# PAPERS AND ORIGINALS

# Mortality, morbidity, resource allocation, and planning: a consideration of disease classification

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## Summary and conclusions

**The report of the Resource Allocation Working Party recommended that revenue allocations to health authorities should be based, in part, on national patterns of bed usage and local standardised mortality ratios for conditions aggregated according to the chapters of the International Classification of Diseases (ICD). Similar criteria are now being considered for planning purposes by regions.**

**The extent to which diseases which commonly result in the use of hospital care are also common causes of deaths within their ICD chapter was studied. National utilisation figures show that most beds in ophthalmology, ear, nose, and throat surgery, gynaecology, and consultant dentistry, and an estimated one-third or more of the beds used in general surgery, neurosurgery, and plastic surgery, are used for the treatment of conditions which are uncommon causes of death, both in absolute terms and relative to their ICD chapters.**

**It seems unlikely that the requirements for care of patients with these diseases can be measured simply, either by all-causes mortality statistics, or by the use of mortality statistics ascribed to the ICD chapter which such diseases share with other, more common, causes of death. Consideration needs to be given to the diseases treated by each specialty in deciding whether and how to apply mortality statistics in planning for and funding the specialty.**


## Introduction

The Report of the Resource Allocation Working Party[1] (RAWP) recommended that the revenue allocated to health authorities should reflect geographical variation in needs for health services and that measures of need should be independent of geographical variation in the provision and use of health services. It advised that, in calculating revenue targets for non-psychiatric inpatient services, the population of each region should be weighted by national age-sex utilisation rates for each diagnostic condition and that these figures should be weighted by the condition-specific standardised mortality ratios for the region as a proxy measure of geographical variation in morbidity attributable to each condition. For these purposes, the report recommended that diagnoses should be grouped according to the chapters of the *International Classification of Diseases* (ICD).[2] It acknowledged that many common conditions, including some which lead to death, place relatively little demand on health services, but this point was not pursued in any detail in the report. Hospital Activity Analysis has often impressed on us the converse of this—that there are, within each clinical specialty, conditions which place heavy demands on the health service but which are uncommon causes of death,[3] and that such diseases often share the same ICD chapter with other unrelated, more commonly fatal diseases.

Any broad classification of disease is to some extent an arbitrary convenience. The ICD classification into chapters is based mainly on either anatomy—for example, diseases of the nervous system and sense organs, diseases of the circulatory system—or pathology—for example, infectious and parasitic diseases, neoplasms. As a result most chapters include a range of disorders which are not necessarily comparable in any meaningful clinical or epidemiological sense. Chapter II, for example, includes carcinoma of the bronchus and fibroids, chapter VI multiple sclerosis and cataract, chapter VII myocardial infarction and varicose veins, and chapter X chronic nephritis and disorders of menstruation. It is misleading that ICD chapter-specific standardised mortality ratios and utilisation rates have been termed "condition-specific" in discussions about resource allocation. It seems inappropriate, at least in concept, to weight utilisation rates for diseases which rarely result in death by mortality ratios which include a numerically important contribution from other, unrelated diseases which share the same ICD chapter. We therefore questioned whether, in practice, this is likely to matter by studying the extent to which diseases that commonly result in inpatient care are also common causes of death.

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## Method

National figures were obtained at the 3-digit level of the ICD on the number of hospital episodes (discharges from and deaths in hospital) from the Hospital In-patient Enquiry,[4] on the average number of beds used daily for each disease from the Office of Population Censuses and Surveys (OPCS),[5] and the total number of deaths ascribed to each disease from the OPCS's mortality statistics.[6] 1976 was chosen as the latest year for which most of the data used in the study were available in published form.

The ICD allocates 3-digit categories to important individual diseases and to groupings of less important diseases. The number of deaths in England and Wales were plotted against the number of hospital episodes and the average number of beds used daily at the 3-digit level of the ICD. The data were analysed by Spearman's method of rank correlation excluding conditions which accounted for fewer than one in 25 000 deaths, and fewer than one in 25 000 beds used daily, to avoid distorting correlations by including very uncommon causes of both death and use of care. (Rank correlation was used rather than linear correlation because of the striking statistical non-normality of the data.) We ranked the ICD codes within each chapter in order, according to the number of deaths ascribed to each code. We then accumulated deaths upward from the lowest ranking cause in each ICD chapter to identify those conditions which fell within the least common first and fifth percentiles as causes of death in their chapter. We calculated the number of hospital episodes and the average number of beds used daily for these conditions, and expressed the results as a percentage of all the episodes and of all the beds used daily in the chapter.

We then studied the relation between mortality and the use of care for individual specialties by selecting conditions which are common reasons for hospital care within each specialty but uncommon causes of death. We identified the average number of beds used daily in each specialty for such conditions from table 12A of the Hospital In-patient Enquiry.[4] This table is not exhaustive but it does list the numerically most important conditions treated by each specialty. We calculated the contribution made by each condition to the mortality ascribed to its ICD chapter from mortality statistics.[6]

Hospital utilisation figures for chapters V, XI, and XII (mental disorders; complications of pregnancy, childbirth, and puerperium; and diseases of skin and subcutaneous tissue) are not weighted according to standardised mortality ratios in the RAWP formula and are therefore excluded from our results.

## Results

The rank correlation between deaths and hospital episodes was statistically significant in nine of the 14 chapters and that between deaths and beds used daily in 12 of the 14 chapters (table I). Although most of the correlation coefficients were significant, some were fairly small, implying that the proportion of variation in the ranking of deaths associated with that of episodes or bed-days was modest. Inspection of the ranking of individual conditions showed that most chapters included diseases which were uncommon causes of death but common reasons for using hospital care. For example, chapters VI, VIII, X, XIII, XIV, and XVI each contain diseases which together accounted for 5% or fewer of all deaths in their respective chapters but which accounted for over half of all admissions in their chapters. Some of the conditions which were, relative to their chapter, much commoner reasons for use of hospital care than causes of death are shown in table II. The descriptive results are summarised briefly here. The diagnostic terms used are those of the ICD.

Benign neoplasms accounted for 24% of hospital episodes, 13% of all beds used daily, but less than 1% of all deaths in chapter II.

TABLE I—*Rank correlations between number of deaths, number of hospital episodes, and average number of beds occupied daily within each ICD chapter; and percentage of hospital episodes and beds used daily within each chapter for diseases in the least common first and fifth percentiles as causes of death in each chapter*

| ICD Chapter | | Rank correlations: Deaths and episodes | | Rank correlations: Deaths and bed days | | Degrees of freedom | Episodes and bed days accounted for by: Causes of death in lowest 1st percentile | | Causes of death in lowest 5th percentile | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $r_s$[1] | p Value | $r_s$[1] | p Value | | % Episodes | % Bed days | % Episodes | % Bed days |
| I | Infective and parasitic diseases | 0·32 | <0·01 | 0·52 | <0·001 | 48 | 8·0 | 5·8 | 24·4 | 17·4 |
| II | Neoplasms | 0·44 | <0·001 | 0·68 | <0·001 | 82 | 23·1 | 11·8 | 29·6 | 19·6 |
| III | Endocrine, nutritional, and metabolic diseases | 0·55 | <0·01 | 0·63 | <0·001 | 24 | 7·8 | 3·4 | 14·5 | 8·4 |
| IV | Diseases of blood and blood-forming organs | 0·75 | <0·01 | 0·90 | <0·001 | 8 | 0·6 | 0·4 | 2·3 | 1·9 |
| VI | Diseases of nervous system and sense organs | 0·20 | NS | 0·55 | <0·001 | 50 | 57·4 | 23·7 | 61·4 | 26·9 |
| VII | Diseases of circulatory system | 0·60 | <0·001 | 0·70 | <0·001 | 51 | 17·6 | 6·9 | 30·2 | 17·3 |
| VIII | Diseases of respiratory system | 0·29 | <0·05 | 0·58 | <0·001 | 36 | 48·2 | 19·7 | 50·6 | 24·4 |
| IX | Diseases of digestive system | 0·41 | <0·01 | 0·70 | <0·001 | 42 | 18·7 | 7·6 | 40·5 | 24·3 |
| X | Diseases of genitourinary system | 0·13 | NS | 0·44 | <0·01 | 38 | 63·1 | 38·6 | 75·6 | 56·6 |
| XIII | Diseases of musculoskeletal system and connective tissue | 0·19 | NS | 0·37 | <0·05 | 23 | 25·7 | 11·3 | 50·2 | 29·2 |
| XIV | Congenital anomalies | −0·24 | NS | 0·08 | NS | 18 | 52·5 | 40·1 | 62·2 | 46·8 |
| XV | Causes of perinatal morbidity and mortality | 0·61 | <0·01 | 0·67 | <0·01 | 12 | 3·4 | 1·6 | 6·2 | 2·8 |
| XVI | Symptoms and ill-defined conditions | −0·08 | NS | 0·25 | NS | 15 | 33·0 | 20·1 | 71·4 | 40·3 |
| XVII | Accidents, poisoning, and violence | 0·32 | <0·001 | 0·48 | <0·001 | 150 | 19·1 | 13·7 | 40·7 | 28·2 |

[1] Spearman's rank correlation coefficient.
NS = Not significant.

TABLE II—*Selected conditions which are common reasons for use of hospital care but uncommon causes of death*

| ICD Chapter | ICD Codes | Conditions | Deaths in in chapter: No | Deaths in in chapter: % | Hospital episodes in chapter: No | Hospital episodes in chapter: % | Beds used daily in chapter: No | Beds used daily in chapter: % |
|---|---|---|---|---|---|---|---|---|
| II | 210–228 | Benign neoplasms | 633 | 0·5 | 102170 | 24·4 | 1980 | 11·2 |
| VI | 351, 353 | Trigeminal neuralgia; sciatica | 0 | 0·0 | 3810 | 1·5 | 145 | 1·1 |
| | 360–379 | Diseases of eye | 21 | 0·3 | 105550 | 40·6 | 2346 | 18·1 |
| | 380–389 | Diseases of ear and mastoid process | 64 | 1·0 | 60738 | 23·3 | 737 | 5·7 |
| VII | 454, 455 | Varicose veins; haemorrhoids | 125 | <0·1 | 51040 | 10·0 | 1292 | 3·1 |
| VIII | 500–508 | "Other diseases of upper respiratory tract" | 88 | 0·1 | 134460 | 33·4 | 1451 | 11·4 |
| IX | 520–525 | Diseases of teeth and supporting structures | 12 | <0·1 | 59430 | 11·9 | 396 | 3·1 |
| | 540–543 | Appendicitis | 279 | 1·9 | 80291 | 16·1 | 1647 | 13·0 |
| | 565, 566 | Anal fissure, fistula, abscess | 22 | 0·1 | 16580 | 3·3 | 269 | 2·1 |
| | 550, 552 | Inguinal hernia | 286 | 1·9 | 76650 | 15·4 | 1430 | 11·2 |
| X | 603–607 | Diseases of male genital organs* (excluding prostate) | 16 | 0·4 | 46540 | 37·8 | 492 | 15·6 |
| | 610–629 | Diseases of breast and female genital system* | 114 | 3·0 | 242472 | 86·8 | 3793 | 76·6 |
| XIII | 724–731 | Internal derangement of joint; displacement of intervertebral disc; vertebrogenic pain syndrome; bunion; synovitis | 78 | 2·8 | 76150 | 39·1 | 2497 | 21·2 |
| | 736–738 | Flat foot, hallux valgus and other deformities | 2 | <0·1 | 17460 | 9·0 | 490 | 4·2 |
| XIV | 744, 745, 749 752, 754, 755 | Congenital anomalies of eye, ear; lip, palate; genital organs; limbs | 23 | 0·7 | 42180 | 52·6 | 902 | 40·0 |
| XVI | 780, 781, 783 –791, 793 | All conditions in chapter except cardiovascular symptoms, uraemia, senility, sudden death and unknown causes | 114 | 3·8 | 345700 | 71·5 | 6693 | 40·3 |

*Percentages of deaths, discharges, and beds used daily for relevant sex.

Malignant neoplasms of the trachea, bronchus and lung, stomach, large intestine, and rectum accounted for 50% of all deaths in the chapter.

In chapter III diabetes mellitus was by far the commonest cause of death, hospital admission, and use of bed-days.

In Chapter VI diseases of the eye, ear, and mastoid process (notably cataract, strabismus, glaucoma, and otitis media) accounted for 64% of all hospital episodes, and 24% of all beds used daily. The commonest causes of death in the chapter were paralysis agitans, "other cerebral paralysis," and multiple sclerosis.

In chapter VII varicose veins and haemorrhoids together accounted for 10% of hospital episodes but were negligible causes of death. Mortality statistics were dominated by the various codes covering ischaemic heart disease and cerebrovascular disease.

In chapter VIII "other diseases of upper respiratory tract," notably hypertrophy of tonsils and adenoids, deflected nasal septum, and nasal polyp, accounted for a third of all hospital episodes. The commonest causes of death were bronchopneumonia and chronic bronchitis.

In chapter IX dental disorders accounted for 12% of all hospital episodes. Appendicitis, inguinal hernia, anal fissure, fistula, and abscess accounted together for 26% of all beds used daily. Ulcers of the stomach and duodenum and cirrhosis of the liver were the commonest causes of death.

In chapter X diseases of the breast and female genital system (notably disorders of menstruation, uterovaginal prolapse, and chronic cystic disease of breast) accounted for 87% of hospital episodes and 69% of beds used daily for women. Diseases of the male genital organs (excluding prostatic disease but including hydrocoele and redundant prepuce and phimosis) accounted for 38% of episodes and 16% of beds used daily for men. Chronic nephritis and infections of the kidney were the commonest causes of death in the chapter.

In chapter XIII "internal derangement of joint" (mainly disorders of the meniscus of the knee), displacement of intervertebral disc, vertebrogenic pain syndrome, bunions, synovitis, bursitis and tenosinovitis, flat foot, hallux valgus, hallux varus, and other similar deformities accounted for 48% of episodes and 38% of beds used daily but were negligible causes of death.

In chapter XIV cleft palate and lip, congenital anomalies of genital

TABLE III—*Average number and percentage of beds used daily for selected conditions according to specialty in England and Wales 1976*

| ICD chapter and codes | Diagnoses | Average beds used daily in specialty | |
|---|---|---|---|
| | | No | % |
| Ophthalmology: | All conditions | 2626 | 100·0 |
| VI 373 | Strabismus | 211 | 8·0 |
| VI 374 | Cataract | 984 | 37·5 |
| VI 375 | Glaucoma | 306 | 11·7 |
| VI remainder 360–379 | Other diseases of eye | 591 | 22·5 |
| ENT: | All conditions | 3030 | 100·0 |
| VI 380–389 | Diseases of ear and mastoid process | 622 | 20·5 |
| VIII 463 | Acute tonsillitis | 77 | 2·5 |
| VIII 500 | Hypertrophy of tonsils and adenoids | 809 | 26·7 |
| VIII 504, 505 | Deflected nasal septum; nasal polyp | 252 | 8·3 |
| VIII remainder 500–508 | Other diseases of upper respiratory tract | 275 | 9·1 |
| XVI 783 | Symptoms referable to respiratory system | 195 | 6·4 |
| Gynaecology: | All conditions | 7793 | 100·0 |
| II 218–221 | Benign neoplasms of female genital organs | 1009 | 12·9 |
| X 623 | Uterovaginal prolapse | 867 | 11·1 |
| X 626 | Disorders of menstruation | 1257 | 16·1 |
| X remainder 610–629 | Other diseases of breast and female genital organs | 1170 | 15·0 |
| XVI 785, 786 | Symptoms referable to abdomen, lower gastrointestinal tract, genitourinary system | 430 | 5·5 |
| General surgery: | All conditions | 24941 | 100·0 |
| VII 454, 455 | Varicose veins; haemorrhoids | 938 | 3·8 |
| IX 540–543 | Appendicitis | 1468 | 5·9 |
| IX 550, 552 | Inguinal hernia | 1321 | 5·3 |
| IX 565, 566 | Anal fissure, fistula, abscess | 244 | 1·0 |
| IX 574, 575 | Cholelithiasis, cholecystitis | 1841 | 7·4 |
| X 603–607 | Male genital disorders | 388 | 1·6 |
| X 610–629 | Diseases of breast and female genital system | 314 | 1·3 |
| XIV 752 | Congenital anomalies of genital organs | 173 | 0·7 |
| XVI 785, 786 | Symptoms referable to abdomen, lower gastrointestinal tract, genitourinary system | 1554 | 6·2 |
| Neurosurgery: | All conditions | 1101 | 100·0 |
| II 191, 192 | Malignant neoplasms of brain and other parts of central nervous system | 87 | 7·9 |
| II 225 | Benign neoplasms of brain and other central nervous system | 71 | 6·4 |
| VI 351 | Trigeminal neuralgia | 11 | 1·0 |
| VII 430 | Subarachnoid haemorrhage | 84 | 7·6 |
| XIII 725, 728 | Displacement of intervertebral disc; vertebrogenic pain syndrome | 110 | 10·0 |
| Plastic surgery: | All conditions | 1261 | 100·0 |
| II 172, 173 | Malignant neoplasms of skin | 132 | 10·5 |
| II 216, 217 | Benign neoplasms of skin | 29 | 2·3 |
| X 610–629 | Diseases of breast and female genital system | 26 | 2·1 |
| XIV 745, 752, 755, 757 | Congenital anomalies of ear, face, neck, genital organs, limbs, skin | 115 | 9·1 |
| XIV 749 | Cleft palate and cleft lip | 71 | 5·6 |
| XVII N940–N949 | Burns | 247 | 19·6 |
| Consultant dentistry: | All conditions | 523 | 100·0 |
| IX 520–525 | Diseases of teeth and supporting structures | 335 | 64·1 |

TABLE IV—*Contribution of conditions shown in table III to the average number of beds used daily in each specialty; percentage contribution of the conditions to overall mortality ascribed to their ICD chapters and to all-causes mortality in England and Wales, 1976*

| Specialty | Subtotal of individual conditions shown in table III | | | | |
|---|---|---|---|---|---|
| | Average No of beds used daily in specialty | Percentage of all beds used in specialty | No of deaths ascribed to conditions | Weighted average percentage* of all deaths in relevant ICD chapters | Percentages of all deaths |
| Ophthalmology | 2092 | 79·7 | 21 | 0·3 | <0·01 |
| ENT | 2230 | 73·6 | 165 | 0·4 | 0·03 |
| Gynaecology | 4733 | 60·7 | 215 | 2·2‡ | 0·07‡ |
| General surgery | 8241 | 33·0 | 1776 | 2·2 | 0·30 |
| Neurosurgery | 363 | 33·0 | 6158 | 1·4 | 1·03 |
| Plastic surgery | 620 | 49·2 | 1919 | 1·2 | 0·31 |
| Consultant dentistry | 335 | 64·1 | 12 | <0·1 | <0·01 |

*Weighted by the relative contribution of each group of conditions in Table III to the average number of beds used daily in the specialty.
‡Percentage of all deaths for women.

organs (such as hypospadias, undescended testicle), club foot, and other congenital deformities of limbs were common reasons for use of hospital care but uncommon causes of death. The commonest causes of death were spina bifida and congenital anomalies of the heart and circulatory system.

Chapter XVI consists of a miscellany of symptoms and ill-defined conditions. This chapter includes the codes for diagnoses given simply as, for example, abdominal pain, frequency of micturition, cough, and headache. The commonest ascribed causes of death in the chapter were senility and "sudden death (cause unknown)."

All chapters include a very varied mix of diseases and there are, of course, conditions which are expensive to treat but rare and which do not rank highly among the causes of either death or hospital use. A striking feature of the conditions that are common reasons for hospital admission but uncommon causes of death is that they tend to be treated in particular specialties. Table III shows the contribution of some of these diseases to the work load of several surgical specialties in England and Wales. Table IV summarises the use of beds in each specialty for these diseases and gives the number and percentage of deaths ascribed to the conditions. Thus, for example, strabismus, cataract, glaucoma, and other diseases of the eye accounted for 80% of all beds used daily for ophthalmology. These conditions accounted for fewer than one in 100 000 deaths overall and for 0·3% of all deaths in their ICD chapter. The conditions shown for ear, nose, and throat surgery in table III accounted for 74% of all beds used daily in the specialty but, on average, accounted for only 0·4% of all deaths in the relevant ICD chapters (VI, VIII, and XIV). A similar pattern is seen for gynaecology and consultant dentistry. In general surgery, neurosurgery, and plastic surgery a relatively small number of conditions accounted, respectively, for 33%, 33%, and 49% of all beds used but each condition contributed only a small percentage of deaths to the overall mortality ascribed to their chapters.

## Discussion

The validity of using ICD chapter-specific mortality statistics as a proxy measure of need rests on two related assumptions. The first is that diseases are grouped in such a way that there is good reason to believe that mortality rates for each grouping *might* be a suitable proxy for morbidity. The second assumption, more difficult than the first to test, is that mortality rates *do* in fact reflect morbidity. We have addressed only the first issue.

*Use of ICD chapter-specific data*—All ICD chapters include a heterogeneous group of diseases. All chapters except III, IV, and XV contain diseases which are numerically important reasons for hospital admission but very uncommon causes of death. For many of these conditions it is far from self-evident that needs for their care can be assessed by the use of mortality statistics for their chapter. This needs further study but it seems unlikely that ICD chapters constitute the most appropriate grouping of diseases for resource allocation, planning health care, or, indeed, in other circumstances where measures of needs for health services are sought.

Other points which emerged from the analysis also merit comment. Firstly, there are two chapters where a very small number of conditions contribute substantially to the mortality ascribed to the chapter—diabetes mellitus in chapter III, and rheumatoid arthritis, osteoarthritis, and osteoporosis in chapter XIII—but where any geographical variation in mortality rates might be susceptible to variation in certifying the underlying cause of death. Secondly, in general the correlations between deaths and occupied beds were stronger than those between deaths and episodes of hospital care because commonly fatal conditions tend to have longer lengths of stay than, say, elective surgical procedures. Funding and planning according to the RAWP formula implies that the daily cost of conditions with a long average stay is equivalent to the daily cost of conditions with shorter lengths of stay. In practice this probably underestimates the relative resource requirements of many short-stay conditions.

*Implications for individual specialties*—Because resources are allocated according to "RAWP-weighted" populations, whose derivation includes use of standardised mortality ratios, it seems logical to suggest that individual specialties should be planned on a similar basis.[7-9] This is now being undertaken in several regions. For some specialties, however, this would mean that their needs are assessed, in part, on standardised mortality ratios which are irrelevant to them, the most obvious examples being ophthalmology, ear, nose, and throat surgery, gynaecology, and consultant dentistry. A substantial part of the work load of ophthalmology and ear, nose, and throat surgery is concerned with treatment of disorders of the sense organs which are codable to chapter VI, but the main conditions which contribute to mortality ascribed to this chapter are chronic neurological disorders. About half of all admissions for gynaecology are for benign diseases of the female genital system, codable to chapter X, but the main conditions which contribute to mortality in this chapter are chronic nephritis and other renal diseases. The neoplasms treated by these specialties (codable to chapter II) are a relatively small proportion of all neoplasms, and needs for their care are unlikely to be measured by standardised mortality ratios for neoplasms as a whole. The findings also suggest that needs for at least a part of the work load of general surgery, neurosurgery, and plastic surgery are unlikely to be reflected accurately either by chapter-specific or by all-causes mortality statistics. (It follows that departments which support these specialties (such as anaesthetics) should not be planned or funded in full on criteria, such as RAWP-weighted populations, which include the use of mortality statistics.) Account should be taken of the diagnoses treated by each specialty in deciding whether and how to apply mortality data in planning for the specialty. We recognise that this would aggravate a planning problem which already exists, namely that hospital services are planned according to specialty or client group but are funded according to a formula based on ICD chapters rather than specialties. This highlights the need to reconcile the bases of planning and resource allocation.

We have not attempted to be exhaustive in reporting conditions where chapter-specific mortality may not adequately reflect needs. We recognise that this would entail making many arguable assumptions about the possible relation between one disease and another. For example, the validity of using standardised mortality ratios in planning for much of trauma and orthopaedic surgery rests on whether mortality rates in chapter XVII (accidents, poisonings, and violence) adequately reflect needs for services for both major and minor trauma, and on whether mortality rates in chapter XIII, notably from rheumatoid arthritis, osteoarthritis, and osteoporosis, adequately reflect needs for orthopaedic treatment. We have also ignored conditions which account for a relatively small part of each specialty's work load (such as lipoma, carpal tunnel syndrome) but which together add to the percentage of hospital work load which is inappropriately scaled by standardised mortality ratios.

The use of mortality statistics as an overall measure of health status has an attractive simplicity and has some empirical support from the fact that variation in mortality rates tends to be associated with variation in other social indicators. If mortality data are to be used as a proxy for needs for specific hospital services, however, and there are reasons other than those discussed here to question this,[10-12] we suggest that the selection and grouping of diseases for this purpose need more detailed study and more explicit justification than they have hitherto received.

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## References

1 DHSS. *Sharing resources for health in England: report of the Resource Allocation Working Party*. London, HMSO, 1976.
2 International Classification of Diseases. 8th Revision. WHO, Geneva, 1965.
3 Goldacre MJ, Harris RI. *Hospital activity analysis: workload of each specialty according to diagnosis*, 1974-1978. Oxford Regional Health Authority, unpublished tables.

[4] Office of Population Censuses and Surveys. *Hospital in-patient enquiry.* HMSO, 1976.
[5] Office of Population Censuses and Surveys. *Hospital in-patient enquiry, Table R* 1976, unpublished.
[6] Office of Population Censuses and Surveys. *Mortality statistics: cause.* HMSO, 1976.
[7] Vaughan DH. *Allocation of additional consultant posts: critical review. Br Med J* 1977;ii:843.
[8] London Health Planning Consortium. *Acute hospital services in London.* HMSO, 1979, 61.
[9] London Health Planning Consortium Study Group on Methodology. *Overview of the SGM methodology for projecting acute inpatient service requirements.* Department of Health and Social Security, 1980, 5.
[10] Barr A, Logan RFL. Policy alternatives for resource allocation. *Lancet* 1977;i:994.
[11] Forster DP. Mortality and resource allocation. *Lancet* 1977;i:997.
[12] Knox EG. Principles of allocation of health care resources. *J Epidemiol Community Health* 1978;82:3.

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# Screening for congenital hypothyroidism in the Republic of Ireland

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## Summary and conclusions

**A national pilot study for detecting congenital hypothyroidism by radioimmunoassay of thyroid-stimulating hormone concentrations in dried blood was incorporated into the newborn screening programme in Ireland on 1 August 1979. The programme has been monitored by a steering committee and follows the guidelines set by the European Society of Paediatric Endocrinologists.**

**During the first 12 months 76 224 infants were screened and 19 cases confirmed, giving an incidence of 1:4012. Fifty infants (0·07%) were recalled for a serum sample, though most of the recalls (31; 0·04%) occurred during the first three months, before the methodology had become established. No case was detected clinically. At recall only three of the 19 affected infants had obvious features of hypothyroidism, seven had mild features, and nine inconspicuous features. Organisation was directed at early diagnosis and treatment, the mean age at beginning treatment being 15 days.**

**These results confirm the efficacy of screening for congenital hypothyroidism and suggest that capital and running costs will be offset by savings in maintenance treatment of untreated patients. Screening does not, however, remove the need for continued vigilance, and clinicians should request thyroid-function tests in any suspected case.**

## Introduction

Like phenylketonuria, congenital hypothyroidism has apparently become a model condition for mass screening. Testing for congenital hypothyroidism was first introduced into a screening programme in Quebec in 1974,[1] and a recent leading article in the *BMJ* concluded that further delays in implementing a national screening programme for the condition in Britain cannot be justified.[2] Untreated, congenital hypothyroidism leads to mental and physical retardation, and the disease is rarely diagnosed clinically before irreversible nervous system damage is established. Some three and a half million babies have now been screened for hypothyroidism, the worldwide case-detection rate being 1:4435 (Western Europe 1:3976, North America 1:4299, Australia 1:5817, Japan 1:6884).[3] Hulse *et al* reported an incidence of 1:3363 among newborn infants in North London and adjoining counties.[4] Detection of congenital hypothyroidism by thyroid-stimulating hormone (TSH) assay on dried-blood filter-paper specimens is a sensitive and practical procedure with a low recall rate. Confirmatory assays are in the repertoire of all endocrine laboratories and within the competence of general clinical laboratories experienced in radioimmunoassay. The efficacy of treatment—namely, simple oral replacement—has been proved, and mass screening and early institution of treatment will apparently be an economic asset to the community compared with maintaining untreated patients.[5]

A national newborn blood phenylketonuria screening service for Ireland was established in the pathology department of the Children's Hospital in 1966, the Guthrie microbiological inhibition assay procedure being used on dried blood collected by heel stab on the fourth or fifth day of life.[6] Similar tests have been added at intervals for other inherited metabolic errors, and the entire newborn population of Ireland is now screened for phenylketonuria, homocystinuria, galactosaemia, tyrosinaemia, maple syrup urine disease, and, since August 1979, hypothyroidism. The additional metabolite tests added little to the cost of testing for phenylketonuria, but capital and running costs were increased when screening for congenital hypothyroidism was included.

We describe the incorporation of screening for hypothyroidism into the national newborn dried-blood screening programme in the Republic of Ireland and present the results of a 12-month pilot study.

## Materials and methods

The programme was funded by the Department of Health, and the 12-month pilot study was begun on 1 August 1979. The screening procedure consisted in estimating by radioimmunoassay thyroid-stimulating hormone concentrations in heel-stab samples of dried blood. A steering committee was set up, comprising a medical representative from the Department of Health, paediatricians from centres throughout Ireland, a consultant endocrinologist and consultant radiologist, and the laboratory director and clinical biochemists concerned. One of us (SD) acted as secretary and clinical co-ordinator for the study. The committee met monthly to review laboratory results and case records and discuss protocol in relation to developments.

*Collection of blood samples*—Heel-stab samples are collected on filter

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