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Age, deprivation and rates of inguinal hernia surgery in men. Is there inequity of access to healthcare?

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Abstract

Objectives: to study trends in hospital admissions for inguinal hernia surgery in men, examining relationships between age, deprivation and rate of surgery.
Design: graphical analyses of hospital discharge data and demographic information, guided by three hypotheses on urgency of surgery, age and evidence of discordance between population prevalence of disease and rates of surgery.
Setting and subjects: men undergoing inguinal hernia surgery in Scotland in 1982–4, 1987–9 and 1992–4.
Main outcome measures: rate of operation per 100 000 population.
Results: over the study period, there has been (i) a marked increase in the rate of elective hernia operations in the over-65s, (ii) a stable rate of non-elective operations in all age groups, (iii) a lower rate of elective surgery in patients from deprived areas than in patients from affluent areas.
Conclusions: during the period studied there has been decreasing inequity on the grounds of age but persisting inequity on the grounds of deprivation. These techniques of analysis are potentially applicable to many conditions and may be useful in equity audit in patients of all ages.

Keywords: *access to healthcare, aged, deprivation category, equity, inguinal hernia, socio-economic status, surgery*

Introduction

Three recent reviews have concluded that "research is needed to examine the extent of differences in access to the National Health Service according to age group" [1], that it is "vital not to neglect older people when analysing inequalities in health" [2] and that health inequality is "the UK's biggest issue" [3]. Using the example of inpatient inguinal hernia surgery in men, we propose ways of studying whether age-related inequity of access to health care is present, through analysis of data which are collected routinely in Scotland.

We chose to study inguinal hernias as, although they are common, often cause morbidity, are occasionally fatal and are readily treatable by surgery, some sufferers seeking symptomatic relief are still denied access to elective surgery [4]. We have analysed the effects of age and deprivation category on rates of hernia surgery and have examined changing trends over time.

The relationship between socio-economic factors and health care provision has only recently attracted any significant research interest [5–13], and age/socio-economic interactions have not been well studied. In the studies relating socio-economic factors to mortality [10, 14–17] and morbidity [7, 13, 18–23], only two groups of workers have focused on age/socio-economic interactions [18, 20, 21].

Methods

Data collection

We used data supplied to us by the Information and Statistics Division of the Scottish Health Service [24, 25]. We combined demographic data with hospital discharge data for inpatient inguinal hernia surgery in men in Scotland to provide:

1. Age-specific rates of discharge in 10-year age bands, expressing rates of surgery relative to 100 000 people of that age and gender in the general Scottish population.

2. Separate analyses of elective and non-elective admissions.
3. Time trends, examining data from 1982–4, 1987–9 and 1992–4.
4. Deprivation category, based on the postcode of residence, using the Carstairs index [16, 26].

Prior hypotheses

We use the term 'inequity' to imply a sub-optimal rate of hospital referral and/or surgical treatment resulting from negative attitudes of patients or their professional advisers. For operations generally perceived to result in health gain, we used the following three hypotheses to guide our data collection, analyses and interpretation.

Hypothesis 1

Elective and non-elective admissions: changes in lay or professional attitudes to surgery will have their main impact on the rate of elective admissions; the rate of non-elective admissions will be influenced primarily by the underlying prevalence and incidence of disease in the population (as the urgency of the surgical problem will tend to override negative attitudes to referral [27]).

Hypothesis 2

Age differences: a reduction of age-related inequity will lead to an increase in surgical rates in older people, over and above any changes in rate that occur in younger adults.

Hypothesis 3

Discordance: 'discordance' [9], is *prima facie* evidence of inequity. (The community prevalence of many medical and surgical problems [16, 19, 22, 23], including inguinal hernia [9], is higher in socio-economically deprived groups. When elective surgical rates are lower in such groups, this is an example of discordance between need and provision [9].)

Results

Effects of age, year and urgency of operation on rate of inguinal hernia surgery

Figure 1a shows data for elective and non-elective surgery in 1982–4, 1987–9 and 1992–4. For non-elective patients, the age-specific rate of hernia surgery for a given age group was stable over time. In contrast, for elective patients, the age-specific rate of surgery for groups aged 65 and over rose steadily between 1982–4 and 1992–4. From hypotheses 1 and 2, we infer that inequity of access on the grounds of age has decreased over the last 10 years.

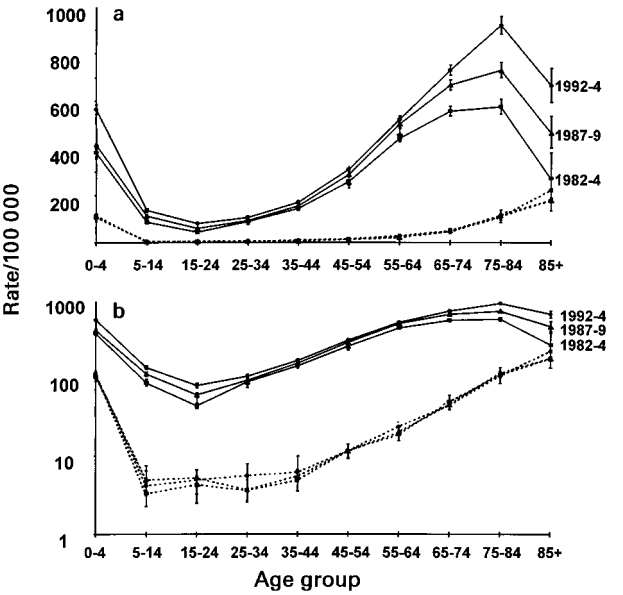

Figure 1. **a** Standard and **b** logarithmic plots of rates of elective (—) and non-elective (- - -) inguinal hernia surgery in men in Scotland in 1982–4 (■), 1987–9 (▲) and 1992–4 (o). The error bars represent 95% confidence intervals, assuming a Poisson distribution [44]. Rates remained stable over time for non-elective surgery but rates for elective surgery on patients aged 65 and over rose steadily. **b** A logarithmic plot offers advantages when the focus of interest is the relative rather than the absolute difference between groups.

Changes in one age group relative to another are difficult to visualize in Figure 1a as the vertical axis is linear. The logarithmic scale used in Figure 1b overcomes this problem. For patients aged between 25 and 64 the three lines at the top of Figure 1b are almost superimposed, whereas the lines for those aged 65 and over diverge upwards, indicating that the proportional increase in elective operative rate was greatest in the oldest age groups. From hypothesis 2, we infer that the increased equity of access has been greatest in the oldest patients.

Effects of age and deprivation category on rate of inguinal hernia surgery

Under the seven-category Carstairs classification [26], category 1 patients are from the least deprived postcode areas and category 7 patients are from the most deprived areas. Figure 2 shows that in elective cases the slope of individual lines tends to be negative, with lower rates of surgery in groups with higher levels of deprivation. In other words, elective operative rates are 'discordant'. In non-elective referrals, the slopes of the lines tend to be 0 or positive, indicating a concordant pattern, whereby the highest rates of surgery are found in the most deprived groups. From

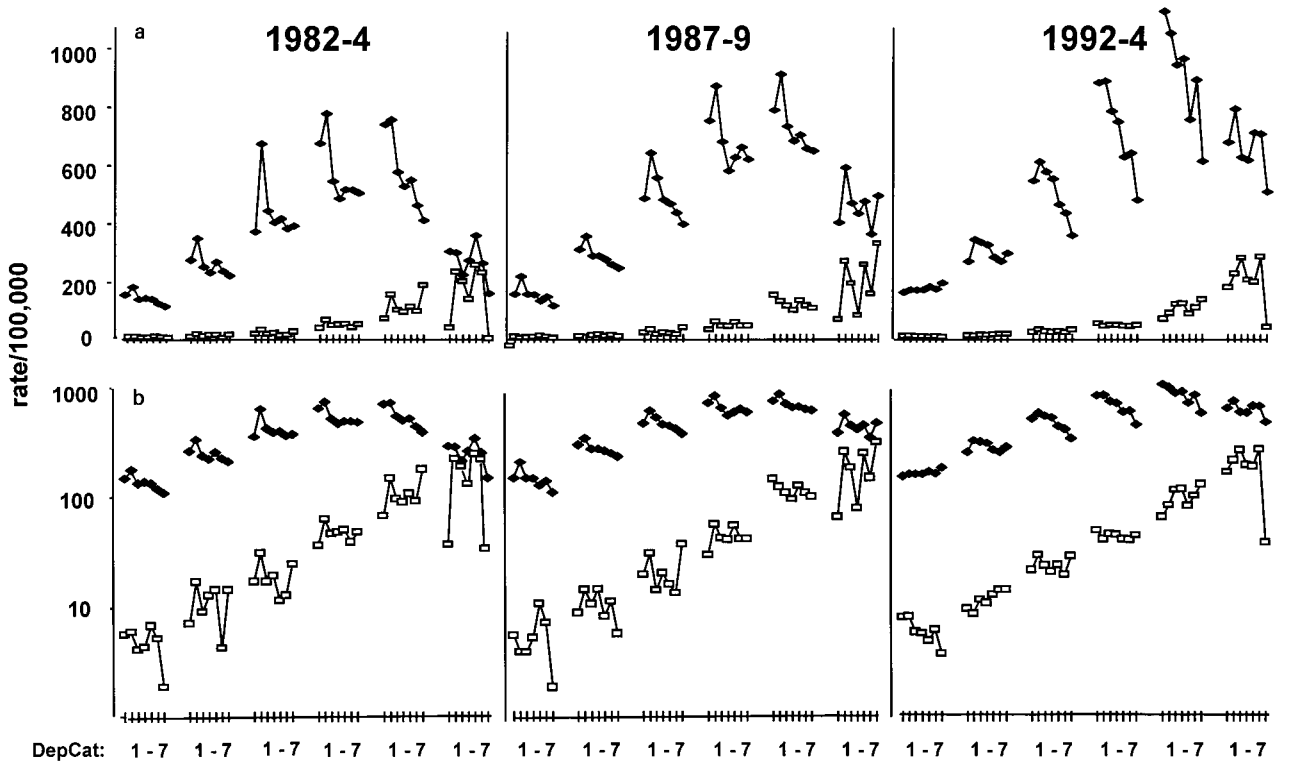

Figure 2. **a** Standard and **b** logarithmic plots of age, deprivation category (DepCat) and elective (■) and non-elective (□) inguinal hernia surgery in men in Scotland in 1982–4, 1987–9 and 1992–4. The effects of deprivation category appear to act in different ways (i) in different age groups and (ii) in elective *versus* non-elective cases.

hypotheses 1 and 3, we infer that inequity on the grounds of deprivation category is present and has not decreased during the study period.

Time trends

Figure 3 regroups the seven-point deprivation category into three subcategories: affluent (1 and 2), intermediate (3–5) and deprived (6 and 7). Throughout the time between 1982–4 and 1992–4, the rate of elective hernia surgery in the most affluent group far exceeds that in the most deprived group in all patients aged between 55 and 84 years of age (and all differences are highly statistically significantly different [28]). However, different age groups show different patterns of change with time. Thus, the rate of increase in elective operations between 1982–4 and 1992–4 becomes steadily steeper as we pass from 65–74-year-olds to those aged 85 and over. In those aged 75 and over, this increase in rate of elective surgery is seen in affluent, intermediate and deprived patient groups, but in younger patients the relationship between age, deprivation category, time and surgical rate is more complicated. In contrast to the situation for elective operations, in non-elective operations the rates of surgery in the three deprivation subcategories are the same and do not change with time.

Inferences drawn from time trends data

For non-elective surgery, the stability with time of the surgical rates is evidence that the underlying prevalence/incidence of inguinal hernia has not altered between 1982–4 and 1992–4 (see hypothesis 1).

For elective surgery, where inequity of referral is more likely to affect the rate of surgery, the pattern is more complex:

1. In patients aged 35–54, it seems likely that the rate of elective surgery in the affluent group (deprivation categories 1 and 2) has already attained an optimal level by 1982–4 and that the intermediate (deprivation categories 3–5) and deprived (deprivation categories 6 and 7) groups 'catch up' over the next 10 years.
2. In patients aged 55–64, the intermediate deprivation group almost catch up with the affluent group by the end of the study, but the most deprived group lag behind.
3. In patients aged 65–74, the intermediate group do not fully catch up the affluent group, but still improve relative to the deprived group.
4. In patients aged 75 and over, inequity on the basis of age appears to decrease markedly over the period of the study, but inequity on the basis of deprivation category persists.

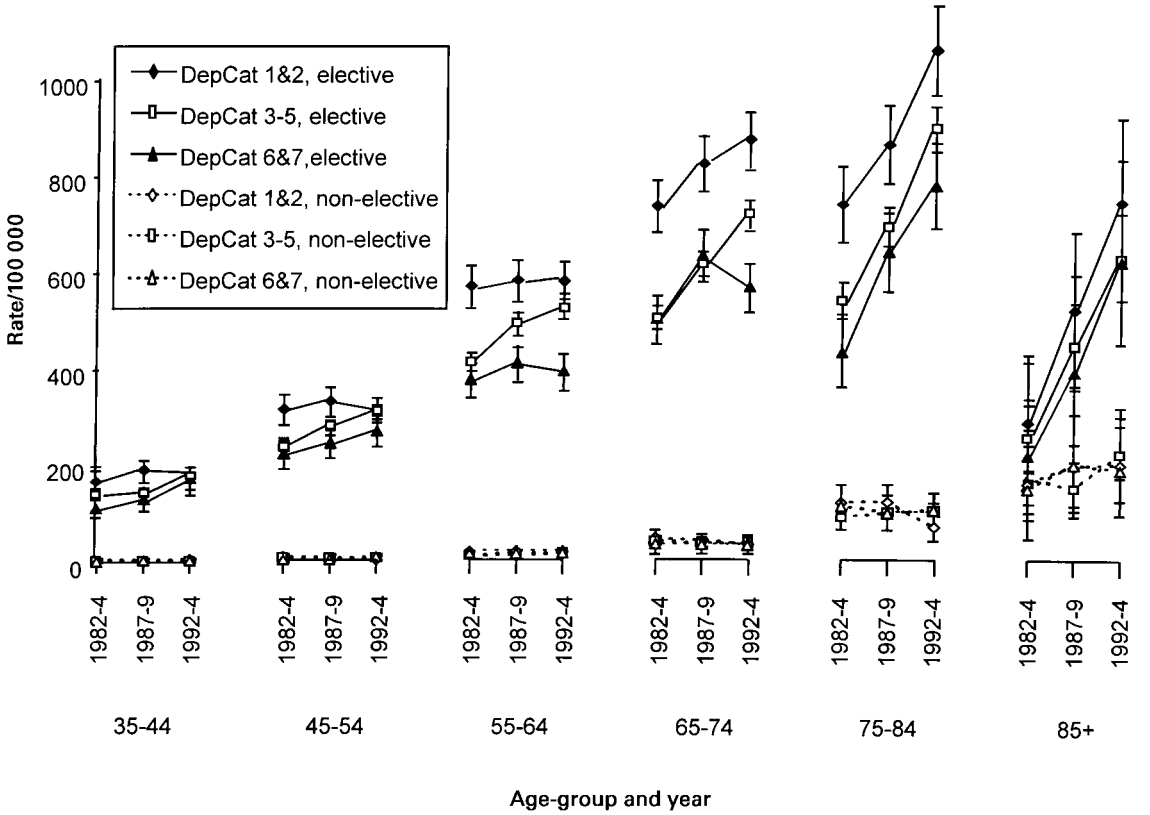

Figure 3. Age, deprivation category (DepCat) and elective (—) and non-elective (- - -) inguinal hernia surgery in men in 1982–4, 1987–9 and 1992–4. This method of data presentation makes it easy to examine changes with time. Note that, for all subgroups of patients aged between 55 and 84, elective surgical rates in the most affluent group are much higher than those in the most deprived group and that these differences do not diminish between 1982–4 and 1992–4.

Discussion

Inferring inequity *versus* measuring inequity

The ideal way to look for inequity of access to health care is to survey individuals at all stages in the referral and treatment process [29–32], but this is difficult and time-consuming. Because our techniques use routine data, they could prove useful for day-to-day equity audits [5, 6]. They should prove complementary to other techniques [8, 9, 33], but have several different emphases, including a graphical presentation, a separation of patients into different age groups and an explicit hypothesis-driven system of data analysis.

The relationship between socio-economic factors and health care provision has only recently attracted research interest [5–13] and few authors have focused on age/socio-economic interactions [18, 20, 21]. Our report suggests that we need to examine both age and socio-economic factors when interpreting changes in health service use: older people are not a homogenous group. There has probably been an overall reduction of inequity on the grounds of age over the decade. However, inequity of referral is probably influenced heavily by social deprivation as well as by age and, in patients aged 55 and over, the gap between the most affluent and the most deprived groups has not decreased over the 10-year period. This last finding echoes the conclusions of many researchers in relation to mortality differences between high- and low-deprivation groups over the same period [14, 15, 34].

Discordance between need and health care provision

For men having elective hernia operations, the lowest rates of surgery tend to be found in the most deprived groups, even though community prevalence data indicate that hernia is more common in such patients [9]. This may be an example of discordance between need and provision [9]. While previous studies have not separated age and socio-economic effects, discordant referral patterns on the basis of socio-economic status have been reported for inguinal hernia [9], gallstones [9], cataract [9, 22], ischaemic heart disease [8, 12] and total hip replacement [9, 35].

Discordant age/deprivation differences in elective operative rate are not necessarily the result of negative attitudes to referral or surgery. Age and poverty are associated with increased rates of disease and physical

disability in the general population [7, 13, 16, 18–21, 26, 36, 37] and so some older, socially-deprived patients may be judged 'unfit for surgery'. However, since elective inguinal hernia surgery is associated with a very low mortality rate [4], surgery is almost always feasible [38].

Characteristics of clinical conditions and treatments which are suitable for study using routine National Health Service and demographic data

There are limitations of using hospital data as a general proxy for community need and provision [35, 39, 40], but studies of selected conditions have been more useful [33, 39]. Our proposed techniques fall into this latter category. The types of analyses we propose are designed for hospital-based procedures or operations that promote health gain and can readily be identified from routine data (e.g. operations for inguinal hernia, arthritis, coronary artery disease, valvular heart disease and many operations or procedures in urology, gynaecology, ophthalmology and otolaryngology).

Possible artefacts in calculating surgical rates

Our clinical information is drawn from routine data which is of good quality [41] but National Health Service data sets will tend to underestimate the number of private operations. Had all private operations been included, the deprivation category effects in elective patients in Figures 2 and 3 would have been even more marked [9]. Similarly, the omission of day cases from the present data set would also tend to minimize rather than exaggerate age or deprivation effects, as patients suitable for day surgery tend to be younger and fitter and have more social support [42].

The 1991 census probably under-counted young adults in lower socio-economic categories [43], but again this would tend to underestimate rather than overestimate socio-economic disparities in referral.

Conclusions

In inguinal hernia surgery in men, old age has become much less of a barrier to surgery over the last decade, but inequity based on deprivation category has persisted. Similar analyses of other medical and surgical problems, using this hypothesis-driven system for assessing routine hospital data may allow better targeting of effective health care interventions and health education. Future studies might explore other potential sources of inequity such as gender, location (including urban and rural status) and ethnicity.

Key points

- We have studied patterns of inpatient inguinal surgery in men using a mixture of routine hospital discharge data, demographic data and the Carstairs deprivation category.
- Comparison of data from 1982–4, 1985–7 and 1992–4 reveals that inequity of access to inguinal surgery on the grounds of age has decreased, but inequity on the basis of deprivation category has persisted.
- While our techniques cannot provide definitive answers about inequity of access, they can raise important questions and might contribute to equity audit.

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