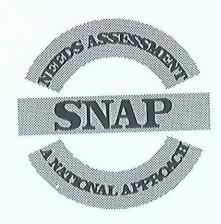
Scottish Needs Assessment Programme



Total Elective Hip and Knee Replacement

A Comparative Assessment

FOR REFERENCE ONLY

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al Elective Hip and Knee Joint Replacement-A Comparative Assessment

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The data used for the analyses presented here has been sent to each Health Boa. Department of Public Health Medicine.

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Summary

- Total hip replacement (THR) and total knee replacement (TKR) must be viewed in the wider context of policies for the prevention and management of the disabilities which result from arthritis.
- At Scottish level, there will be a need for a small increase in the provision of THR over the next 15 years to take account of demographic changes. The need for revisions will also increase.
- There is a substantial unmet need for TKR and provision should be increased.
 Revisions will also increase in future. This will have major resource implications.
- Individual Boards must examine their own current age and sex specific operation rates, population projections and local risk factors to determine their future needs for both THR and TKR. They should take account of the views of local providers and consumers.
- THR and TKR cannot be considered in isolation from other orthopaedic services. Appropriate levels of provision of less effective orthopaedic procedures must be assessed in the light of the resource implications of increased numbers of joint replacements.
- The development of outcome measures and guidelines for referral and treatment in provider units is essential.
- A population study is needed to determine the prevalence of disease which could benefit from hip or knee replacement.
- Research into the underlying causes of osteoarthritis is essential, with the longterm aim of primary prevention.

1. INTRODUCTION

This study forms part of the Scottish Needs Assessment Programme (SNAP) begun in early 1992 and co-ordinated by networks of the Scottish Forum for Public Health Medicine. The purpose of SNAP is, by co-operation and sharing of work between consultants in Public Health Medicine in the Scottish Health Boards, to build up a comprehensive series of needs assessment projects covering a wide range of issues.

The Acute Services Network agreed that total hip and knee joint replacements (THR and TKR) would be a priority project for 1992/93 for the following reasons:

- a) Hip and knee replacements are expensive but effective surgical procedures which lead to real health gain for patients.¹
- b) Studies in England have shown wide geographical variations in operation rates. 1,2
- c) People waiting for hip and knee replacements constitute an important part of waiting lists and Boards must now give guaranteed maximum waiting times for these procedures.
- Good information on future needs is essential to help target resources (including waiting list initiatives) appropriately.

In 1990, as part of the District Health Authorities (DHA) project, an epidemiologically based needs assessment for hip and knee replacements was published using English data. It identified major gaps in our information on the numbers of people in the community who are likely to benefit from these operations. This report made provisional estimates of likely recommended levels for elective joint replacements for England and Wales. Consideration of these recommendations in the Scottish context formed a key part of our report.

This project is mainly concerned with those aspects of services which can be influenced by purchasing decisions taken and contracts set by Health Boards. In the first instance these will involve contracts for orthopaedic surgery. It is important, however, to emphasise that these surgical interventions must be seen within the wider context of community and preventive services for the underlying diseases - principally osteoarthritis of these joints.

This report is the first part of the needs assessment project, and is based on currently available National Health Service activity data. The essential next stage will be a population study of the prevalence of disease which could benefit from hip or knee replacement. A full assessment of need can only be made when such a study has been completed.

2.1 Aim of Study

The overall aim of this project is to assess the need for hip and knee replacement surgery in Scotland.

2.2 Objectives of this Comparative Assessment

- a) To analyse and interpret the pattern and trends in hip and knee replacement operation rates in the Scottish Health Boards.
- b) To examine these figures in the wider context of outpatient referrals, orthopaedic discharges and bed days used in orthopaedic surgery throughout Scotland.
- c) To estimate numbers currently waiting for surgery.
- d) To provide the basis for Boards to estimate the future demand for surgery taking into account local factors.
- e) To identify the additional information necessary to carry out a full assessment of need.

THE NEED FOR HEALTH CARE

This can be defined as the appropriate level of provision of a health care intervention that is both effective and desired by the population. There is a distinction between need, demand and supply: need is what people could benefit from, demand is what they ask for, and supply is what is provided.

The need for an intervention is determined by three main factors:

- a) The prevalence and distribution of the condition in the population.
- b) The individual's probability of benefiting from a particular intervention.
- c) The individual's wish to be treated.

Three broad approaches to needs assessments have been identified³:

- a) <u>Epidemiological assessments</u> based on the ability to benefit from health care and reflecting what is known about incidence, prevalence and the effectiveness of treatment.
- b) <u>Comparative assessments</u> which compare levels of service in different areas for example, using NHS activity data and demographic data.
- A 'corporate' view which takes account of the interests of local people, GPs, providers, other agencies and the NHS Management Executive.

Good population studies on the numbers of people who can benefit from the intervention are therefore essential for any valid assessment of need. Such studies are not currently available in relation to hip and knee replacements. In their absence, a comparative approach has been taken in this report, as a first step in the needs assessment for hip and knee replacements. It is recognised that this is more a surrogate for than a calculation of the true level of need, and it provides information about demand and supply.

The next step will be to undertake a population study as the basis of a full needs assessment.

4. HIP AND KNEE JOINT REPLACEMENTS

4.1 Conditions Benefiting from Elective THR and TKR

The indications for hip replacement may be subdivided into two broad categories:

- (a) arthroplasties carried out to replace joints damaged by trauma, mostly fractures of the neck of the femur, carried out usually as emergency operations, and
- (b) arthroplasties to replace joints damaged by chronic disease, such as osteoarthritis, and occasionally rheumatoid arthritis, carried out as elective surgery.

Elective hip replacements account for about two-thirds of all hip replacements in Scotland. Hip arthroplasty is one of the most common and successful major elective operations with 3538 elective hip operations carried out in 1991 in Scotland. Knee replacements are performed almost exclusively as elective procedures and 1676 such operations were carried out in Scotland in 1991. In this assessment of need we are concerned with those operations to alleviate the symptoms of chronic disease and therefore operations with an underlying diagnosis of fracture of femur (ICD 820) - which has quite different underlying causes - are excluded from the main analyses. Fractured femur is, however, a major preventable health problem in the elderly and should be the subject of a separate needs assessment project.

Elective total hip and knee replacements are carried out mainly to relieve the symptoms of osteoarthritis (pain and limited mobility), although some are also done for rheumatoid arthritis. An increasing number of revision operations are now required as old prostheses wear out and need to be replaced.

4.2 Complications of Surgery

Most patients who undergo elective major joint replacement are elderly and many may have other medical problems. Thus, deaths in the year after operation may be related to the surgery or, particularly in the elderly, may be from an unrelated cause.

A recent large record linkage study from Oxford provided detailed information on mortality and emergency readmission rates after elective THR.² Post-operative mortality was found to be much higher in men than in women, but this probably reflected the higher population mortality rates in men. For early post-operative deaths (within 90 days of surgery), which are more likely to be associated with the operation, an excess mortality of approximately 6.5 deaths/1000 hip replacement operations was found, with most of the deaths being ascribed to cardiovascular events.

There were no significant differences in either mortality rates or emergency readmission rates between teaching and non-teaching hospitals. An emergency readmission rate of 28/1000 operations was found in the 28 days after discharge, with thromboembolic disease being the most common cause.

4.3 Effectiveness of THR and TKR

Outcome in terms of pain relief and function show acceptable improvement over a five year period in some 80% of cases undergoing hip replacement.¹

In studies of the outcome of knee joint replacement, the length of follow-up is shorter, but the proportion of patients with good outcomes is similar to that for hips.

While replacement surgery may offer long-term relief to certain categories of patients, the boundary between those eligible for surgery and those not eligible must at some point be arbitrary. Alternative patterns of care for those who do not wish surgery or could not benefit from it include drug therapy for pain relief, physiotherapy and in some cases aids to mobility. The effectiveness of joint replacements in appropriate cases should not detract from the wider implications of providing care for people with arthritis.

4.4 Cost Effectiveness

This has been fully reviewed in the DHA project/report .1

The average cost quoted for THR has fallen over recent years, reflecting the shorter length of stay. Costs in one Scottish Unit are £3700 for a primary hip replacement and £4400 for an uncomplicated hip revision.

To determine the relative cost effectiveness, costs must be considered in association with outcomes, and one study of cost per QALY found THR at £750/QALY to be more cost effective than many of the other interventions considered .⁴

Costs and benefits will differ markedly, however, according to various patient characteristics, including age, severity and underlying pathology of disease. The key problem common to all available cost effectiveness studies of THR and TKR is the lack of any indication of the type of patient for whom these interventions are most cost effective. It is difficult, therefore, to draw conclusions about cost effectiveness at the margin. In broad terms, it appears that the cost effectiveness is greatest among patients with severe single joint disease.⁵

4.5 Future Developments

The key change in surgical practice concerns the increasing use of cementless THR which now accounts for some 50% of THRs in the USA. Some short and medium term follow-up results compare favourably with those reported for cemented series. Doubts however remain among orthopaedic surgeons as to their long term advantages over established cemented prostheses.

Cementless varieties of TKR have also been introduced and are likely to become more widespread in future.

5. EPIDEMIOLOGY

5.1 General Points

Elective total hip and knee replacements are carried out mainly to relieve the symptoms of osteoarthritis (pain and limited mobility), although some are also done for rheumatoid arthritis.

Osteoarthritis is a very common painful and disabling condition which remains poorly understood. It is the most common joint disorder both in the United Kingdom and throughout the world. It affects joint cartilage and underlying bone, cartilage being affected first. When the loss is extensive, a narrowing of the joint space can be seen on radiographs.

Most studies have been on the prevalence of radiological disease rather than clinical disease. For an assessment of need this is a problem, as many people with radiological disease do not have symptoms and radiological signs do not indicate the severity of any symptoms. Factors influencing the development of symptoms are no well understood.

Some studies have found that obese subjects with x-ray signs of knee osteoarthritis are more likely to have symptoms than the non-obese, ⁶ but other studies have been unable to detect such a link. ⁷ Among white females, hypertension and poor psychological well-being have been found to be related to an increased likelihood of knee symptoms among those with radiological disease. ⁸

Prevalence studies of osteoarthritis using radiographic changes alone are, therefore, of limited usefulness in assessing the need for hip and knee replacements. There is need for studies which include information on symptoms, joint function and fitness for surgery, and few such studies have been done.

5.2 <u>Hip Osteoarthritis</u>

The prevalence of radiographic hip disease has been measured in several surveys an these have been fully reviewed in the DHA project. In general, they show that disease increases in prevalence with age, and is more common in men. Several studies have estimated a prevalence rate of around 5% for severe disease in those aged over 60 years, and it has been suggested that a large proportion of disease is secondary to developmental abnormalities.

Recent work has shown that farming communities may have higher rates than similar non-farming communities. A cross-sectional survey in five rural general practices in England found a higher prevalence of osteoarthritis among farmers than in controls who had done mostly sedentary work, and other studies support the idea that farmers are at increased risk of osteoarthritis of the hip. It was not possible to

identify a particular type of farming as a high risk activity, but neavy lifting may be implicated.

While there is some information available on the epidemiology of osteoarthritis of hip, there has been very little work examining the proportion of patients with this disease who would benefit from arthroplasty. The only study to address this was reported in 1979. Eight hundred and thirty-eight people over the age of 65 years from Oxfordshire were examined using two scoring systems - an activities of daily living index and a composite hip function score including questions on pain, mobility and range of hip movement. Of the survey group 0.7% had already had a hip replacement, and a further 0.5% would have benefited from surgery. An additional 1.3% needed the operation, but were unfit for surgery. This small study, while providing valuable information, is now 13 years old, and criteria for surgery (and for anaesthesia) have changed significantly, so its relevance to future needs is somewhat limited.

5.3 Knee Osteoarthritis

Osteoarthritis of the knee is more common than that of the hip and is frequently symptomatic. Radiographic disease increases with age. It is negligible in those aged 25-34 years but increases to between 20% and 40% in those aged over 75 years, only 30-40% of whom have symptoms. It is more prevalent in men up to the age of 45 years after which it becomes more prevalent in women with the difference in rates increasing.¹¹

These conditions are responsible for a substantial amount of pain, loss of mobility and disability in the population.

SCOPE FOR PREVENTION

Osteoarthritis produces significant morbidity, including loss of independence, especially in the elderly.

Recent work on the high risk of hip osteoarthritis in farmers suggests heavy lifting as a likely explanation, possibly at an early age when the hip joint is still not fully developed. Until the causes of osteoarthritis are found, preventive strategies can only be speculative. Because heavy lifting is also associated with other muscular skeletal diseases - for example, low back disorders - it makes sense to limit manual handling of heavy loads in agriculture as far as is reasonably practical. With data suggesting that as many as one in five farmers may eventually need a hip replacement and given that about 300000 men work in agriculture in Britain, and even more have done in previous years, this implies a major public health problem. If the risk is from heavy lifting, it will not be confined to farmers, and the public health burden will be even greater. Education of high risk groups and their employers is needed, and consideration should be given to making hip osteoarthritis a prescribed industrial disease in farm workers.

Hip osteoarthritis may also be secondary to developmental defects and relevant preventive measures may include screening for congenital dislocation of hip.

Rheumatoid arthritis is a complex disease affecting 3% of the population. As yet there is no scope for primary prevention, but effective management can limit or delay disability.

7. METHODS

In the absence of good information on the number of people in the population who would be able to benefit from joint replacement, it was necessary to use the available NHS activity data as an imperfect measure of demand for services. The absence of data on operations in the private sector means that the rates shown underestimate the true figures.

7.1 Data Used

Age and sex specific operation rates were calculated for each Health Board of residence for 1991 and also for the five year period 1987-91. The rates were also compared with the English figures - both actual and recommended - from the DHA project.

Time trends in operation rates for the Boards for 1981-91 were calculated as were trends in length of stay.

The proportion of orthopaedic bed days used for hip and knee replacements was calculated as one measure of the resource implications of these procedures.

Numbers of patients on waiting lists is one measure of unmet demand, and we attempted to get these figures for each Board. New outpatient orthopaedic referral rates were calculated by Board of residence.

This information was obtained on disc from ISD using the SMR1 (inpatients) and SMRO (outpatients). The SMR3 (waiting list) data was not available at the time of writing. Data analysis was carried out by the project team. Information from the public health data set was also used.

The population figures were the resident population by Health Board. Population projections were 1989 based. Rates were standardised by the indirect method using five year age groups and taking the Scottish rates as the standard rates.

Information on the percentage of farm workers in an area was not readily available, and the 1981 census population density was, therefore, used as a measure of rurality.

7.2 Definitions of Procedures

These are similar to those used in the DHA project¹, and the operation codes used are shown in table 1(appendix).

The strict definition of total hip replacements (THR) is the replacement of the femoral head and the acetabulum. For the purpose of estimating district requirements for THR, however, the crucial distinction is between elective procedures and those emergency procedures carried out for fracture. These latter are given priority by immediate admission to hospital.

Because of the uncertainties surrounding current coding practices, the operational definition of elective THR is here taken to be those THRs and hemiarthroplasties undertaken for conditions other than fracture.

Total knee replacements (TKR) include both femoral and tibial components. These are performed almost exclusively as elective procedures.

8. DEMAND ON HEALTH SERVICES

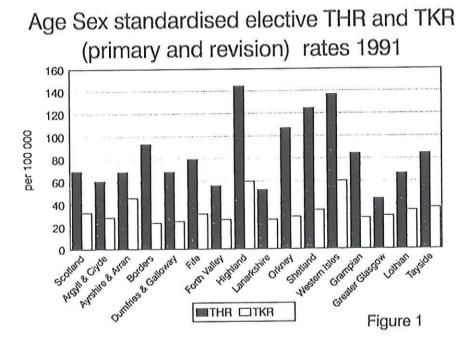
All figures and tables are included in the appendix. A few key figures are also reproduced within the text below for ease of reference. Data by Health Board are grouped in the order non-teaching Boards, island Boards, and teaching Boards.

8.1 Operation Rates

a) Hip replacements - 1991 data

The age and sex standardised rates for 1991 by Board are shown in figure 1 below.

The age and sex specific operation rates for all Scotland and by Board of residence for 1991 are shown in table 2 and in figure 2 (both in the appendix), together with the proportion of operations which were revisions. As can be seen, the operation rates differ markedly according to age and sex and there is widespread variation between Boards.



There is a consistent pattern with the highest rates being in rural or island Boards - Highland, Western Isles, Shetland, Orkney and Borders - Boards likely to have a high population of agricultural workers. The lowest rates are in Greater Glasgow, Lanarkshire and Forth Valley. Indeed, more hip replacements (289) were carried out on Highland residents (population 204 300) than on Lanarkshire residents (population 562 500) - 262 operations.

Examination of the rates for one year alone, however, can give a false picture. In particular, waiting list initiatives in some Boards may have had a significant impact on rates during 1991. In addition, the numbers of operations in any one year in the smaller Boards is very low.

of The replacements - 1307-31 data

Operation rates for 1987-91 are shown in figures 3 and 4 in the appendix, and include emergency cases for comparison.

For elective cases, a similar pattern is shown to the 1991 figures - with Orkney, Western Isles, Highland and Borders having the highest rates and Lanarkshire and Greater Glasgow having the lowest rates. Both for the years 1987-91 combined and for 1991 alone, the elective operation rate in the Board with the highest rate is about three times that in the lowest. For some age groups, the differences are even greater.

c) Relationship with population density

The operation rates (elective and emergency) for local government districts for 1987-91 are shown in figure 5 in the appendix. The correlation with population density from the 1981 census is shown in figure 6 below. A negative correlation can be seen (r = 0.5).

Age standardised THR rates (primary and revisions) 1987-91 against 1981 crude population densities (emergency + elective operations)

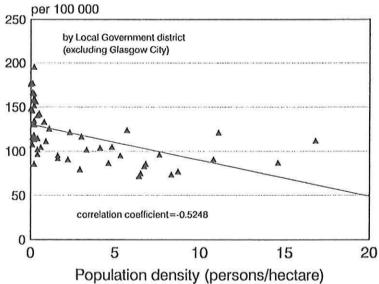


Figure 6

d) Hip replacements - comparison with English rates (table 3 below).

The DHA project provided data on the age and sex specific elective hip replacement rates for England in 1988/89 (column 1 below). It also proposed target age and sex specific rates for hip replacements (column 2 below). Column 3 shows the 1991 Scottish elective THR rates.

Table s

Comparison of 1988/89 English, Target, and 1991 Scottish age and sex specific elective THR per 100,000

	Column 1 Elective THR per 100,000 England 1988/89 NHS + private (estimated)		Column 2 Proposed Target THR per 100 000 (DHA project)		Column 3 Elective THR per 100 000 Scotland 1991 NHS only	
Age	male	female	male	female	male	female
<45	4	4	5	5	3.6	3.4
45-54	30	41	38	50	43.4	51.7
55-64	87	119	106	150	158	154
65-74	204	260	258	323	271	319
75+	219	297	275	370	290	385
Equivalent to a crude population rate of:	54/10	000 000	70/100 000		69/100 000	

The figures in column 1 include an estimate for operations in independent hospitals in England - where the level of private medicine is, in general, higher than in Scotland. The target rates in column 2 apply regardless of whether the procedure is conducted in an NHS or private hospital.

It can be seen that the Scottish NHS hip replacement rates (column 3) currently exceed the English recommended rates (column 2) for all but three groups (men and women <45 and women 65-74).

e) Knee replacements - 1991 data

The age and sex specific operation rates for all Scotland and by Board of residence for 1991 are shown in Table 4 and Figure 7 (both in the appendix) together with the proportion of operations which were revisions. It should be noted that the numbers in the smaller Boards are very low.

The rates of knee replacements are substantially lower in all age groups than those for hip replacement, and there is wide variation between Boards. The highest rates are found in Highland, Western Isles and Ayrshire and Arran, and the lowest rates in Dumfries and Galloway. There is no clear relationship between the level of provision of hip and of knee replacements (figure 1 in the appendix).

f) Knee replacements - 1987-91 data

The public health common data set figures for elective plus emergency replacements have been used as the number of emergency knee replacements is very small.

Age standardised rates for 1987-91 are shown in Figures 8 and 9 in the appendix. Ayrshire and Arran, Highland and Western Isles have the highest rates, with Lanarkshire having the lowest rates.

g) Knee replacements - comparison with English rates

Figure 10 in the appendix shows the 1987-91 Scottish rates together with the rates for the English regions with the highest and lowest rates for 1988-89. It can be seen that the rates in all Boards, except Lanarkshire, exceed the rate in South Western 1988/89, the highest English region.

The DHA project proposed that levels of knee joint replacements should eventually reach the same target levels proposed for THRs. These target figures are shown in table 5 overleaf, together with the 1991 Scottish TKR rates.

Table 5
Comparison of target and 1991 Scottish age and sex specific TKR rates

	Proposed target THR/ TKR per 100 000 (DHA project)		Elective TKR per 100 000 Scotland (1991)		
Age	male	female	male	female	
<45	5	5	0.7	1.8	
45-54	38	50	12.0	17.2	
55-64	106	150	68.5	65.4	
65-74	258	323	143	167	
75+	275	370	143	162	
Equivalent to a crude population rate of:	70/10	00 000	33/10	000	

8.2 <u>Trends Over Time</u>

a) Primary Hip Replacements

Over the past 10 years, there has been a rise in hip replacements, with the overall rate for Scotland doubling since 1981. The rate of increase has now slowed down and seems to be flattening off (Figure 11 opposite).

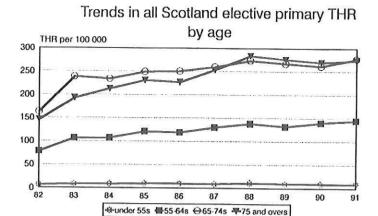


Figure 11

The trends over time for individual Boards compared to the Scottish trends can be seen in Figure 12 in the appendix and there are substantial variations. Most Boards show a marked increase in rates except for Greater Glasgow Health Board where the operation rates seem to have changed little since 1983.

b) Hip Revisions

The trends over time in revisions for all Scotland are shown in Figure 13 below. The rate of increase is more marked in males. The percentage of revisions vary markedly between Boards, and there seems to be no simple relationship with rates of primary replacement in previous years. These rising rates will have considerable impact on services in future.

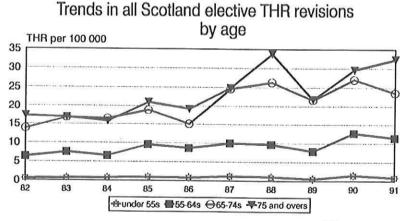
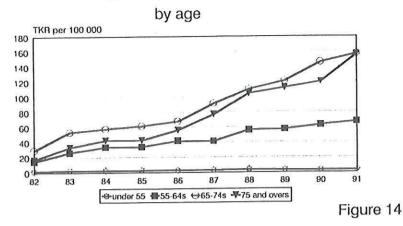


Figure 13

c) Knee Replacements

In contrast to the increase in hip replacements, which is now tailing off, the increase in knee replacements is dramatic, and continuing to rise (Figure 14 overleaf). The increasing demand for such operations is likely to be a major factor influencing the need for resources over the next few years.

Trends in all Scotland elective TKR (primary and revisions)



d) Length of Stay

There has been a continuing fall in the length of stay for hip replacements from 23 days in 1982 to 17 days in 1991. Length of stay for primary replacements (1991) varies between Boards from 13.08 days in Fife to 20.6 days in Shetland residents (Figure 15 in appendix). Length of stay for hip revisions is substantially longer than for primary surgery. The length of stay after a knee replacement is similar to that after a hip replacement.

e) Age at Operation

There has been a relatively small increase in the age at first operation from 1982-1991 - both for men and for women. The average age is now 65.5 years for men and 68.5 years for women.

Somewhat surprisingly, the average age at revision for women is little different from the age at first replacement. For men, age at first revision is 67.5 years - two years older than for primary replacement. Further study - including record linkage - of the reason for this is needed.

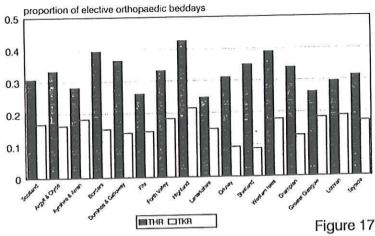
The variation in age at first operation between Boards is shown in Table 6 in the appendix. Lanarkshire and Greater Glasgow Health Boards, with low operation rates also have low age at first operation. Age at revision in Western Isles and for women in Shetland is substantially higher than for other Boards, but the numbers are relatively small.

8.3 Orthopaedic Service Utilisation Data

While both hip replacements and knee replacements are a relatively small percentage of total orthopaedic discharges (Figure 16 in the appendix), they use a very high proportion of total elective orthopaedic bed days - for most Boards, 40-50% of the elective bed days in the specialty (Figure 17 opposite).

It is obvious that any increase in these procedures will have a substantial resource implication in future years.

Proportion of elective orthopaedic beddays 1991 accounted for by elective THR and TKR



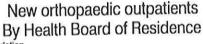
8.4 Waiting Lists

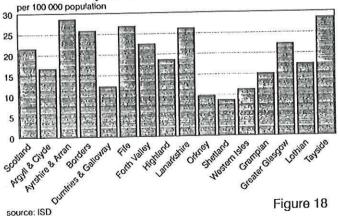
Both hip and knee replacements are procedures for which Boards must give guaranteed maximum waiting times, so accurate data on the numbers of patients waiting is essential, together with the length of time they have been waiting.

This information is included in the new SMR3 system, but so far no accurate data is available on this nationally. Figures should be available early in 1993.

8.5 Outpatient Referral Rates

New referral rates for orthopaedic outpatient clinics are shown for all Boards (Figure 18 below). It might be expected that Boards with a high demand for orthopaedic services in general, as measured by outpatient referral rates, would also have a high demand for joint replacement. There is, however, no correlation between outpatient referral rates and joint replacement rates. Indeed, the Island Boards and Highland with high operation rates have low referral rates, possibly reflecting their less easy access to clinics.





9. DISCUSSION

Total hip replacement and total knee replacement have been shown to be costeffective procedures. ¹

The appropriate level of provision in an area will be determined by the following factors:

- a) The numbers in the population with symptomatic disease who could benefit from joint replacement. This should take account of any high risk groups in the community.
- b) The demographic profile and future population projections.
- c) The access of the population to services that is, the criteria for referral to an outpatient clinic and the criteria for selection for surgery.

Osteoarthritis of the hip is an important cause of pain and disability in older people. The best estimates suggest about 5% of men and women over the age of 60 years suffer symptoms severe enough to warrant total hip replacement, but there is no upto-date work to support this.

Evidence is emerging that the prevalence of hip osteoarthritis is higher in farm workers than in other subjects, and this is especially so in those who have farmed for more than 10 years (odds ratio 9.3). This may be one reason for the higher hip replacement rates in the islands and in some rural Boards. Using population density as a proxy measure for the proportion of farm workers in a district, we found a negative correlation with hip replacement rates - supporting this theory.

The age and sex specific hip replacement rates for Scotland in 1991 exceed the levels recommended for England and Wales in the DHA report for most age groups. The DHA report, however, did not take into account the likely variation in need in different areas as a result of the proportion of the population in high risk groups, such as farm workers. The need for hip revision operations is also likely to vary in relation to previous operation rates in an area (the more operations carried out, the more hips will need revised in future years). We do not therefore, support the view that the need for hip replacements, and therefore the recommended levels of provision, should be the same for all Boards.

Hip replacement rates in some large urban Boards - Greater Glasgow and Lanarkshire - are substantially lower than the Scottish average, with no increase in recent years, particularly in Greater Glasgow. The rates in Lothian (also predominantly urban), however, are much closer to the Scottish average, raising questions about why Glasgow and Lanarkshire should be so low.

The impact of demographic changes on the need for elective joint replacements must be considered by each Board in the light of its own population projections. Overall, the Scottish figures (Figure 19 in the appendix) do suggest a small increase in need for THR over the next 15 years as a direct result of demographic changes, but there are substantial variations between Boards, which must take account of local figures.

We conclude that definitive recommendations on appropriate levels of provision must await dedicated population studies which should include both urban and rural Boards. In the absence of such studies we think there is a need for a small increase in the number of elective hip replacements in Scotland to take account of demographic changes over the next 15 years.

No evidence is currently available on the proportion of people in the community who are able to benefit from knee replacement. As knee osteoarthritis is at least as common as hip osteoarthritis, however, the problem is likely to be at least equal in size.

Current levels of knee replacements are substantially lower than for hip replacements, and the trend in recent years in Scotland has been increasing sharply. We support the view that the overall need for TKRs is likely to be comparable to that for THRs, as recommended in the DHA report. No high risk groups have as yet been identified, so there is no current evidence to suggest that the need varies substantially between Boards. Population studies are required to give accurate figures for appropriate level of provision. In anticipation of these, however, we support the view that provision of TKRs should increase. This will have major resource implications for Boards, and the real need for other less cost-effective procedures must be considered in the light of this, assuming limited resources in future.

One major determinant of the level of provision in an area is the ease of access to services by those in need. Equitable provision of services to meet need should be one aim of the National Health Service. At present, there are no agreed criteria for referral by GPs to outpatient clinics, for inclusion of patients on waiting lists or indeed, for suitability for joint replacements. These criteria will vary between Boards.

There is a need to develop guidelines for:

- a) appropriate stage in the disease for referral to outpatient clinics.
- b) appropriate selection criteria for primary joint replacement.
- c) appropriate selection criteria for joint revision.

Currently the absence of such criteria make the interpretation of waiting list statistics for the Boards very difficult. Such guidelines should be drawn-up locally, involving clinicians, GPs and purchasers. Some degree of consistency between Boards, however, would be valuable and co-ordination at national level should be considered.

Finally, although this report concludes that each Board must carry out their own needs assessment to take account of local circumstances, we feel there are clear advantages in co-operation between Boards to look at comparative data on a national basis.

10. ISSUES FOR PURCHASING

- i) Total hip replacement and total knee replacement must be viewed in the wider context of policies for the prevention and management of the disabilities which result from arthritis.
- ii) Boards must examine their own current age and sex specific operation rates, population projections and other risk factors to determine their future needs for both THR and TKR. They should also take account of the views of their local providers and consumers.
- iii) The need for hip replacements will vary between Boards according to the proportion of farm workers and any other high risk groups in their population. At Scottish level, it is likely there will be a need for a small increase in the provision of THR over the next 15 years to take account of demographic changes. The need for revisions will increase and will be related to current and previous levels of activity.
- iv) There is a substantial unmet need for TKR and provision should be increased. Revisions will also increase in future. This will have major resource implications.
- v) The need for THR and TKR cannot be considered in isolation from the need for other orthopaedic services. Appropriate levels of provision of other less effective orthopaedic procedures must be assessed in the light of the resource implications of increased rates of joint replacements.
- vi) Accurate SMR3 data is essential to monitor numbers waiting and the waiting time for operations. This should be made available as a priority.
- vii) Purchasers should require medical audit in provider units to address revision rates, timing of revisions and complication rates. This would provide easily accessible national data over the next few years.
- viii) Guidelines/protocols should be drawn up for:
 - a) Outpatient referral for hip/knee osteoarthritis.
 - b) Appropriate selection criteria for primary joint replacement.
 - c) Appropriate selection criteria for revision.

This should be done locally involving clinicians and GPs and purchasers and should be initiated by purchasers in contracts. A national audit of guidelines to ensure comparable criteria would be valuable.

ix) Outcome measures (including pain relief and mobility as well as readmission rates and mortality) should be developed as a matter of priority and included in contracts.

11. RECOMMENDATIONS FOR FURTHER RESEARCH

- i) A population study is urgently needed to determine the prevalence of disease which could benefit from hip or knee replacement. This should be set up as a matter of priority and should include both urban and rural Boards.
- ii) Research into the underlying causes of osteoarthritis is essential, with the long-term aim of primary prevention.
- iii) Improved data on revision rates and timing of revisions should be developed. This will require record linkage studies and better routine data on operations (for example, specifying the side of operation right or left).
- iv) Research is needed into the factors which affect loosening of prostheses for example, surgical technique, low grade infection, age, sex, weight.
- v) A full assessment of need for treatment (including THR) of fractured femurs in the elderly should be carried out. The underlying pathology and potential for prevention is quite different from the diseases requiring elective THR and TKR.

TABLES

Operation codes Table 1 Age and sex specific rates of THR primary and revision by Board of Table 2 Residence 1991. Rates of current English (1988/89), target and current Scottish (1991) Table 3 elective THR. Age and sex specific rates of TKR primary and revision by Board of Table 4 Residence 1991. Rates of target and current Scottish (1991) elective TKR. Table 5 Average age at elective primary and revision THR by Health Board of Table 6 Residence 1987-91.

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FIGURES 1991 Age sex standardised THR & TKR rates (primary and revision) Figure 1 by Health Board of residence. Age specific THR rates 1991 By Health Board of residence. Figure 2 Age standardised THR rates 1987-91 elective and emergency by sex Figure 3 and Health Board of residence. Comparison of crude operation rates of elective only and elective & Figure 4 emergency THR 1987-1991. Age standardised THR rates (elective + emergency) by local Figure 5 government district. Correlation of population density and hip operation rates by local Figure 6 government district. Age specific TKR rates by Health Board of residence 1991. Figure 7 Age standardised TKR rates 1987-1991 elective and emergency. Figure 8 Comparison of elective only and elective & emergency TKR rates Figure 9 1987-1991. Comparison of English and Scottish crude TKR rates. Figure 10 Trends in all Scotland elective hip replacements 1982-1991. Figure 11 Trends in elective THR rates by Board 1982-1991 age and sex Figure 12 standardised to Scotland 1982. Trends in all Scotland elective THR (revisions) 1982-1991. Figure 13 Trends in all Scotland TKR rates 1982-1991. Figure 14 1991 Average stay for THR (primary and revisions) by Health Board of Figure 15 residence. Proportion of elective orthopaedic discharges. 1991 accounted for by Figure 16 elective THR and TKR by Health Board of residence. Proportion of elective orthopaedic bed days accounted for by elective

- Figure 17 THR and TKR by Health Board of residence.
- New orthopaedic outpatients Apr-Dec 1991 by Health Board of Figure 18 residence.
- Population projections for Scotland to 2006. Figure 19

Operation codes:

A) 1988 to present; OPCS Operation Codes, 4th revision. The relevant codes are shown below.

Code	Operation
W37-W39	Total hip replacements
W40-W42	Total knee replacements
W46-W48	Hemiarthroplasty*
	ent of the femoral head only.

It is important to acknowledge that there is diversity in coding practice. Here operations are considered to be primary where the third digit is .1, .8 or .9, and a revision procedure where the third digit is .2, .3 or .0.

B) 1975-1987 data; OPCS Operation Codes, 3rd revision. The relevant codes are shown below. The 4th digit codes differ from those used in the DHA report due to a different coding practice in Scotland.

Code	Operation
810.0,.9	Total hip replacement
810.5	Revision of a total hip replacement
811.0,.9	Hemiarthroplasty
811.5	Revision of hemiarthroplasty
812.0,.9	Total knee replacement
812.5	Revision of a total knee replacement

The definition of THR above is therefore taken as corresponding to cases receiving operations coded 810 and 811 (or W37-W39/W46-W48) where the underlying ICD code is not fracture of neck of femur (ICD 820).

TKR is taken as corresponding to operations coded 812 (or W40-W42).

Age and Sex specific rates of elective THR 1991 By Health Board of Residence

MALES UNDER 55yr	3			FEMALES UND	ER 55yrs	
Health Board	total number	% revisions	rate per	total number	% revisions	rate per
of Residence	of THR		100 000	of THR		100 000
						11
Scotland	183	11%	9.5	207	11%	22
Argyll & Clyde	17	12%	10.2	18	17%	18.9
Ayrshire & Arran	21	10%	15.1	11	9%	24.6
Borders	2	0%	5.5	6	33%	22.4
Dumfries & Galloway	4	25%	7.5	3	0%	16.7
Fife	19	0%	14.5	14	7%	18.9
Forth Valley	9	11%	8.8	8	25%	29.2
Highland	17	6%	21.8	16	6%	34.7
Lanarkshire	14	29%	6.4	29	17%	27.5
Orkney	2	50%	27.5	1	0%	37.3
Shetland	2	0%	22.8	2	0%	71
Western Isles	1	0%	8.7	5	0%	57.9
Gramplan	14	14%	7.1	19	0%	17.2
Greater Glasgow	22	5%	6.4	24	0%	17.5
Lothlan	29	14%	10.2	29	14%	23.8
Tayside	10	10%	7	19	16%	13.4

MALES 55-64yrs				FEMALES 55-	64yrs	
Health Board	total number	% revisions	rate per	total number	% revisions	rate per
of Residence	of THR		100 000	of THR		100 000
Scotland	400	9%	157.6	441	10%	155.2
Argyll & Clyde '	30	3%	136.2	31	6%	125.1
Ayrshire & Arran	30	17%	156.9	33	18%	154.7
Borders	6	0%	111.3	20	10%	327,5
Dumfries & Galloway		8%	153.8	14	14%	153.3
Flfe	34	9%	204.4	28	14%	151.3
Forth Valley	21	14%	153.2	22	5%	147.1
Highland	25	8%	240.1	41	7%	370.5
Lanarkshire	34	3%	123.3	46	11%	148.7
Orkney	1	0%	101.7	3	0%	309.6
Shetland	2	0%	247.2	4	0%	411.9
Western Isles	2 6	17%	374.8	3	0%	194.3
Grampian	52	15%	215.6	44	9%	165.7
Greater Glasgow	51	12%	108.5	50	10%	91.8
Lothlan	58	5%	164	63	10%	158.4
Tayslde	36	6%	174.3	37	8%	160

Age and Sex specific rates of elective THR 1991 By Health Board of Residence

MALES 65-74yrs				FEMALES 65-	74vrs	
Health Board	total number	% revisions	rate per	total number	% revisions	rate per
of Residence	of THR	701010110	100 000	of THR	70101010	100 000
or modiatino	Or IIIII		100 000	01 11111		
Scotland	508	13%	272	795	7%	322.2
Argyll & Clyde	. 28	7%	180.7	63	6%	299.1
Ayrshire & Arran	32	16%	225.6	58	9%	311.5
Borders	21	5%	446.8	28	7%	486.7
Dumfries & Galloway		14%	316.6	26	8%	323.1
Fife	44	11%	332.1	61	7%	361.4
Forth Valley	18	33%	182.3	35	6%	271.4
Highland	45	16%	616.9	59	5%	634.5
Lanarkshire	39	5%	213.1	49	6%	203.8
Orkney	3	0%	400	7	14%	724.6
Shetland	ĭ	0%	146.6	6	0%	641
Western Isles	6	17%	488.2	11	9%	713.4
Gramplan	67	21%	384.8	77	6%	346.1
The state of the s	50	16%	145.1	109	7%	225.4
Greater Glasgow Lothlan	71	6%	266.3	114	9%	323.3
						394.1
Tayside	55	15%	347.8	82	9%	394.1
MALES OVER 75yrs				FEMALES OVE	R 75yrs	
Health Board	total number	% revisions	rate per	total number	% revisions	rate per
of Residence	of THR		100 000	of THR		100 000
Scotland	310	16%	289.7	694	14%	314.1
Argyll & Clyde	16	19%	186.2	57	16%	314.5
Ayrshire & Arran	28	11%	363.1	48	10%	294.5
Borders	8	25%	259.7	22	14%	373.6
Dumfries & Gallowa	y 16	25%	419.6	17	6%	238.4
Fife	24	0%	318.2	52	8%	343.6
Forth Valley	11	9%	195.4	25	24%	228.9
Highland	26	27%	576.5	60	15%	700
Lanarkshire	11	0%	124.9	40	8%	223.5
Orkney	1	0%	170.6	4	0%	431.5
Shetland	2	50%	367.6	6	0%	628.3
Western Isles	4	50%	414.9	11	27%	586.4
Gramplan	54	13%	498.1	80	11%	377
	20	120/	160.4	02	150/	210 1

13% 28% 13% 158.4 203.7 471.6

30

32

46

92

97

78

15%

21%

15%

218.1

286.9

390.3

Greater Glasgow

Lothlan

Tayside

Table 3

Comparison of 1988/89 English, Target, and 1991 Scottish age and sex specific elective THR rates per 100,000

	Colur	nn I	Column 2		Column 3	
	Elective THR rates England 1988/89		Proposed Target THR rates (DHA project)		Elective THR rates Scotland 1991	
Age	male	female	male	female	male	female
<45	4	4	5	5	3.6	3.4
45-54	30	41	38	50	43.4	51.7
55-64	87	119	106	150	158	154
65-74	204	260	258	323	271	319
75+	219	297	275	370	290	385
Equivalent to crude population rates of:	54/1	00 000	70/100 000		69/100 000	

Age and Sex specific rates of elective TKR 1991 By Health Board of Residence

MALES UNDER 55				FEMALES UNI	DER 55vre	
Health Board of Residence	total number of TKR	% revisions	rate per 100 000	total number	% revisions	rate per
Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland Western Isles Grampian Greater Glasgow Lothian	46 2 1 1 1 2 6 7 8 1 0 0 6 2	7% 0% 0% 0% 0% 50% 0% 14% 0% 0% 0%	2.4 1.2 0.7 2.7 1.9 1.5 5.9 9 3.7 13.7 0 0 3.1	of TKR 80 5 2 2 4 5 3 8 5 1 1 0 8 18	18% 60% 0% 0% 0% 0% 13% 20% 0% 0% 0% 0% 0% 39%	4.2 3.1 1.4 5.6 7.7 3.9 3 10.6 2.3 14.1 11.6 0 4.3 5.3
Tayside	5 4	0% 0%	1.8 2.8	9 8	22% 0%	3.2 5.7

MALES 55-64yrs Health Board	total acceptance			FEMALES 55-	-64yrs	
of Residence	total number of TKR	% revisions	rate per 100 000	total number of TKR	% revisions	rate per 100 000
Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland	174 18 24 2 8 13 7 8 11 0	6% 11% 4% 0% 0% 0% 0% 18% 0%	68.5 81.7 125.5 37.1 94.6 78.2 51.1 76.8 39.9 0	186 13 13 3 9 16 9 16	8% 8% 0% 0% 11% 13% 0% 6% 14%	65.4 52.5 61 49.1 98.5 86.5 60.2 144.6 45.3 0
Western Isles Grampian	2	0% 0%	124.9	2 3	0% 0%	206 194.3
Greater Glasgow Lothian	34 18	9% 0%	29 72.3 50.9	17 27	0% 11%	64 49.6
Tayside	20	10%	96.8	25 16	8% 6%	62,9 69,2

Age and Sex specific rates of elective TKR 1991 By Health Board of Residence

MALES 65-74yrs Health Board of Residence	total number of TKR	% revisions	rate per 100 000	FEMALES 65— total number of TKR	% revisions	rate per 100 000
	267	9%	143	412	6%	167
Scotland	13	0%	83.9	31	10%	147.2
Argyll & Clyde	35	9%	246.7	47	0%	252.4
Ayrshire & Arran	5	0%	106.4	11	27%	191.2
Borders	6	0%	90.4	5	0%	62.1
Dumfries & Galloway	18	11%	135.8	23	9%	136.2
Fife	12	0%	121.6	19	11%	147.4
Forth Valley	16	19%	219.3	27	0%	290.4
Highland	25	8%	136.6	31	16%	128.9
Lanarkshire	25 1	0%	133.3	1	0%	103.5
Orkney	1	0%	146.6	1	0%	106.8
Shetland	2	0%	162.7	6	0%	389.1
Western Isles	15	7%	86.2	43	0%	193.3
Grampian	51	10%	148	72	6%	148.9
Greater Glasgow	40	15%	150	66	9%	187.2
Lothian	25	8%	158.1	29	3%	139.4
Tayside	20		1.50553			
MALES OVER 75y Health Board	total number	% revisions	rate per	FEMALES OVI total number of TKR	ER 75yrs % revisions	rate per 100 000
	rs total number of TKR	% revisions	rate per 100 000	total number of TKR	% revisions	100 000
Health Board of Residence	total number of TKR	% revisions		total number of TKR 358	% revisions	100 000
Health Board of Residence Scotland	total number of TKR 153		100 000	total number of TKR 358 34	% revisions 5% 3%	100 000 162 187.6
Health Board of Residence Scotland Argyll & Clyde	total number of TKR	6%	100 000 143 69.8 194.5	total number of TKR 358 34 37	% revisions 5% 3% 8%	100 000 162 187.6 227
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran	total number of TKR 153 6 15	6% 17%	100 000 143 69.8	total number of TKR 358 34 37 3	% revisions 5% 3% 8% 0%	100 000 162 187.6 227 51
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders	total number of TKR 153 6 15 2	6% 17% 0%	100 000 143 69.8 194.5	total number of TKR 358 34 37 3 5	% revisions 5% 3% 8% 0% 0%	100 000 162 187.6 227 51 70.1
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway	total number of TKR 153 6 15 2	6% 17% 0% 0%	100 000 143 69.8 194.5 64.9	total number of TKR 358 34 37 3 5 20	% revisions 5% 3% 8% 0% 0% 10%	100 000 162 187.6 227 51 70.1 132.2
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway	total number of TKR 153 6 15 2 4 14	6% 17% 0% 0% 25%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4	total number of TKR 358 34 37 3 5 20 7	% revisions 5% 3% 8% 0% 0% 10%	100 000 162 187.6 227 51 70.1 132.2 64.1
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley	total number of TKR 153 6 15 2 4 14 7	6% 17% 0% 0% 25% 7%	100 000 143 69.8 194.5 64.9 104.9 185.6	total number of TKR 358 34 37 3 5 20 7 28	% revisions 5% 3% 8% 0% 0% 10% 0%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland	total number of TKR 153 6 15 2 4 14 7	6% 17% 0% 0% 25% 7% 14%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4	total number of TKR 358 34 37 3 5 20 7 28 24	% revisions 5% 3% 8% 0% 0% 10% 0% 0% 8%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire	total number of TKR 153 6 15 2 4 14 7 10	6% 17% 0% 0% 25% 7% 14% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7	total number of TKR 358 34 37 3 5 20 7 28 24	% revisions 5% 3% 8% 0% 10% 0% 0% 8%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney	total number of TKR 153 6 15 2 4 14 7 10 12	6% 17% 0% 0% 25% 7% 14% 0% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3	total number of TKR 358 34 37 3 5 20 7 28 24 4	% revisions 5% 3% 8% 0% 10% 0% 0% 8% 0%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland	total number of TKR 153 6 15 2 4 14 7 10 12 2 2	6% 17% 0% 0% 25% 7% 14% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3 341.3 367.6 414.9	total number of TKR 358 34 37 3 5 20 7 28 24 4 0	% revisions 5% 3% 8% 0% 10% 0% 0% 6% 0% 0% 0%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2 0
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland Western Isles	total number of TKR 153 6 15 2 4 14 7 10 12 2 2 4	6% 17% 0% 0% 25% 7% 14% 0% 0% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3 341.3 367.6	total number of TKR 358 34 37 3 5 20 7 28 24 4 0 0 27	% revisions 5% 3% 8% 0% 0% 10% 0% 0% 0% 0% 8% 0% 0% 4%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2 0 0 127.2
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland Western Isles Grampian	total number of TKR 153 6 15 2 4 14 7 10 12 2 2 4 11	6% 17% 0% 0% 25% 7% 14% 0% 0% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3 341.3 367.6 414.9 101.5 95	total number of TKR 358 34 37 3 5 20 7 28 24 4 0 0 0	% revisions 5% 3% 8% 0% 0% 10% 0% 8% 0% 0% 4% 3%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2 0 0 127.2 151.7
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland Western Isles Grampian Greater Glasgow	total number of TKR 153 6 15 2 4 14 7 10 12 2 2 4 11 18	6% 17% 0% 0% 25% 7% 14% 0% 0% 0% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3 341.3 367.6 414.9 101.5	total number of TKR 358 34 37 3 5 20 7 28 24 4 0 0 27 64	% revisions 5% 3% 8% 0% 0% 10% 0% 8% 0% 0% 4% 3% 3%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2 0 0 127.2 151.7 195.2
Health Board of Residence Scotland Argyll & Clyde Ayrshire & Arran Borders Dumfries & Galloway Fife Forth Valley Highland Lanarkshire Orkney Shetland Western Isles Grampian	total number of TKR 153 6 15 2 4 14 7 10 12 2 2 4 11	6% 17% 0% 0% 25% 7% 14% 0% 0% 0% 0% 0%	100 000 143 69.8 194.5 64.9 104.9 185.6 124.4 221.7 136.3 341.3 367.6 414.9 101.5 95	total number of TKR 358 34 37 3 5 20 7 28 24 4 0 0 0	% revisions 5% 3% 8% 0% 0% 10% 0% 8% 0% 0% 4% 3%	100 000 162 187.6 227 51 70.1 132.2 64.1 326.6 134.1 213.2 0 0 127.2 151.7

Target and 1991 Scottish age and sex specific TKR rates

Table 5

	Proposed target THR/ TKR rates (DHA project)		Elective TKR rates Scotland (1991)		
Age	male	female	male	female	
<45	5	5	0.7	1.8	
45-54	38	50	12.0	17.2	
55-64	106	150	68.5	65.4	
65-74	258	323	143	167	
75+	275	370	143	162	
Equivalent to crude population rates of:	70/100 000		33/100 000		

Table 6
Average age at elective primary and revision THR
by Health Board of Residence 1987-91

Health Board of	age at primary	age at revision	age at primary	age at revision
residence	replacement		replacement	07.0
Argyll & Clyde	64.02	66.46	67.43	67.9
Ayrshire &	64.63	65.08	67.55	65.24
Arran		61.00	68.70	60.85
Borders	65.77	61.00		27.04
Dumfries &	66.07	69.8	67.39	67.31
Galloway Fife	64.87	66.32	67.61	65.56
Forth Valley	64.72	68.76	66.79	69.02
Highland	65.88	70.28	68.11	69.31
Highliand				20.57
Lanarkshire	63.42	65.54	65.6	60.57
Orkney	68.07	63.22	66.95	67.60
			67.37	73.75
Shetland	63.56	67.00	67.37	
Western Isles	67.06	73.33	68.57	74.67
Grampian	66.5	67.57	68.06	68.36
Grampia.			07.70	68.54
Greater	63.81	62.88	67.79	
Glasgow	65.1	66.67	67.89	68.16
Lothian	05.1	00.07		
Tayside	67.07	69.37	69.42	67.81

Age Sex standardised elective THR and TKR (primary and revision) rates 1991

Figure 1

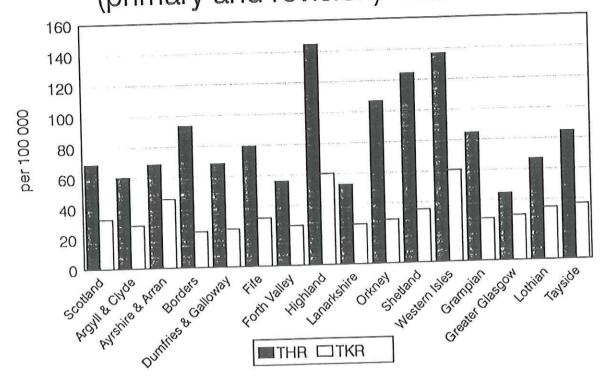
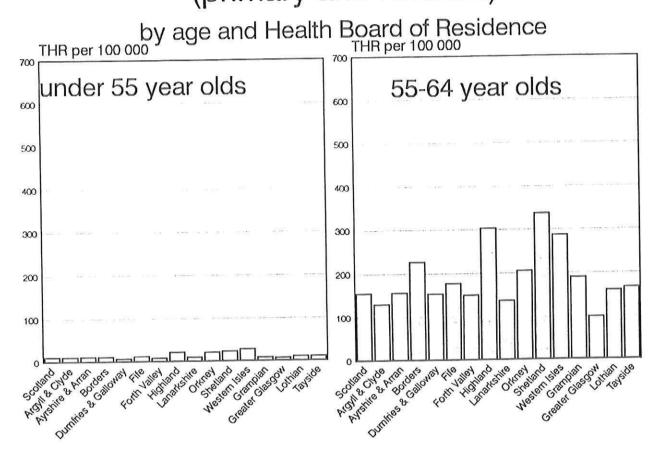
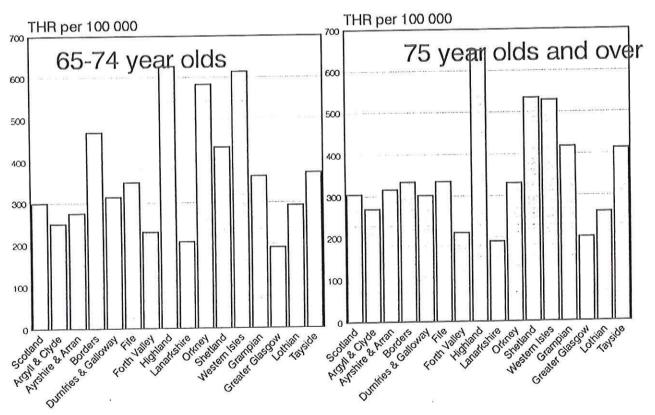


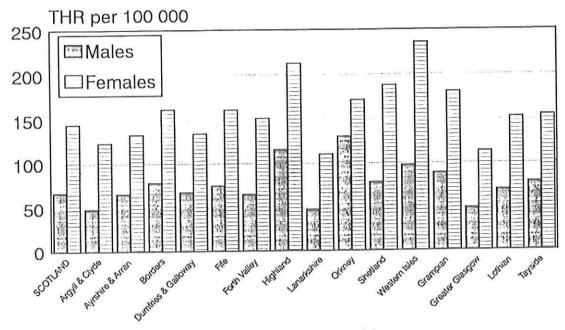
Figure 2

1991 Elective THR rates (primary and revision)



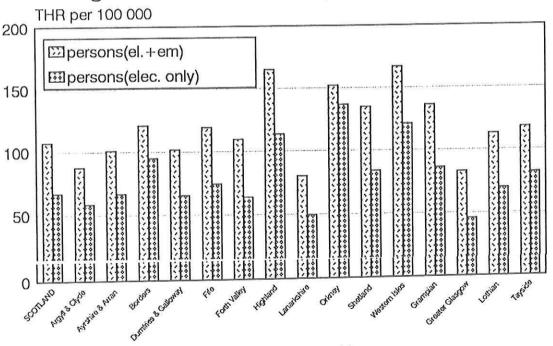


Age standardised THR rates 1987-91 (elective and emergency, primary and revisions)



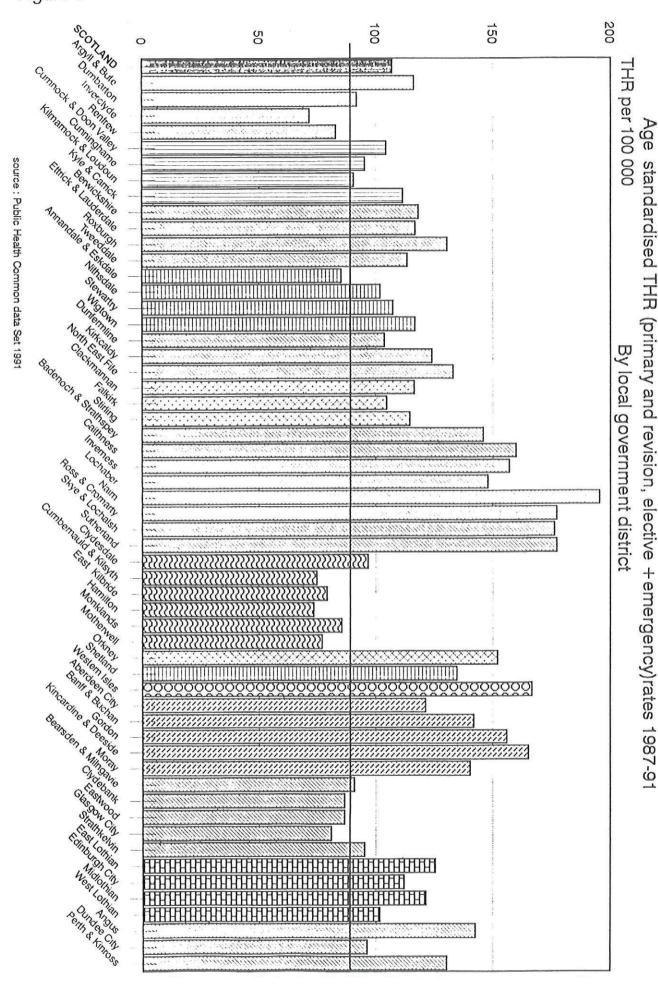
Health Board of Residence source : Public Health Common Data Set

Figure 4
Comparison of elective only and
elective & emergency THR
Age standardised rates , Scotland 1987-91

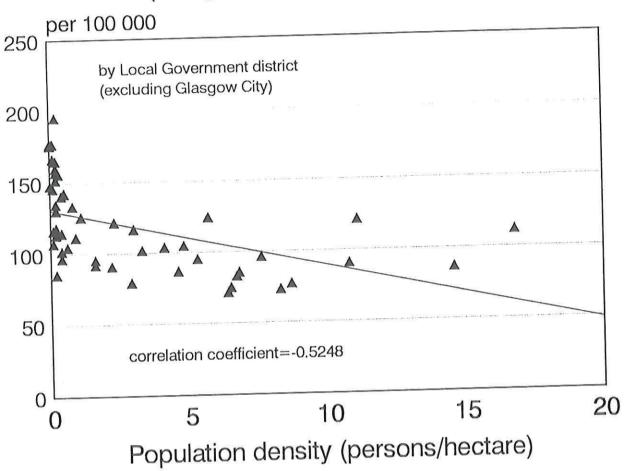


Health Board of Residence source : Public Health Common Data Set & SNAP project

Figure 5



Age standardised THR rates (primary and revisions) 1987-91 against 1981 crude population densities (emergency + elective operations)

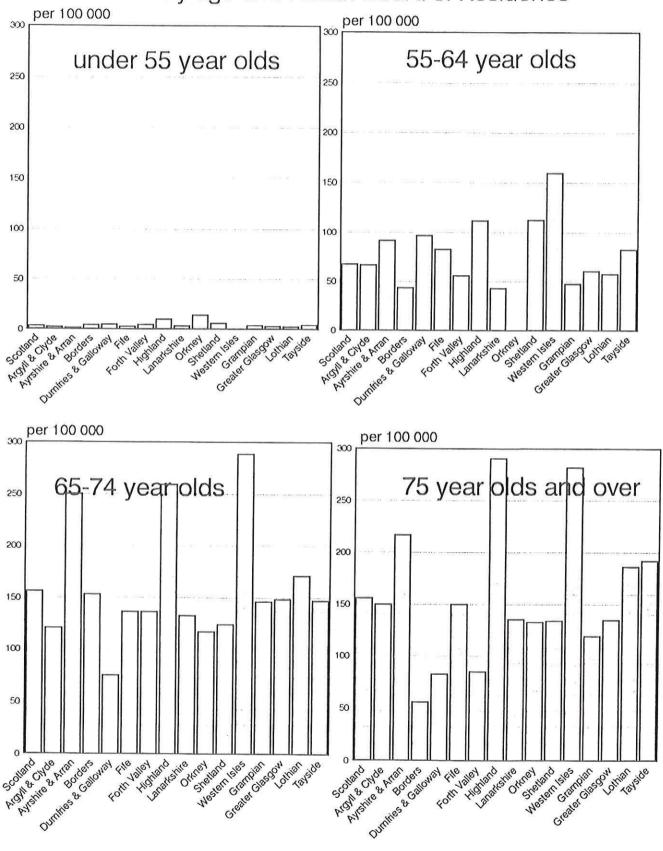


source: Public Health Common Data set 1991, 1981 Census.

Figure 7

1991 Elective TKR rates (primary and revisions)

by age and Health Board of Residence



Age standardised TKR rates 1987-91

(primary and revision, elective and emergency)

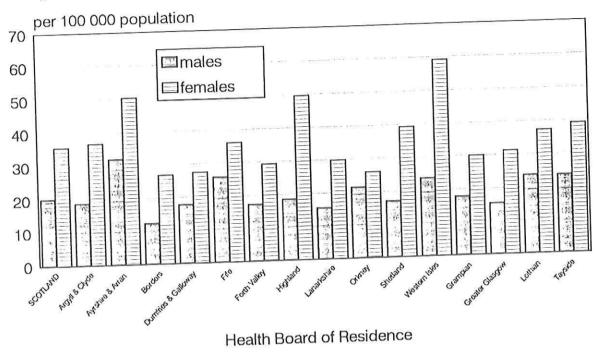


Figure 9

Age standardised elective TKR (primary and revisions) 1987-1991

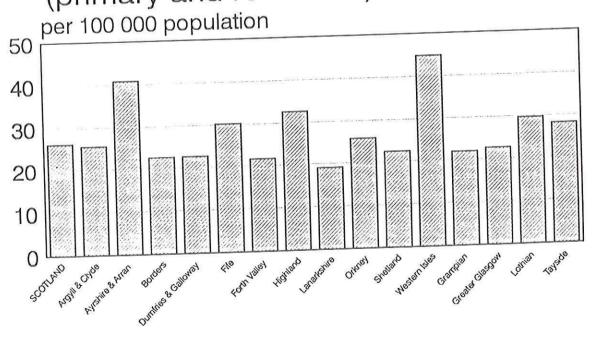
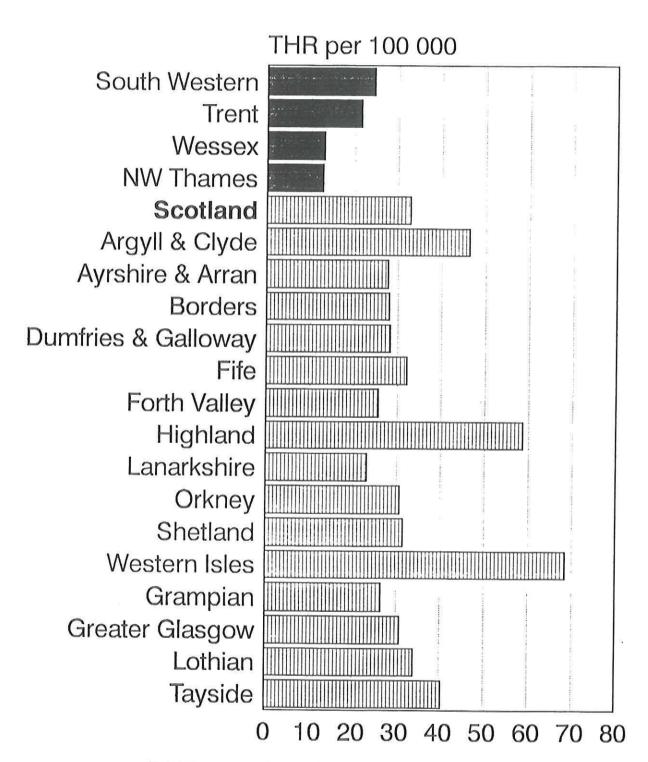


Figure 10

Comparison of English and Scottish crude TKR rates

English highest and lowest RHAs 88/89 (including private) & Scotland 1991



source: DHA report and present study

Figure 11

Trends in all Scotland elective primary THR

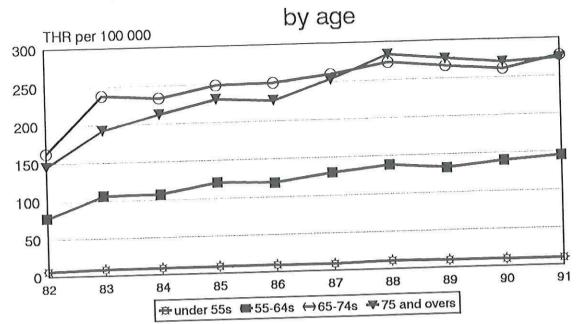


Figure 12

Trends in THR rates 1982-91

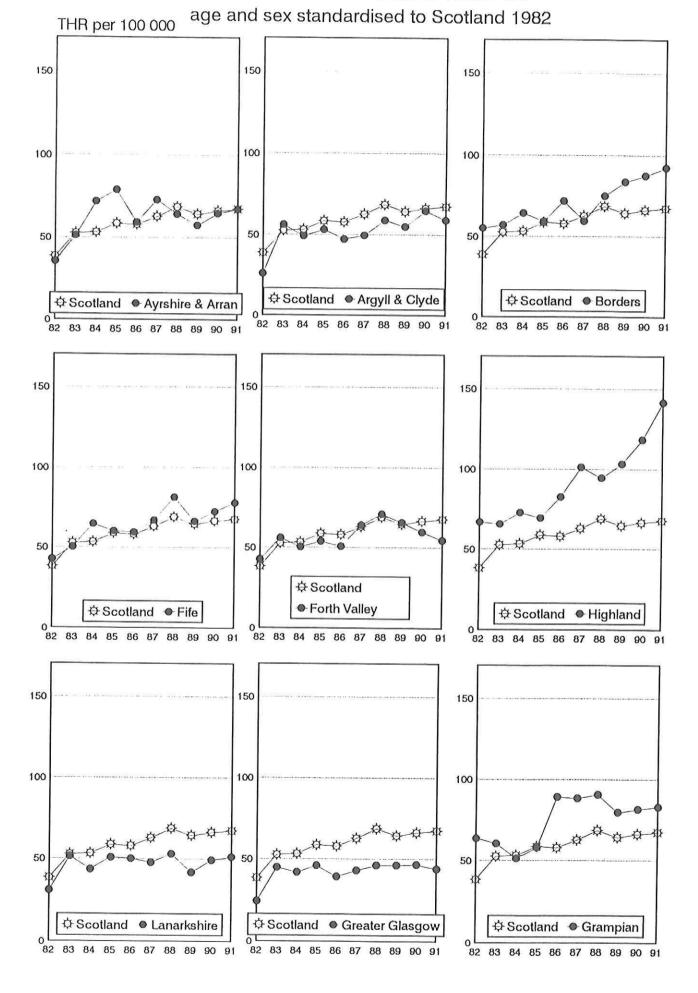


Figure 12 continued

Trends in THR rates 1982-91

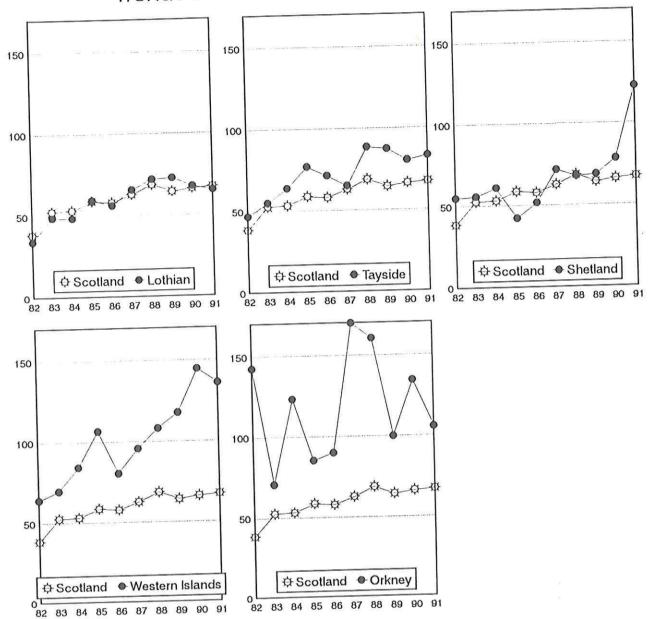


Figure 13

Trends in all Scotland elective THR revisions

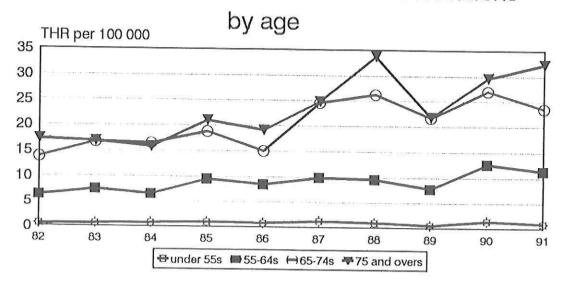


Figure 14

Trends in all Scotland elective TKR (primary and revisions)

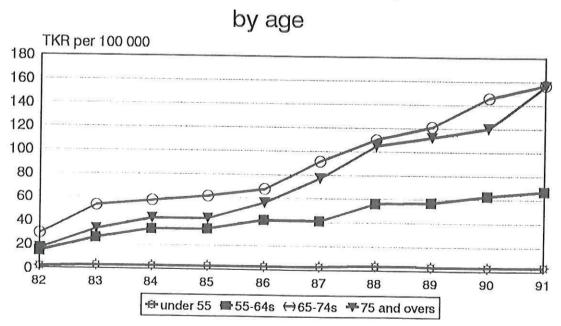
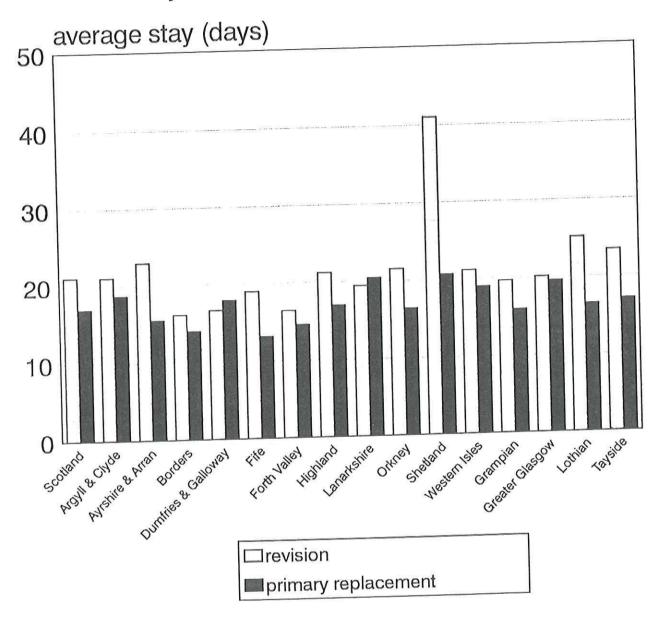


Figure 15

1991 Average stay for THR (primary and revisions) by Health Board of Residence



Proportion of elective orthopaedic discharges 1991 accounted for by elective THR and TKR

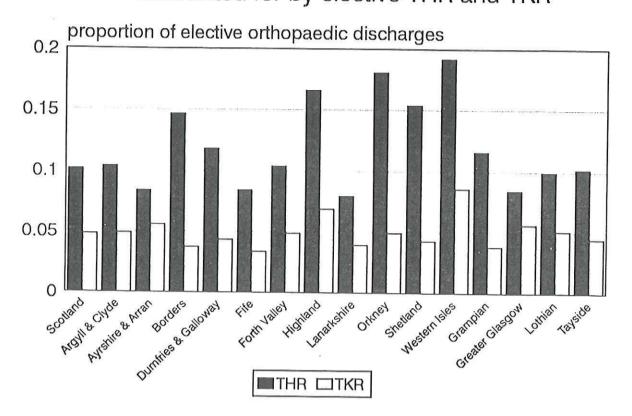
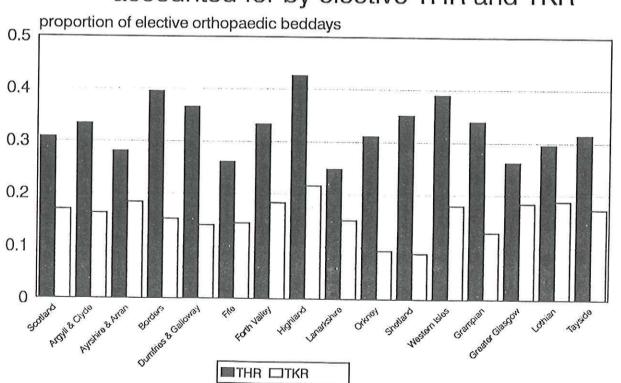
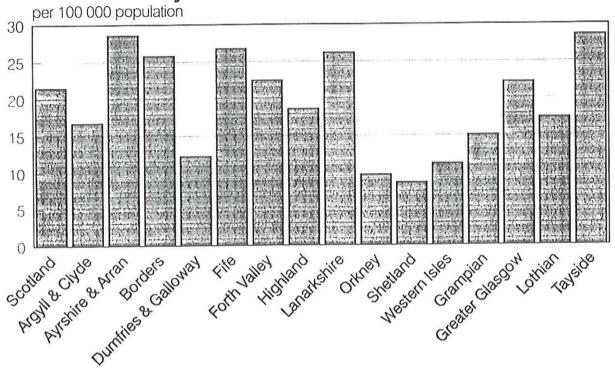


Figure 17
Proportion of elective orthopaedic beddays 1991
accounted for by elective THR and TKR



New orthopaedic outpatients By Health Board of Residence



source: ISD

