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Fernandez, Jose-Luis; Forder, Julien

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Editorial Office, Dept of Economics, Warwick University, Coventry CV4 7AL, UK

Consequences of Local Variations in Social Care on the Performance of the Acute Health Care Sector

Summary: The paper uses two-years worth of data from 150 English local authorities to quantify the extent to which local variations in social care resources are associated with variations in performance in the acute sector, and particularly on the rates of hospital delayed discharges and hospital emergency readmissions. Results indicate social care services play a significant role in explaining local variations in acute sector performance.

Keywords: Performance; Social Care; Acute Hospital Care.

INTRODUCTION

Significant policy attention has been placed in recent times on the efficiency implications for the acute health care sector of shortages in social care resources, particularly in relation to the so-called 'bed-blockers' (Victor et al., 2000, Mountain and Pighills, 2003, Glasby and Lester, 2004). These (predominantly older) patients, although ready for discharge from hospital following acute treatment, find themselves unable to cope unassisted in the community, thus trapped in a hospital awaiting the availability of a community care package or a residential or nursing home placement.

Out of such concerns, the U.K. Secretary of State for Health announced on 30 September 1998 the establishment of a National Beds Inquiry (NBI), whose aim was to 'review assumptions about growth in the volume of general and acute hospital services and their implications for health services and hospital bed numbers looking 10 to 20 years ahead'. The English Department of Health believed that the long-term decline in hospital capacity had gone too far, so that hospitals were now ill prepared for dealing with increasing waiting lists and the recurrent winter pressures on emergency beds. At the same time, it was of the opinion that significant inappropriate and avoidable use of hospital resources was going on. Similar concerns have been widely raised internationally (Rosko, 2001, Vetter, 2003, Epstein et al., 2001, Falcone et al., 1991).

In their report (Department of Health, 2000b), the NBI stressed how hospital services should be considered within a wider context, including other parts of health and social care systems such as primary, community, rehabilitative and long-term care. In particular, the report collected circumstantial evidence for England suggesting that the need for hospital services and beds was influenced by the availability of these other services, which 'can help prevent the need for acute interventions, can enable safe discharge to community or home-based care and can act as either substitutes for or complements to hospital services'.

The NHS plan (Department of Health, 2000a) announced a very significant expansion of intermediate care services, pledging a £900 million investment on community-based health and social care services by 2003/2004. Such funds were in addition to the £200 million already allocated to Health Act schemes promoting partnership working (Department of Health, 1999). Through these services, the British government expected among other things to be able to achieve a significant reduction in the average rate of delay discharge from hospital for people aged 75 and over (Department of Health, 2001b).

Delayed discharge or 'excessive' length of stay is often regarded as an inefficiency in health and social care systems. Caring for patients in need of general social support but that no longer require acute treatment in hospital is much more expensive than doing so in the community, in residential care or in nursing care homes (whereas the cost per day of a hospital bed is around £200 (Netten and Curtis, 2000), the average daily price of residential and nursing home placements is around £40). Although 'delayed discharges' have been a more or less a continuous feature in England since the inception of the NHS, they received particular attention around the time of the NHS Plan in 2000. Statistics in 2000 suggested that around 12% of acute beds for people aged 75 and over were occupied by patients awaiting to be discharged.

Reducing the numbers of delayed discharges could therefore lead to a significant boost in capacity for the acute sector. Doing so was particularly important amid widespread concerns about waiting lists and insufficient throughput (Department of Health, 2000a).

Social care services (or rather, the lack of) was seen as a key explanation at the time, with the official statistics identifying delays 'caused' by the social care system in a number of ways. For example in 2000 the main reasons linked to delays were a lack of assessment for community care (22%), no SSD funding (14%), and the unavailability of social care packages following hospital discharge (36%) (Department of Health, 2001a).

Within the context outlined above, the paper investigates the relationship between local variations in social care services and three key indicators of acute health system performance, the rates of hospital delayed discharges for patients over 75 years old, of emergency readmissions following an acute episode and of hospital throughput (finished consultant episodes). The analysis is primarily concerned with estimating the strength and significance of the relationship between provision of social care services and health care performance. However, it also presents estimates of the structural relationships between rates of delayed discharges, emergency readmissions, average length of stays and hospital throughputs, with the particular aim to test whether improvements with respect to delayed discharges are at the expense of deteriorations in other dimensions of performance.

The reminder of the paper is organised as follows. A first section presents the analytical framework underpinning the analysis. Section two introduces the data and empirical methods used in the estimation of the models. The following two sections present respectively the results of the estimations and a discussion of their implications for policy.

ANALYTICAL FRAMEWORK

Conceptually, the utility and constraint functions for key stakeholders in the health and social care system – including service users and their families – are resolved together to produce, relevant to our analysis, a set of realised demands for health and social care services.

The exact processes that lead to deployment of hospital resources in the form of acute beds and health workforce are complex and multi-dimensional. An equivalent situation applies in the social care system. What is relevant to the current analysis is the administrative, professional and financial separation between the acute health sector and the long-term or social care sector. This feature is common in many countries, not just England (Johri et al., 2003b). As a result, the processes that lead to service demands in the health sector make little account, when reaching these service decisions, of the preferences and resource constraints in the social care sector, and vice versa. In simple analytical terms two maximisation problems can be summarised by:

(1) $$x^S\left(\delta^S, w, B^S\right) = \arg\max\left(U^S\left(x^S, \delta^S\right), G^S\left(\delta^S, x^S, w, B^S\right)\right)$$

and

(2) $$x^H\left(\delta^H, w, B^H\right) = \arg\max\left(U^H\left(x^H, \delta^H\right), G^H\left(\delta^H, x^H, w, B^H\right)\right)$$

where superscripts H and S denote health (secondary) and social care stakeholders respectively. In each case U is the preference/utility function of decision makers, G is a set of constraints they face. The x's are vectors of services (e.g. hospital beds, home care services etc). Furthermore, δ indicates need, B is service budgets and w indicates price levels of factors of production. These determinants are consistent with hospital and social care models developed in the literature (Oliveira, 2004, Forder and Netten, 2000, Forder, 2000, Fernandez et al., 2007). The service decisions in (1) i.e. $x^j\left(\delta^j, w, B^j, x^{-j}\right)$ might take a range of functional forms depending on the nature of the decision-making processes in use. Nonetheless, we might expect the usual signs. Prices are expected to have a negative relationship with demand: $\partial x^j / \partial w < 0$, and budgets should be positively related: $\partial x^j / \partial B^j > 0$.

The functions in (1) do not embed the preferences and constraints of decision makers in the other sector (either health or social care). As such, we would not systematically expect demands in (1) to coincide with those made in a joint or co-operative decision making process, such as: $\left\{x^{H*}, x^{S*}\right\} = \arg\max\left(U^H, U^S, G^H, G^S\right)$. Nonetheless, there is a *technical* inter-relationship between the health and social care systems (Johri et al., 2003a) and therefore we hypothesise that decisions in one sector will affect *outcomes* in the other, regardless of whether these effects are explicitly accounted for or not.

Rates of delayed discharge will depend on the level of provision of social care services, x^S, because, ceteris paribus, variations in care patterns affect the chances that people requiring a discharge to a care home or to their own home with a community care service package receive support promptly. In particular, rates of delay will depend on the interplay of demand for and supply of social care packages. Demand is generated where people in hospital need to be discharged with a social care package (and also when people are referred from the community). Suppose that the number of people to be discharged in any given day *t* is *n*. On average, with no delays, discharges are equal to available beds (*b*) divided by mean length of (non-delayed) stay (m^N):

(3) $$n = \frac{b}{m^N}$$

With excess demand for hospital care, available beds per day are equivalent to capacity: i.e. $b \equiv x^H$. This also means that any increase in beds/capacity will allow more activity and so a higher level of discharge. In the short run, given hospital beds, (non-delayed) average length of stay will reflect the need and characteristics of the patient population. We might also assume that local clinical practice will have a bearing on length of stay (which will be denoted by the parameter, λ). Hence:

(4) $$m^N = m^N(\delta, \lambda)$$

Non-delayed length of stay is therefore exogenous to the system.

Only a proportion, σ, of all discharges per day will be to social care; some people will be discharged home without social care support. For example, with no delays:

(5) $$\sigma(\delta, \lambda(x^S))n = \sigma \frac{b}{m^N}$$

This proportion will depend on need and also local clinical judgements. These judgements could be influenced by the availability of social care placements as discussed further below.

The demand for discharges to social care will also depend on the numbers of people already delayed in two ways. First, current demand for discharges to social care will be increased by the numbers of people who were not able to be discharged previously. Second, because these people have remained in beds, this has limited the numbers of people who could currently receive treatment. A simple dynamic model illustrates these effects. For any given day *t*, the numbers of people delayed is dependent on current new discharge demand and previous day's numbers delayed:

$$\Omega_t = [\pi\Omega_{t-1} + \sigma n_t] - \mu x^S = \left[\pi\Omega_{t-1} + \sigma\frac{b}{m^N} - \sigma\frac{1}{m^N}\Omega_{t-1}\right] - \mu x^S = \left[\left(\pi - \sigma\frac{1}{m^N}\right)\Omega_{t-1} + \sigma\frac{b}{m^N}\right] - \mu x^S \quad (6)$$

Where Ω_t is current numbers delayed and Ω_{t-1} is the previous day's number delayed. This simple formulation[1] assumes that 'available' beds for new episodes are reduced by the number of people delayed and occupying beds, as carried over from the previous day i.e. $n_t = \frac{b - \Omega_{t-1}}{m^N}$. For exposition, other parameters and services are

[1] This function is an approximation for what could be a very complicated dynamic process that would depend on how beds were allocated, rates of crowd out of treatment episodes by people delayed in beds, demand for hospital services and so on.

assumed to be invariant through time. The terms in square brackets are the demand for discharges to social care. The parameter $\pi \in [0,1)$ reflects that some people delayed in hospital will die during that period – it indicates the proportion of people that do not die, and in practice will be close to 1 since the time period *t* is just one day. The parameter μ is the proportion of social care places that are available that day to take people discharged from hospital. Intuitively, since only a fraction, $\sigma < \pi$, of people newly completing treatment and being discharged will need social care, but all those delayed will need social care by definition, any delay carried over will increase demand for social care discharge on any given day i.e. $1 > \pi - \sigma \frac{1}{m^N} > 0$ in (6).

The function in (6) is recursive and can be solved by backwards substitution:

(7)
$$\begin{aligned}\Omega_t &= \left(\pi - \sigma \frac{1}{m^N}\right)^T (\Omega_{t-T}) + \left(\pi - \sigma \frac{1}{m^N}\right)^T \left(\sigma \frac{b}{m^N} - \mu x^S\right) \\ &+ \left(\pi - \sigma \frac{1}{m^N}\right)^{T-1} \left(\sigma \frac{b}{m^N} - \mu x^S\right) + \ldots + \left(\pi - \sigma \frac{1}{m^N}\right)^0 \left(\sigma \frac{b}{m^N} - \mu x^S\right) . \\ &= \left(\sigma \frac{b}{m^N} - \mu x^S\right) \sum_{t=0}^{T} \left(\pi - \sigma \frac{1}{m^N}\right)^t\end{aligned}$$

where at some point the number of peopled delayed at time *t* – *T* is zero. This function can be expressed as a rate, τ, by dividing through by the numbers of beds i.e. $\tau = \Omega_t / b$. In general form, the rate of delay, as a counterpart to (7), is:

(8) $$\tau = \tau(\delta, x^S, b, \lambda)$$

or using the specific form in (7),

(9) $$\tau = \frac{1}{b}\left(\sigma \frac{b}{m^N} - \mu x^S\right)\sum_{t=0}^{T}\left(\pi - \sigma \frac{1}{m^N}\right)^t$$

The differential with respect to b is $\frac{\partial \tau}{\partial b} = \frac{1}{b^2}\left(\frac{\partial \Omega_t}{\partial b} b - \Omega_t\right)$. Using (7) indicates that $\frac{\partial \tau}{\partial b} > 0$. As the capacity (and so realised activity) to treat in the hospital increases so, relative to unchanged social care supply, this increase in demand for discharge to social care will push up the delay rate.

As noted above, if local clinical decisions about when and where to discharge are not at all influenced by the supply of social care places (i.e. $\sigma_{x^s} = 0$) then it is clear that $\partial \tau / \partial x^s < 0$ other things equal (i.e. given 'demand'). An increase in social care, means a greater number of available places. However, if there is an influence, as modelled through the parameter $\sigma(\delta, x^S)$, such that $\frac{\partial \sigma}{\partial x^S} > 0$, then:

(10) $$\begin{aligned} \frac{\partial \tau}{\partial x^S} &= \frac{1}{b}\frac{\partial \Omega_t}{\partial x^S} \\ &= \frac{1}{b}\left[\left(\sigma_{x^S}\frac{b}{m^N} - \mu\right)\sum_{t=0}^{T}\left(\pi - \sigma\frac{1}{m^N}\right)^t - \left(\sigma\frac{b}{m^N} - \mu x^S\right)\sigma_{x^s}\sum_{t=0}^{T}(t+1)\left(\pi - \sigma\frac{1}{m^N}\right)^t\right] \end{aligned}$$

which has an indeterminate sign because the sign of $\left(\sigma_{x^S}\frac{b}{m^N} - \mu\right)$ is unknown. Nonetheless it would be clearly counter-intuitive to expect clinicians to reduce their intended discharges to social care by more than the change in social care availability.

The function (4) was for average length of stay without any delay period. Adding the average delay period gives a *total* average length of stay of:

(11) $$m = m(\delta, \lambda, \tau)$$

Without-delay length of stay, m^N, is a fixed variable in the above system, being a function only of parameters. However, m above is a function of delay rates and therefore will be affected by choices about social care capacity. Actual discharge per day will be:

(12) $$\eta_t = n_t - \Omega_t(x^S) = \left(\frac{b}{m^N} - \left(\sigma \frac{b}{m^N} - \mu x^S \right) \sum_{t=0}^{T} \left(\pi - \sigma \frac{1}{m^N} \right)^t \right)$$

Other things equal, a number of discharges from hospital will be unsuccessful and will result in a re-admission, possibly an emergency re-admission. The number of re-admissions e is assumed to be a function of numbers of people (for a given time period) *actually* discharged, differentiating between people with and without social care support. After accounting for levels of need (i.e. of need of the hospital population, δ^H) or other relevant health characteristics, the level of support post-discharge will also be important. People with high levels of social care support, given their needs/health status, will have the lowest chance of re-admission. People with low levels of services will have a higher chance. Those discharged without support will have the highest chance.

In general form, the numbers of re-admissions for a given period[2] will be:

(13) $$e = e\left(n(b), \Omega_t, \sigma, \delta^H, x^S\right)$$

that is, a function of numbers of people actually discharged (demand for discharges less delayed people), the proportion of people discharged with and without social care support, the needs/health status of people discharged and the supply of social care. Again, there is a range of possible specific functional forms. A simple model is:

(14) $$e = \phi^1\left(x^S, \delta^H, m\right)\sigma\left(x^S, \delta^H\right)\left(n - \Omega_t\left(x^S\right)\right) + \phi^2\left(\delta^H, m^N\right)\left(1 - \sigma\left(x^S, \delta^H\right)\right)\left(n - \Omega_t\left(x^S\right)\right)$$

where ϕ^1 and ϕ^2 are the proportions of discharges to social care and home respectively that will result in a re-admission. Moreover, ϕ^1 is a function of the intensity of social care received on average, which for given numbers of discharges is a function of total social care supply. It is also a function of total length of stay, assuming that on average people that remain in hospital longer are healthier at discharge. For those discharged directly home, this length of stay effect also applies, but in that case total length of stay is equal to non-delayed length of stay.

[2] Re-admissions have a defining period. People who return to hospital after this period (e.g. 7 days, 28 days) are counted as new admissions and so current period re-admissions do not depend on people discharged previously outside this period. Strictly, the numbers in (13) and similar equations will be the sum over each day up to the relevant period. However, this is summation notation is suppressed in what follows for clarity.

This number can be expressed as a *rate* of re-admission by dividing (13) or (14) through by the number of actual discharges:

$$(15) \qquad \varepsilon = \varepsilon\left(m, \delta, x^S, \lambda\right)$$

The net effect of social care services on re-admission will be mixed. Other things equal more social care reduces delays and so improves actual discharges. In turn this means a higher number of re-admissions. However, improvements in the average level of social care per discharge and a greater likelihood for people to be (actually) discharged with a social care package rather than no support, following an increase in social care capacity, will reduce re-admission rates. These later improvements respectively are captured as $\phi^1_{x^S}$ and $\sigma_{x^S} > 0$. The effects of social care capacity on ϕ^1 are not clear cut, however. More social care provision means better support post discharge, but also, with less people delayed, a reduction in average total length of stay, and consequently a slightly higher risk of re-admission following discharge: $\phi^1_{x^S} = \phi^1_{x^S}\Big|_m + \dfrac{\partial \phi^1}{\partial m}\dfrac{\partial m}{\partial x^S}$. In theory, since any delay period is for non-clinical reasons, the impact of this delay on a person's health should be small (i.e. $\phi^1_m \to 0)$. As such we would expect $\phi^1_{x^S} < 0$.

$$(16) \qquad \frac{\partial e}{\partial x^S} = \left(\phi^1 - \phi^2\right)\left[-\Omega_{x^S}\sigma + \left(n - \Omega_t\right)\sigma_{x^S}\right] + \phi^1_{x^S}\sigma\left(n - \Omega_t\right) - \phi^2\Omega_{x^S}$$

Given that $\partial\Omega_t / \partial x^S < 0$ as described above – e.g. see (7) – and that by assumption $\phi^1_{x^S} < 0$ and $\sigma_{x^S} > 0$, the first and second terms in (16) are negative, but the last is positive. The overall effect will hinge greatly on how improvements in social care capacity improves average levels of support. Otherwise, if people are delayed in hospital they have no chance of counting as a re-admission. By contrast when this problem is cast in terms of re-admission *rates per actual discharge*, the later effect of social care on improving actual discharges is removed. The rates function is then,

$$(17) \qquad \varepsilon = \phi^1\left(x^S, \delta^H, m\right)\sigma\left(x^S, \delta^H\right) + \phi^2\left(\delta^H, m^N\right)\left(1 - \sigma\left(x^S, \delta^H\right)\right)$$

and without the effect of social care pushing up actual discharges, the net effect on the rate of re-admission is negative.

$$(18) \qquad \frac{\partial \varepsilon}{\partial x^S} = \left(\phi^1 - \phi^2\right)\sigma_{x^S} + \sigma\phi^1_{x^S} < 0$$

Figure 1 summarises the theoretical system outlined above. Choices in Figure 1 about the respective levels of health and social care service levels are based on the underlying preferences in U^j, which in turn are reflected in the set of performance indicators discussed above i.e. delayed discharge rates, re-admission rates, discharge/activity rates – or for shorthand: I where $\{n, \tau, \varepsilon\} \subseteq I$ – and resources G^j.

There are efficiency implications associated with the inter-play of health and social care on system outcomes. Reducing delayed discharge specifically benefits people delayed. However, it also has wider system effects. Patients awaiting treatment are likely to quickly take up any spare capacity gained from improved patient transition. As a result, average lengths of stays are likely to decrease and hospital throughputs to increase. However, improving delayed discharge rates may also be at the expense of deteriorations in other system outcomes, and in particular in terms of higher readmission rates. Overall, the effect of social care services on the number of extra patients treated by the acute sector will constitute the net effect of increases in throughput due to the reduction in hospital lengths of stay (because of reductions in delayed discharges), minus the detrimental effect of shorter lengths of stay on rates of emergency readmission.

Empirical specifications

The theoretical model above provides a set of structural equations for estimation, as outlined in what follows. In general, since we do not know *a priori* the exact form of these structural equations, each can be approximated by polynomials in empirical equations.

Social care provision is given by (1) and is a function only of parameters in the system i.e. population need/health status, input prices and social care budget. In stochastic form:

$$(19) \qquad x^S = x^S\left(\delta, w, B^S; \beta^{x^S}\right) + u^{x^S}$$

The structural equation for delayed discharge rate is either (8) in general or (9) in specific form. The stochastic counterpart for estimation is:

$$(20) \qquad \tau = \tau\left(\delta, x^S, b, \lambda; \beta^{\tau}\right) + u^{\tau}$$

This might take a simple linear function form:

(21) $\tau = \beta_0^\tau + \beta_1^\tau \delta + \beta_2^\tau x^S + \beta_3^\tau b + \beta_4^\tau \lambda + u^\tau$

With reference to (9), $\dfrac{\partial \tau}{\partial b} = \beta_3^\tau = \dfrac{\mu x^S \Sigma}{b^2}$ where $\Sigma = \sum_{t=0}^{T} \left(\pi - \sigma \dfrac{1}{m^N} \right)^t$ is a constant. Also, $\dfrac{\partial \tau}{\partial x^S} = \beta_2^\tau = -\dfrac{\mu \Sigma}{b}$ (assuming $\sigma_{x^S} = 0$, or as in (10) otherwise).

The empirical counterpart to (15) or (17) is:

(22) $\varepsilon = \varepsilon\left(\delta, m, x^S; \beta^\varepsilon\right) + u^\varepsilon$

Again, this might be expressed as a linear approximation:

(23) $\varepsilon = \beta_0^\varepsilon + \beta_1^\varepsilon \delta + \beta_2^\varepsilon m + \beta_3^\varepsilon x^S + u^\varepsilon$

where $\dfrac{\partial \varepsilon}{\partial x^S} = \beta_3^\varepsilon$ is given by (18) above. Also, $\dfrac{\partial \varepsilon}{\partial m} = \beta_2^\varepsilon = \phi_m^1 \sigma + \phi_m^2 (1 - \sigma)$ using (17).

The final structural equation to be estimated is:

(24) $m = m\left(\delta, \lambda, \tau; \beta^m\right) + u^m$

the linear version of which is:

(25) $m = \beta_0^m + \beta_1^m \delta + \beta_2^m \tau + \beta_3^m \lambda + u^m$

The estimated parameter of interest in this case is β_2^m, which is expected to be positively signed (by definition: increased delayed means higher average total length of stay).

The main empirical hypotheses to be tested below are:

H1: $\frac{\partial \tau}{\partial x^S} = \beta_2^\tau < 0$

H2: $\frac{\partial \varepsilon}{\partial x^S} = \beta_3^\varepsilon < 0$

H3: $\frac{\partial x^S}{\partial w} = \beta_w^S < 0$

We can also estimate partial reduced form equations, by substituting for x^S using (1) i.e.

(26) $\tau = \tau^R(\delta, B, w, b, \lambda; \beta^{\tau R}) + u^{\tau R}$

(27) $\varepsilon = \varepsilon^R(\delta, m, B, w; \beta^{\varepsilon R}) + u^{\varepsilon R}$

Also, using (12), actual discharges are:

(28) $\eta = \eta^R(\delta, B, w, \lambda, b; \beta^{\eta R}) + u^{\eta R}$

With the main hypothesis investigated being:

H4: $\{\beta_B^{\tau R} < 0; \beta_w^{\tau R} > 0\}$

H5: $\{\beta_B^{\varepsilon R} < 0; \beta_w^{\varepsilon R} > 0\}$

H6: $\{\beta_B^{\eta R} > 0; \beta_w^{\eta R} < 0\}$

Both reduced-form and structural equations are fitted below. The reduced form models are for the three key variables in the analysis, delayed discharge rates, emergency readmission rates, and finished consultant episodes. These attempt to map the relationship between aggregate resources, input costs and the three dependent variables.

The paper then explores in greater detail the effect of health and social care services on delayed discharge and emergency readmission rates, and the interrelation between them and average length of stays in hospital and finished consultant episodes.

DATA AND EMPIRICAL METHODS

Data sources

Given the focus of the paper, the analysis has been undertaken at the local authority level. Two years of data for the 150 local authorities in England formed the basis of the dataset: 1998/9 and 1999/00. These data were complemented with data from the 99 health authorities in England. Where health and local authorities are not coterminous health level data were allocated to local authority area on an elderly population basis (in 26 cases). Table 1 provides details of the sources of the data. Whenever possible and appropriate, indicators were standardised by population over 65. Due to their widely recognised uncharacteristic nature, City of London and Isles of Scilly were dropped from the dataset. A further four observations (corresponding to Hertfordshire and Rutland) were excluded from the analysis due to the poor quality of the data.

Social care indicators

The analysis employed two indicators of residential/nursing care activity, the number of LA supported nursing home beds per individual over 65 years old, and the number of residential places per individual over 65. The level of home care activity was measured as the number of hours of home care supported by the LA per individual over 65 years old. In addition, the reduced form models used as the indicator of LA social care budget the gross expenditure per individual over 65 years of age.

Insert table 1 here

Delayed discharge indicator

The indicator of delayed discharges was defined as the proportion of people over 75 occupying acute hospital beds on a given survey day that were professionally classified as eligible for discharge conditional on receiving support services but where these services were unavailable (this indicator was not available for over 65 year olds). The source of these data was NHS Performance reports (NHS Executive, 2000).

Emergency readmissions

The indicator of emergency readmission was defined as the age and gender standardised rate of emergency readmissions to hospital within 28 days of discharge, as a percentage of live discharges, for all types of hospital discharges. The source of the indicator was the PAF reports (Common Information Core). Contrarily to other dependent variables in the analysis, the indicator of emergency readmissions was only available as a proportion of all discharges, including individuals less than 65 years old.

Discharges – Finished consultant episodes

The total number of in-patient episodes finished during one year (irrespective of diagnosis or treatment, but excluding mothers giving birth in hospital and babies delivered in hospital) is a proxy of discharges. In practice, FCEs are higher than discharges because some patients have new treatment episodes with different consultants during a single hospital stay. However, this should in no way affect the expected relationships with social care capacity and other factors. Source: Hospital Episode Statistics data. For modelling purposes, this indicator was standardised by population over 65 years of age.

Average length of stays

Average length of stays were defined as the number of beds days (from Hospital Episode Statistics data) in one year divided by the number of finished consultant episodes.

Empirical methods

The paper addresses two main questions. First, to what extent do variations in local social care resources explain variations in two measures of acute health care system performance, hospital delay discharge rates and rates of emergency readmissions? Second, what are the main interrelationships between social care services, delay discharge rates, rates of emergency readmissions, average lengths of hospital stay and overall hospital throughputs? As indicated above, the two sets of questions are modelled empirically in terms of reduced form and structural form models, respectively.

Since persons discharged from hospital are a key source of demand for residential and home care social services there is a possibility of circularity or ‘endogeneity’ in assessing how delayed discharge might be affected by changes in service levels. As a result, instrumental variables regression techniques were employed to estimate the relationships postulated in the structural model.

Using 3SLS allowed the model to take into account the structure of the coefficients of all equations as well as the likely correlation between the error terms of the different equations in the system, and so to maximise efficiency in the estimation of the parameters in the model. In addition, 3SLS models allow maximum transparency in the specification of the set of structural relationships postulated, in that they explicitly state jointly the complete set of equations. However, as is noted in (Wooldridge, 2002, p.199), for the estimates of 3SLS models to be unbiased it is necessary that $E\left(z_k^{'}u_k\right)=0$, where z_k and u_k denote respectively the vector of exogenous indicators and error terms in each of equation k in the system being estimated. That is, it is necessary for all equations in the system to be properly specified, as misspecification in one equation would propagate to the rest of the system. Given the lack of easily implementable specification tests for 3SLS models, the analysis was also carried out using 2SLS estimates, potentially less efficient but more robust than those based on 3SLS methods. Tests were then used to verify the validity of the instruments used for controlling the potential endogeneity of social care resources.

Since health care services are determined on a bureaucratic basis they were not expected to be endogenous and tests supported this hypothesis. The reduced-form model estimates relationships between delayed discharges and readmission rates and the instrumental variables only (i.e. no service levels). It does not as a consequence suffer from endogeneity problems. Fixed time effects were included in all models estimated.

Include Table 2 here

Table 2 reports descriptive statistics of the endogenous variables in the analysis. The discharge rate indicator was somewhat skewed and leptokurtic (Skewness 1.86, Kurtosis 8.64), but since this was not extreme and not materially improved by logging anyway, a linear functional form was chosen for the reduced form model estimation.

The sample sizes of the final regressions are the same as those indicated in the above table. For one variable – district nurse whole-time-equivalents – 4 LAs had missing data (7 cases in the pooled dataset) and these were replaced using the sample mean or imputed from values of neighbouring years.

Whereas the sets of relationships to be estimated was derived from the theoretical framework discussed above, it was not possible for the analysis to specify strong a priori hypotheses as to the precise nature of the functional relationship between the indicators in the models. Thus, second order effects were tested for during the modelling process, and included if they provided a better fit of the model.

RESULTS

All the regression models reported below were significant overall. Individual coefficients that are statistically significant at the 90%, 95% and 99% confidence level are marked with one, two and three asterisks respectively. All regressions satisfied diagnostics relating to specification. Against the possibility of heteroscedasticity, robust standard errors were estimated. Tests for endogeneity, where appropriate, were also undertaken and these were all consistent with the specifications estimated.

Insert Tables 3 to 5 here

Reduced form models

Delayed discharge rates

Table 3 reports the results of the reduced form estimation of delay discharge rates. Unsurprisingly given their close link with levels of demand for hospital services and therefore hospital discharges, higher standardised mortality rates (SMR) are associated with higher rates of delay. Even though it remains positive over the range observed of the indicator, the nature of the effect described in the model suggests the net effect of marginal increases to fall with SMR levels.

Higher numbers of hospital beds are linked to higher delay rates. Other things equal, increases in the number of hospital beds should lead to increases in the number of hospital discharges. Demand for health care is exogenous but assumed to be in excess of hospital capacity/beds, as indicated by the significant waiting lists for hospital services (National Audit Office, 2001). Therefore any increase in beds will increase discharges until excess demand is reduced to zero – see also (12). Within a given level of social and community health services this means more people likely to be delayed.

The analysis corroborates the hypothesis held by the National Beds Inquiry that social care resources affect delayed discharge rates very significantly. Hence, 'richer' social care departments appear to enjoy lower levels of delays. However, the levels of social care services purchased are dependent, among other things, on the input prices faced by the providers of the services. As a result, increases in input prices (as indicated by property prices and average gross weekly earnings) are found to worsen delay rates. Other things being equal, higher input prices imply higher production costs, thus higher production prices and ultimately lower service demand. The length of the chain of this argument testifies to the strength of this effect.

Holding constant hospital capacity, increases in the revenue of the health care sector are also found to reduce significantly the observed rates of delay, with an elasticity of 1.45, about twice that of social care budgets. However, when translated into monetary terms (reduction in delayed discharge rates per extra pound of budget spent), this effect was several times weaker than that of social care budgets.

Emergency readmission rates

The results in Table 4 for emergency readmissions almost mirror those found for delayed discharge rates. Again, the level of health and social care resources appear to play a beneficial effect on emergency readmissions, and prices of inputs (and in particular house prices) appear associated with worse performance.

In addition, two local need-related indicators, the proportion of individuals in the LA receiving income support and the proportion of the population with a limiting long-standing illness, appear to increase significantly readmission rates.

Finished consultant episodes

As in the previous two models, social care support is identified as having a positive effect on hospital throughput (see Table 5). Such a finding is not surprising, however, and is related to the impact of social care services in reducing delayed discharges and therefore on the impact of social care inputs on freeing-up beds for further treatment (Fernández and Forder 2002). Indeed, the period to which the data relate was characterised by high levels of delayed discharges, with about 12 per cent of acute beds in England being occupied by patients fit for discharge but lacking appropriate support in the community.

Not surprisingly, hospital capacity appears to have a very significant effect in explaining levels of hospital throughput. In addition, indicators of need (gender and standardised mortality rates) also explain variations in the levels of acute care activity, as do supply side factors (indicated by house prices).

Structural model

The results of the structural model, summarised in Tables 6 and 7, corroborate the findings from the reduced-form estimations. During estimation, they proved to be robust to changes in specification (particularly instruments).

Include Table 6 here

Three-stage-least squares model

All the signs and significances of the factors predicting levels of social care services conform with prior expectations (see Table 6). This is significant because such equations constitute the basis for the 'instrumentation' of the otherwise endogenous indicators of social care resources. Hence, social care services are found to increase with local levels of need, social care budgets and to decrease with local price levels, and levels of other social care services. In addition, LAs belonging to the 'coast and country resorts' and 'ports and industry' ONS classifications were found to provide higher than average levels of residential and nursing home beds respectively.

The provision institution-based social care (of both residential and nursing inputs) is found to reduce very significantly delayed discharge rates and emergency readmission rates. The effect of home care inputs is weaker. Whereas the effect of community care support is borderline significant at the 10% level for the readmissions rates model, increases in community care support were not associated with significant reductions in delayed discharges. However, exploratory analysis suggested that when the indicator was replaced with a measure of intensive home care support (proportion of households receiving more than 10 hours per week of home care support) the effect becomes borderline significant. This variation was not introduced in the final model for reasons of parsimony (with respect to an already intricate system of equations).

In addition to social care support, district nursing services are also found associated with reductions in the two rates.

The results indicate a significant effect of social care services on inpatient care activity, through the impact on mean lengths of stay of delayed discharges and readmission rates and increase finished consultant episodes. Although with relatively low elasticities, these effects are of policy significance, particularly given the fact that the social care indicators in the analysis refer to overall service levels, a majority of which is not allocated to inpatient care cases.

The four indicators of inpatient care activity included in the analysis show strong correlations compatible with the theoretical specifications of the analysis. Average lengths of stay increase with delayed discharges, and affect readmission rates and the number of finished consultant episodes.

Two-stage-least squares model

The results from the two-stage-least squares specification are highly compatible with those of the 3SLS model. The nature of the interaction between the acute health care activity indicators follows the theoretical specification, with average lengths of stay negatively correlated with emergency readmission rates, and delayed discharge rates positively associated with average length of stay, and thus negatively associated with potential hospital throughputs.

Tests confirm the endogeneity of the social care input indicators, and the appropriateness of the specification of their instruments. As in the 3SLS results, the home care effect on acute care performance appears to be less significant than that of the two indicators of institutional care inputs. This finding is likely to be linked first to differences in the level of support provided by the two types of care, and secondly to the fact that institutional care services are targeted on the most dependent cases, and thus on those with the greatest risk of hospitalisation.

Insert table 7 here

Table 8 reports the estimated elasticities of the key effects of the structural model. It corroborates the greater impact of residential and nursing inputs on delayed discharges, emergency readmissions and average length of stay. In addition, it shows that the effect of social care inputs is significantly stronger on reducing delayed discharge than on preventing emergency readmissions. Overall, the elasticity of finished consultant episodes to social care services is estimated to range from 0.03 for home care services to 0.10 and 0.13 for nursing and residential care services. These finings are compatible with the overall elasticity of finished consultant episodes to social care budgets, estimated by the reduced form model to be approximately 0.05.

As shown above, the net impact of social care services on the number of people treated in hospitals (as opposed to the number of hospital episodes) is the combination of a positive effect on throughput of reductions in mean lengths of stay (due to improvement in the rates of delayed discharges), and the negative effect of increases in the rates of emergency readmissions associated with reductions in mean lengths of stay. Overall, the results suggest the former effect dominates significantly the latter. As a result, in spite of some increases in emergency readmissions, hospitals in local authorities with higher levels of social care services are estimated to treat significantly greater number of patients.

Insert table 8 here

Table 8 indicates significant homogeneity in the range of elasticities estimated by the 2SLS and 3SLS models, with the exception of the elasticity of emergency readmission rates to changes in average lengths of stay in hospital, which is estimated to be -0.71 and -0.35 in the 3SLS an 2SLS models, respectively. Overall, social care resources appear to have a stronger effect on delayed discharge rates that on emergency readmissions. Also, the four indicators of acute health care performance show a significantly greater elasticity to institutional types of care than to community-based services.

DISCUSSION

The analysis provides substantial evidence about the processes behind hospital delayed discharges and emergency readmissions. It corroborates the commonly held (but largely unquantified) assumption that the performance of the social and health care systems are interdependent, and particularly that the intensity of social care provision affects significantly acute health care performance. Between types of services, the results suggest institutional modes of care might be more effective at improving rates of delayed discharges and emergency readmissions.

Policy implications

Health and social care in England are financially, administratively and professional separate systems. A key set of policy questions concern the extent to which the operation of these two distinct systems should be re-aligned, and if so, how. Whilst the policy rhetoric has recognised that interactive effects exist, there is little indication of the size of these effects (Wanless, 2006). Moreover, the attention has been focused on only specific parts of the overall system, such as delayed discharge, rather than also gauging the broader impacts of social care on length of stay, hospital activity rates, re-admission rates and so forth. Policy changes have been made, such as the removal of legal barriers to allow pooled funding between health and social care; the beginnings of a move towards a single assessment of need for both services; the ability of health care organisations to levy charges on social services authorities for some types of delayed discharge. The 2000 NHS Plan also set in train the development of 'intermediate' care, services to facilitate people's movement between acute hospital care and long-term social care.

Many of these measures are at present either embryonic or small scale (Wanless, 2006), although the rhetoric of partnership or interactive working is being strengthened as demonstrated by the 2006 White Paper (Department of Health, 2006). Overall, nonetheless, there is very little evidence concerning the size of the effects of social care on health sector operation and performance, nor much of an indication of how far reaching changes in long-term services will be into acute phases of (health) care. This paper suggests that mainstream social care services can impact on delayed discharge with an elasticity of -0.5 or even more. It also shows that 1% more social care places is associated with a 0.1% increase in total hospital activity rates. Furthermore, were social care services to be more dedicated to tackling patient discharge from hospital, the expectation is that interactive effects would be even greater.

The results of the approach taken in this paper develop the quantitative evidence in this area. In particular, the results can be used to justify dedicated (primary) research as part of an overall economic evaluation of greater partnership working. The results outlined in this paper (and originally reported to the Department of Health) were part of the case for a £60m Government initiative assess greater joint working – the Partnerships for Older People projects (POPPs)[3]

The results also confirm the major impact that input prices (wages and house prices) have on local authority levels of demand for services, and therefore on the performance of the acute health care system. Given the extreme geographical variability in prices in England, further attention needs to be paid to understanding the extent to which Local Cost Adjustment factors incorporated into local allocation formulae do or do not fully compensate for local variations in prices. Significant questions are also begged therefore about the appropriateness of current performance monitoring systems, which do not account for the significant effect that factors outside the control of local policy makers such as input prices or variations in need will have of observed performance levels.

[3] See: http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/OlderPeoplesServices/OlderPeopleArticle/fs/en?CONTENT_ID=4099198&chk=5OV7NB

The estimations highlight the strong interdependences between the different indicators of acute system performance. They illustrate the dangers of focusing policy attention on a single measure of performance, and the need to explore likely unintended consequences. As hypothesised above, higher rates of delay are found to bring about increases in average lengths of stay, and hence reductions in the number of finished consultant episodes. Higher lengths of stay, however, were associated with lower emergency readmission rates. The effect of changes in average length of stay on hospital throughputs depends therefore on the extent to which increases in episodes that follow from reductions in average lengths of stays are offset by the need to *re-treat* more patients as the risk of readmissions increases. The results suggest, however, that the gains in hospital episodes following a given decrease in mean lengths of stays are several times greater than the increases in readmissions.

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Figure 1 Framework for analysis

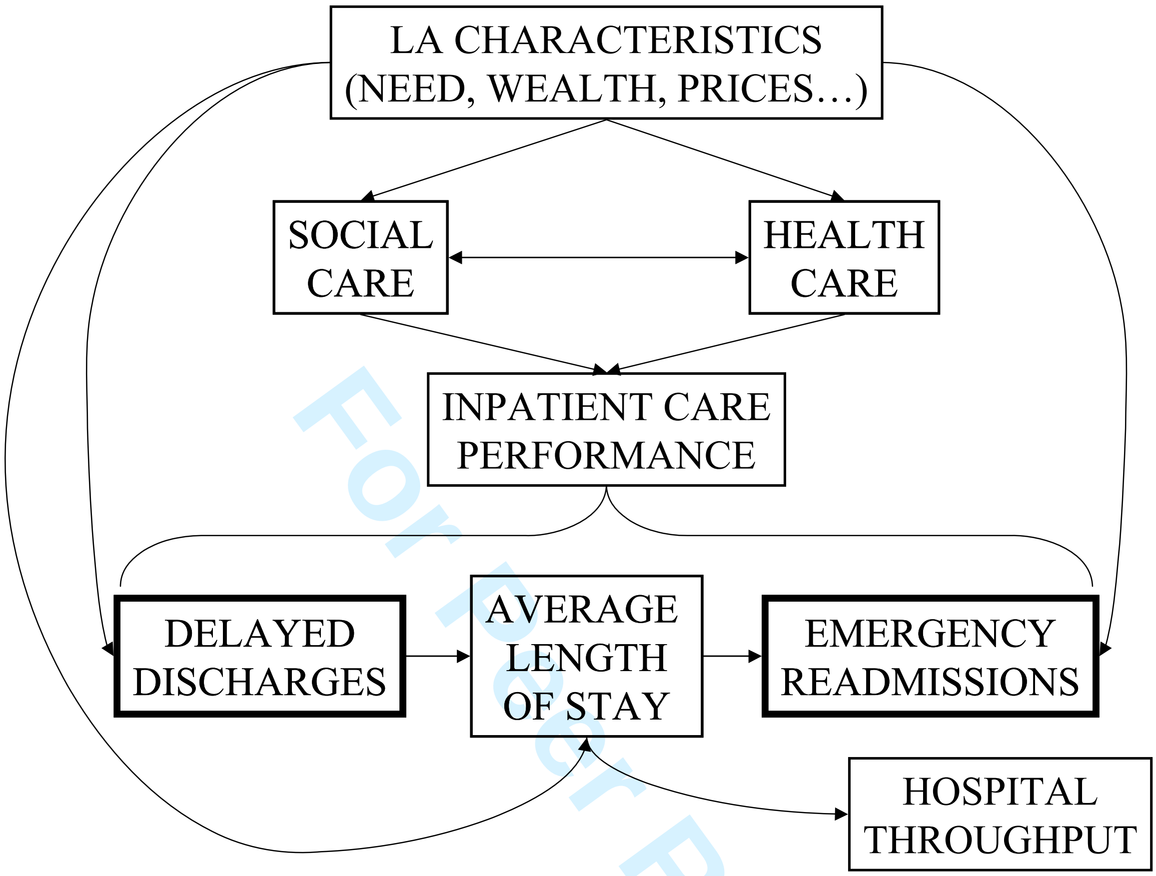

Table 1. Data sources

Category	Variable	Source
Output	• Local authority supported clients: residential care, nursing home care, domiciliary care (contact hours and households); by providing sector • Service provision: Places in residential and nursing homes (all registered beds)	Department of Health *Community Care Statistics*, various Statistical Bulletins
	Hospital episodes (people over 75)	Department of Health, *Hospital Episode Statistics*
	District Nurses Whole Time Equivalent	DH Non-Medical Workforce Census
Expenditure	Local Authority Personal Social Services Gross Expenditure; by service type and cost type (provision cost, overheads etc..)	Social Services Performance Bulletins, Revenue Outturn (R03) statistics, Department of Health and DETR.
Input costs	Capital: Property prices	HM Land Registry.
	Labour: Local wage rates • Weekly gross earnings • LA labour cost index for Area Cost Adjustment	New Earnings Survey DH Baseline estimates
LA characteristics	Population profiles: • by age group • migration	Population statistics, Office of National Statistics

Table 2. Descriptive statistics – endogenous variables

Variable	Obs	Mean	Std. Dev.	Min	Max	Skew	Kurt
Finished consultant episodes*	292	1.583	0.328	0.199	2.501	-0.40	4.57
Delayed discharge rate	292	0.130	0.073	0.007	0.551	1.86	8.64
Standardised emergency readmission rates	292	5.902	0.699	4.243	7.422	0.22	2.27
Average length of stay in hospital	292	4.162	0.559	3.218	5.885	0.94	3.45
LA supported hours of home care*	292	0.403	0.193	0.057	1.466	1.71	7.41
Supported nursing home beds*	292	0.009	0.004	0.001	0.024	0.74	3.73
Residential home beds*	292	0.030	0.012	0.006	0.094	1.41	7.44

* rate per individual over 65.

Table 3. Delayed discharges – reduced-form model

Variable definition	Functional form	Coeff	Elasticities
Unit cost of factors of production			
LA average house prices (all dwellings)	Linear	2.97e-7**	
Average gross weekly earnings	Squared	5e-7***	
Resource levels			
LA total gross elderly expenditure per individual over 65	Linear	-0.123***	-0.73
HA net total revenue per individual over 65	Linear	-0.0003***	-1.45
Need indicators			
Standardised mortality rates	Linear	0.016***	
	Squared	-0.00008***	
Local authority ONS classification: coast and country resorts		0.02	
Local authority ONS classification: ports and industry		0.02**	
Hospital capacity			
Number of beds per individual over 65	Linear	3.69***	
Time fixed effect			
Year 1999/00		0.02*	
Unspecified factors			
Constant		-0.64*	

Model summary			
Dependent variable	Proportion of persons over 75 in acute beds delayed from discharge to social care on a given day		
Number of obs	292	F prob	<0.0001
R^2	0.2204		

Diagnostics				
Specification	Linktest	Linear	(P-value)	0.84
		Squared	(P-value)	0.04
	Ramsey RESET		(P-value)	0.08

** Significant at 5% confidence level; * Significant at 10% confidence level; Model estimated with robust standard errors.

Table 4. Emergency readmissions– reduced-form model

Variable definition			Functional form	Coeff	Elasticities
Unit cost of factors of production					
LA average house prices			Squared	$3.7e\text{-}12^{**}$	
Average gross weekly earnings			Linear	0.0005	
Resource levels					
LA total gross elderly expenditure per individual over 65			Linear	-0.912^{***}	-0.12
HA net total revenue per individual over 65			Linear	-0.002^{***}	-0.17
Need indicators					
Proportion receiving income support			Linear	2.09^{**}	
Proportion of population with a limiting long-standing illness			Squared	11.87^{**}	
Hospital capacity					
Number of beds per individual over 65			Squared	5.59	
Time fixed effect					
Year 1999/00				0.22^{**}	
Unspecified factors					
Constant				4.77^{**}	
Model summary					
Dependent variable		Rate of emergency readmissions to hospital within 28 days of discharge, as a percentage of live discharges, for all types of hospital discharges.			
Number of obs		292		F prob	<0.0001
Adjusted R^2		0.30			
Diagnostics					
Specification	Linktest	Linear	(P-value)	0.80	
		Squared	(P-value)	0.48	
	Ramsey RESET		(P-value)	0.34	
Heteroscedasticity	Breuch-Pagan		(P-value)	0.12	

** Significant at 5% confidence level

Table 5. Finished consultant episodes – reduced-form model

Variable definition	Functional form	Coeff	Elasticities
Unit cost of factors of production			
LA average house prices	Squared	-4e-12***	
Average gross weekly earnings	Linear		
Resource levels			
LA total gross elderly expenditure per pop over 65	Log	0.76**	0.05
HA net total revenue per individual over 65	Linear	-0.0002	
Need indicators			
Standardised mortality rates	Squared	0.000035***	
Local authority ONS classification: coal fields	Linear	0.05*	
Proportion of male population	Linear	3.02**	
Hospital capacity			
Number of beds per individual over 65	Linear	132.37***	
Number of beds per individual over 65	Squared	-1879.09***	
Time fixed effect			
Year 1999/00		-0.01	
Unspecified factors			
Constant		-1.75***	

Model summary			
Dependent variable	Finished consultant episodes per population aged 65 and over		
Number of obs	292	F test (P-value)	<0.01
Adjusted R^2	0.85		

Diagnostics				
Specification	Linktest	Linear	(P-value)	<0.01
		Squared	(P-value)	0.41
	Ramsey RESET		(P-value)	0.06
Heteroscedasticity	Breuch-Pagan		(P-value)	0.23

*** Significant at 1% confidence level; ** Significant at 5% confidence level; * Significant at 10% confidence level.

Table 6. Structural model - 3SLS specification

	Emergency readmission rates	Average length of stay	Delayed Discharge rates	Residential home beds	Supported nursing home beds	Hours of Home care
Hospital performance indicators						
Average length of stay in hospital	-1.01***					
Delayed discharge rates		6.23***				
Formal services						
Hospital beds per individual over 65	74.94***	0.69*** a	86.84**			
HA net total revenue per capita	-0.48**		-0.0002***			
District nurse WTE per individual over 65	-228.75***		-9.80**			
Gross SSD spending per individual over 65				0.02***	0.02***	0.57***
Hours of home care per individual over 65	-0.80*		-0.05	-0.01	-0.02***	
Residential home beds per individual over 65	-13.73***		-2.92***		-0.08***	-3.13***
Supported nursing home beds per individual over 65	-71.11***		-7.08***	-2.07***		-30.00***
Need indicators						
Proportion of population with limiting long standing illness	-51.79***					
Proportion of population with limiting long standing illness (squared)	68.70***					
Proportion of population over 85 years old		12.43***		0.21***		
Proportion of residents living alone	5.51***	4.02***				1.82*** b
Proportion of population receiving income support	2.17**					
Standardised mortality rates			0.002	0.0005***	0.0001***	0.007***
Standardised mortality rates (squared)			-1e-5			
Factor prices						
Average gross weekly earnings				-0.00002* b		-5e-7**
Average house price (all dwellings)					-5e-8***	
Average house prices				-3e-13***		
LA characteristics						
ONS classification: coast and country resorts				0.01***		
ONS classification: ports and industry					0.002***	
Other indicators						
Year 2001	0.19***	0.02	0.006	-0.002*	-0.0007*	-0.02
Constant	20.82***	3.24***	0.26	-0.02	-0.002	-0.51***

[a] Indicator entered under logarithmic form; [b] Indicator entered under squared form; * p<.10; ** p<.05; *** p<.01

Table 7. Structural model - 2SLS specification

	Emergency readmission rates [b]	Average length of stay [c]	Delayed discharge rates [d]
Hospital performance indicators			
Average length of stay in hospital	-0.49***		
Delayed discharge rates		8.46***	
Formal services			
Hospital beds per individual over 65	944.25**		
Hospital beds per individual over 65 (squared)		1756.1***	27.27
HA net total revenue per individual over 65	-0.001*		-0.0002***
District nurse WTE per individual over 65	-191.09***		-2.27
Hours of home care per individual over 65	-0.15		-0.01
Residential home beds per individual over 65	-10.92***		-2.03***
Supported nursing home beds per individual over 65	-17.39*		-7.97***
Need indicators			
Proportion of population with limiting long standing illness	-52.93***		
Proportion of population with limiting long standing illness (squared)	71.74***		
Proportion of population over 85 years old		12.25***	
Proportion of residents living alone		3.38**	
Proportion of population receiving income support	2.11**		
Standardised mortality rates			4e-6
Standardised mortality rates (squared)			2e-6
Other indicators			
Year 2001	0.17**	0.005	0.01
Constant	18.19***	-0.20	0.36
Diagnostics			
Sargan statistic overidentification test (P-value)	0.08	0.69	0.10
Wu-Hausman F endogeneity test (P-value)	<0.01	<0.01	<0.01
Pagan-Hall heteroskedasticity test (P-value)	0.04	0.44	0.17
Link test $\hat{y}$ (P-value)	0.11	0.02	0.67
Link test $\hat{y}^2$ (P-value)	0.03	0.16	0.40

[a] Indicator entered under squared form; * p<.10; ** p<.05; *** p<.01

[b] *Instruments*: area of local authority; rate of delayed discharges; coastal local authority; proportion receiving income support; district nurse WTE per individual over 65; hours of home care per individual over 65; supported nursing home beds per individual over 65; residential home beds per individual over 65; hospital beds per individual over 65; proportion of population with limiting long standing illness; year 2001.

[c] *Instruments*: gross SSD spending per individual over 65; rate of intensive home care packages; average house price (all dwellings); proportion of population over 85 years old; coastal local authority; ports and industry local authority; proportion receiving income support; proportion of residents living alone; hours of home care per individual over 65; hospital beds per individual over 65; proportion of population over 85 years old; proportion of residents living alone; year 2001.

[d] *Instruments*: gross SSD spending per individual over 65; HA net total revenue per capita; average house price (all dwellings); coastal local authority; ports and industry local authority; proportion of residents living alone; hours of home care per individual over 65; district nurse WTE per individual over 65; hospital beds per individual over 65; standardised mortality rates; year 2001.

Table 8. Structural model elasticities

	Finished consultant episodes		Emergency readmission rates		Average length of stay		Delayed discharge rates	
	3sls	OLS	3sls	2sls	3sls	2sls	3sls	2sls
Hospital performance indicators								
Average length of stay in hospital			-0.71	-0.35				
Delayed discharge rates					0.19	0.26		
Social care services								
Hours of home care per population over 65	0.03	0.01	-0.05	-0.01	-0.03	-0.01	-0.17	-0.04
Residential home beds per population over 65	0.13	0.13	-0.07	-0.06	-0.13	-0.12	-0.68	-0.47
Supported nursing home beds per population over 65	0.10	0.15	-0.11	-0.03	-0.10	-0.15	-0.50	-0.57