, many of the PFI hospital plans had been signed off and some were in serious financial difficulty.<sup>6</sup>

### Is there a PFI effect?

Ministers and civil servants have been unanimous in stating that bed closures are a result of clinical decision making and are independent of the affordability problems created by PFI.<sup>7</sup> This has been contested by clinicians, who state that bed numbers were determined by the Scottish management executive on the grounds of affordability.<sup>8 9</sup>

Our study provides compelling evidence of an independent PFI effect on hospital downsizing. Further evidence comes from comparing bed numbers in Scottish NHS boards with and without PFI hospital developments. In Lothian and Lanarkshire Health Boards (both associated with PFI hospital projects), acute bed numbers fell by 20% (from 2093 to 1684) and 14% (1357 to 1167) respectively between 1995-6 and 2000-1 compared with 7.8% (11 308 to 10 428) in Scotland's 13 remaining health boards.

### Evidence for financial constraints

The reduction in admission rates in Lothian compared with other Scottish NHS hospitals reflects the difference between severe capacity constraints associated with a large PFI project and moderate pressures for efficiency savings as a result of underfunding in other Scottish Health Boards without PFI projects.

Further direct evidence of financial problems comes from the planning documents for PFI hospitals. The 1996 integrated healthcare plan was strongly influenced by affordability constraints and reduced previous targets for acute beds by almost a quarter (24%; 490 beds). Similar financial constraints resulting in revisions to bed numbers were experienced in planning first wave PFI hospitals in Halifax, Hereford, Worcester, and Norfolk and Norwich.<sup>10</sup> Recently, district auditors have reported on the financial and

**Table 2** Mean stay, occupancy, and throughput in Lothian Health Board and other Scottish NHS hospitals, 1990-1 to 2000-1

Specialty groups	Performance						Percentage change			
	1990-91		1995-96		2000-01		1990-91 to 1995-96		1995-96 to 2000-01	
	Lothian	Other	Lothian	Other	Lothian	Other	Lothian	Other	Lothian	Other
Mean stay (days)*:										
All acute	7.4	7.0	5.8	6.1	5.7	5.9	-22	-13	-1.7	-3.3
Acute medical	8.9	8.8	6.6	7.0	5.5	6.6	-26	-20	-17	-5.7
Acute surgical	5.9	6.1	4.6	5.1	5.0	4.9	-22	-16	8.6	-3.9
Intensive therapy†	2.2	2.6	2.6	2.7	3.2	2.7	18	3.8	23	0
Geriatric assessment	31	35	29	28	31	29	-6.5	-20	6.8	3.5
Occupancy (%)‡:										
All acute†	75	72	77	74	85	79	2.6	2.8	10	6.7
Acute medical‡	84	80	88	83	90	87	4.8	3.8	2.3	4.8
Acute surgical§	69	68	70	70	81	74	1.4	2.9	16	5.7
Intensive therapy†	70	67	69	69	74	71	-1.4	3.0	7.2	2.9
Geriatric assessment	86	88	89	88	94	91	3.4	0	5.6	3.4
Throughput§:										
All acute	37	37	48	45	54	48	30	22	13	6.7
Acute medical	34	33	49	43	60	48	44	30	22	12
Acute surgical	42	41	56	50	59	55	33	22	5.4	10
Intensive therapy†	116	94	96	93	84	96	-17	-1.1	-13	3.2
Geriatric assessment	10	9	11	11	11	11	10	22	0	0

\*Excludes transfers out (except intensive therapy units). †Intensive care and cardiac care units. ‡Occupied bed days as percentage of available bed days. §Admissions per staffed bed per year, excluding transfers out (except intensive therapy units).

### What is already known on this topic

The full business cases for the 15 first wave private finance initiative (PFI) hospitals in England and Scotland projected reductions in acute beds of about 30% in the five years before the opening of the new replacement hospitals

The new PFI Royal Infirmary of Edinburgh, which will fully open in 2003, is the cornerstone of Lothian Health Board's healthcare plan for its acute hospitals

### What this study adds

Service delivery associated with PFI development has been reduced across Lothian compared with other Scottish NHS hospitals

The planning targets and increase in clinical activity in acute specialties in Lothian hospitals had not been achieved by 2000-1

There is evidence of an independent "PFI effect" on hospital downsizing and bed reductions, which in Lothian has resulted in severe capacity constraints across all acute specialties with a need for immediate expansion in acute and community provision

Further hospital and community service downsizing may be required to meet the financial deficit, which is principally due to the high costs of PFI

clinical performance of the new PFI hospitals in North Durham, Halifax, and Worcester, identifying financial deficits and severe capacity pressures on available beds (see [bmj.com](http://bmj.com) for details).<sup>11</sup>

The healthcare plan anticipated that bed closures and the new PFI scheme would generate a 9% (£15m) reduction in real terms in revenue expenditure on acute hospital services, which could be reinvested in other service programmes.<sup>3</sup> As our evaluation has shown, service expansion in the community sector did not occur.

Despite the major downsizing of hospital beds, the Lothian University Hospitals NHS Trust continues to face serious affordability problems. In January 2003, the report of the auditor general for Scotland highlighted a deficit requiring annual current savings of £2.65m over the four year period 2003-7.<sup>12</sup> The financial recovery plan expects that £55m of savings will come from sale of land and estate and further £40m from savings in the redesign of acute and primary care services. But the auditor general notes that the "external auditor however considers there is a risk that the financial plan may not be deliverable and

therefore the potential deficit may exceed the levels projected." Further services may have to close, compounding the severe capacity constraints. Alternatively, Lothian may have to be bailed out at the expense of the rest of the NHS in Scotland.

### Conclusion

Our analysis shows evidence of reduced service delivery across Lothian and its associated PFI development compared with other Scottish NHS hospitals. There is evidence of both an independent "PFI effect" and of a capacity ceiling in acute specialties and a need for further expansion in acute and community provision. New financial evidence suggests that further hospital and community service downsizing, over and above the 24% reduction in beds and associated services, may be required to meet the financial deficit, principally due to the high costs of PFI.

We thank Trevor Jones and Harry Purser (Lothian Health Board) and the information and statistics division, Scotland, for data; and Brian Potter for helpful advice.

Contributors: See [bmj.com](http://bmj.com)

Funding: No funding was received for this article. The Public Health Policy Unit has received grants and contributions towards some evaluations of PFI schemes from the BMA, the NHS Consultants' Association, UNISON, a health authority, and local authorities. The guarantor accepts full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish.

Competing interests: None declared.

- 1 Pollock AM, Dunnigan MG, Gaffney D, Macfarlane A, Majeed FA. What happens when the private sector plans hospital services for the NHS: three case studies under the private finance initiative. *BMJ* 1997;314:1266-71.
- 2 Pollock AM, Dunnigan MG, Gaffney D, Price D, Shaoul J. Planning the "new" NHS: downsizing for the 21st century. *BMJ* 1999;319:179-84.
- 3 Lothian Health Board. *Integrated healthcare plan 1996-2003*. Edinburgh: Lothian Health Board, 1996.
- 4 Lothian Health Board. *Integrated healthcare plan 1996-2003. Review of projected 2002-03 projected acute bed numbers, inpatient discharges, and inpatient and day case discharges*. Edinburgh: Lothian Health Board, 1999 (updated 2000).
- 5 Department of Health. *Shaping the future NHS: long term planning for hospitals and related services. Consultation document on the findings of the national beds inquiry*. London: Department of Health, 2000.
- 6 Pollock AM, Dunnigan M. Beds in the NHS: the national beds inquiry exposes a contradiction at the heart of government health policy. *BMJ* 2000;320:461-2.
- 7 Coates P. Don't shoot the messenger. *Public Finance* 2000 August 25:16-9.
- 8 Rhind G. [Letter.] *Herald* 1999 February 23.
- 9 Dunnigan MG. Private finance. Bed numbers were imposed. *Herald* 1999 March 1.
- 10 Smith CA. *Making sense of the private finance initiative*. Abingdon: Radcliffe Medical Press, 1999:140.
- 11 *Inpatient waiting list and outpatient waiting times report*. Durham: County Durham and Darlington NHS Health Authority, October 2001.
- 12 Auditor General for Scotland. *Overview of the NHS in Scotland*. Edinburgh: Audit Scotland, 2003. [www.audit-scotland.gov.uk/publications/pdf/03or01ag.pdf](http://www.audit-scotland.gov.uk/publications/pdf/03or01ag.pdf) (accessed 11 Apr 2003). (Accepted 21 March 2003)

### Submitting articles to the *BMJ*

We are now inviting all authors who want to submit a paper to the *BMJ* to do so via the web (<http://submit.bmj.com>).

BenchPress is a website where authors deposit their manuscripts and editors go to read them and record their decisions. Reviewers' details are also held on the system, and when asked to review a paper reviewers will be invited to access the site to see the relevant paper. The system is secure, protected by passwords, so that authors see only their own papers and reviewers see only those they are meant to.

Anyone with an internet connection and a web browser can use the system.

The system provides all our guidance and forms and allows authors to suggest reviewers for their paper. Authors get an immediate acknowledgement that their submission has been received, and they can watch the progress of their manuscript. The record of their submission, including editors' and reviewers' reports, remains on the system for future reference.

The system itself offers extensive help, and the *BMJ*'s editorial office will help authors and reviewers if they get stuck.

BenchPress is accessed via <http://submit.bmj.com> or via a link from [bmj.com](http://bmj.com)