

WORKING PAPER 403

ELECTRONIC SPREADSHEETS IN
HEALTH SERVICE INFORMATION

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1.0 Introduction

In this paper we examine a method for obtaining health service manpower costs by specialty for hospitals at a District Health Authority (DHA) level, focusing initially on clinical nursing costs. The importance of manpower information can be appreciated when it is realised that approximately 70% of all expenditure on health services in Britain is on wages and salaries (DHSS 1983-A). The deployment of the workforce is, therefore, of crucial importance in determining budgets and monitoring expenditure. In addition there exists the potential to trace nearly three-quarters of the costs of the NHS and, by assigning staff costs to appropriate specialities, to indicate the relative costs and efficiencies of services provided at particular locations. This can then be used to look at wider aspects of health service planning and more general questions of intra-district resource allocation.

In Section 2 we examine the background to why there has been a lack of usable information in this area and select a suitable basis on which to investigate costs at the district level. Section 3 outlines the spreadsheet concept and examines the data available for manpower analysis and, in Section 4, this is used to obtain nursing costs by specialty with examples given from a DHA in northern England. Concluding comments are made in Section 5 together with further discussion as to the wider implications of using spreadsheets as part of a computerised district information system.

2.0 Background

Having established that there is a need for this information it might be asked why a system to provide it is not already in operation. In fact, the basic information already exists; manpower information in the NHS is probably the most accurate available if only for the reason that everyone has to be paid. It is only now, however, that it is beginning to be organised into a form that makes it of use in planning and management. Why there has been this delay is not a straightforward question to answer and there are a number of factors which can be held responsible. The historical legacy of assured, continual increases in NHS expenditure (at least until fairly recently) and its perceived role by successive governments and public opinion as a service untrammelled by the need to face competition in the "real" economic environment made the necessity for detailed costs and manpower information relatively unimportant. A "modern" management structure has only been in existence in the NHS for ten years; even in that short time undergoing revision with the prospect of more to come in the near future. This, combined with the slow start in introducing a comprehensive planning system by the DHSS in the mid 1970s, has hindered the development of suitable planning expertise in the health service. There is also the problem of the poor quality of the data available to planners (although manpower statistics are an exception to this). Investigations have recently been carried out into the long term information requirements of the NHS (DHSS Steering Group on Health Services Information 1983) but it will be some time before all its recommendations can be

implemented and planning must continue in the meantime. The purpose of this project has been to use what existing data there is to provide more accurate planning information in the short term.

When examining manpower costs it is possible to undertake investigations at a variety of levels of resolution. Thus, in the case of nursing costs, we could start by assuming a macro-level of costs where a hospital inpatient receives exactly the same amount of nursing care irrespective of specialty of admission or condition. The existing average costs of nursing by hospital type produced in the annual Health Services Costing Returns can be regarded as an example of costs at this level. Here no distinction is made between costs of staff in different specialties (all acute hospitals are grouped into four categories solely on the basis of their total bed complement) and, apart from medical and nursing personnel it is not possible to locate other staff costs separately (see for example DHSS 1983-8). At the opposite end of the spectrum are the detailed accounting exercises relating specific nursing tasks to patients in particular specialties and often incorporating patient dependency on nursing according to condition. An example of such a micro-level study is that by Barr et al.(1973). At the macro level the resulting figures are too crude to be of much help in examining costs; at the micro level special surveys are required which are time-consuming and have to be repeated at frequent intervals to maintain accuracy. This paper looks at what might be termed the meso-level, half-way between these two. Here it is assumed that patients receive the same level of treatment within a specialty at a

particular hospital. We take as given the staffing levels for each specialty and costs are averaged out per inpatient day of treatment in that specialty. Some loss of information in this case, such as patient condition affecting demand for nursing, is unavoidable but there is always going to be some trade-off between a system which is easy and quick to operate and one which places more emphasis on a high degree of accuracy. This is not to say, of course, that greater accuracy is undesirable; rather that in the short term there is a demand for information now and first approximations are better than nothing at all.

3.0 Electronic spreadsheets and data sources

The spreadsheet concept is comparatively recent having emerged only in the past 5-6 years. As its name implies, it has been designed primarily with accounting functions in mind. Typically it operates on a micro-computer and consists of a "worksheet" which is a matrix of cells into which figures and text can be placed, moved about, copied, and have various calculations performed on them. These computer software packages vary in sophistication; the one reported here (LOTUS 1-2-3) provides a worksheet area of 256 columns and over 2000 rows to work on and also has graphing facilities. Once mastered it is easy to set up a manpower "accounts" sheet which can be experimented on or amended with little difficulty. For a DHA the cost of obtaining this software is small. It does not require investment in new computer hardware and can be adapted to operate on whatever micro-computer system is available. Of course, the use of the spreadsheet is not confined to manpower analysis. Standard accounting procedures and other forms of

statistical and database management functions can also be carried out. A major advantage of using such a system is that it removes the need for time-consuming ad hoc preparation of information and enables the simulation of potential outcomes of a variety of planning decisions - an invaluable aid to district level planning.

The ability of the spreadsheet system to act as a planning tool is, however, also dependent on the availability of data. Reference has already been made to the poor quality of much health service information. However, in 1971, a decision was made to standardise certain computer-based information, notably accounting, payroll, and manpower and personnel. In 1975 the Wessex Regional Health Authority (RHA) was given the responsibility of developing a "Standard Manpower and Personnel Information System" (STAMP) which was to be based on the already existing computerised payroll information. This is now being gradually introduced by the 14 RHAs in England (YRHA 1984). Unfortunately, the opportunity has not been taken to link it with any patient-based statistics and therefore manpower costs cannot be directly assigned to specialties. This seems to be a shortsighted action as these costs have as much importance for manpower planning as for specialty costing. It is the development of this link which concerns us in this exercise and it is one which has been relatively easy to make using existing patient statistics. The STAMP system has only recently been introduced to the RHA in which the study DHA is situated and the DHA has not yet taken advantage of it to produce various breakdowns of staff by grade, unit of employment, etc. which it is now possible to do. The

manpower statistics used here were derived from the previously available information from the RHA which came as a monthly statement of staff in employment in the district disaggregated by unit of employment and pay grade. In the case of clinical nursing staff, however, due to various "leads" paid to nurses working in certain specialties, it is necessary to assign them permanently to those specialties and, for the larger hospitals at least, it is possible to obtain details of nursing allocations to individual specialties within the hospital.

The patient statistics used were the most recently available SH3 returns (1983) which are produced annually for each hospital in the district. These provide information on the number of admissions and the average lengths of stay by specialty and hospital. From this it is possible to calculate the average daily number of inpatients in a particular specialty. This could then be used in conjunction with the total nursing costs to derive nursing costs per inpatient day as well as costs per case. In one of the hospitals the small number of dermatology cases treated there was included under the heading of general medicine. The cost of nursing in day treatment units, outpatients and accident and emergency units was not charged to inpatients.

4.0 DHA Nursing Costs

The DHA studied is small in terms of resident population served (164,000) and is situated in industrial northern England. There are six hospitals: two main general hospitals, an orthopaedic hospital with accident and emergency facilities, two long-term stay geriatric hospital.

and one long-term stay orthopaedic/geriatric hospital. This study has concentrated on clinical nursing costs at all of these units (with the exception of the maternity unit in this instance). Nurse salaries form the largest single expenditure component in a hospital (typically between 30 and 50%) and are among the most difficult to account for within a particular unit. Experience gained on setting up a system for this sector should mean that analysis of the remaining staff sectors (technical, ancillary, administrative staff, etc.) should be a comparatively easy task and work is proceeding on that at present. The initial nurse costing work is outlined here to give an idea of how the system will eventually look.

From the information on grade analysis of staff in post for one month, the number of nurses by hospital, specialty and grade were abstracted and converted to whole time equivalents (WTEs) (see table 1). All nursing staff from the student/pupil grade up to and including senior staff on clinical duties were allocated to their hospital work locations and specialty where known. In the case of the student and pupil nurses their locations were derived from their training schedule which, in the course of 2 years for pupil and 3 years for student nurses, has them gaining experience in most of the district specialties. Where senior nursing staff are concerned their costs usually have to be apportioned over several specialties and sometimes over more than one hospital because of the spread of their responsibilities. This was done on the basis of estimations provided by the staff involved of time they spent in each of their areas of responsibility. The other main apportionment which had to be made involved the night-duty

staff. For the two larger hospitals they are regarded as a separate group, not attached to individual specialties, so to complete the picture on costs it was necessary to apportion the cost of their time over all the specialties they were responsible for. This was done using the proportion of inpatient days in those specialties as a proxy for workload with the exception of the geriatric acute specialty where, due to the increments involved, both night and day duty staff are accounted for separately from staff in other specialties (see table 2) For the smaller hospital units figures were obtainable which gave a breakdown of staff by grade on day and night duties. These statistics were not available from the RHA manpower statistics.

For this exercise staff costs were taken from the salary scale mid-points for the respective grades as of April 1984. While this was regarded as suitable for initial estimates it can mask variations in the average nursing costs for individual specialties. Each pay grade has several incremental points on it; to assume the mid-point ignores the fact that in some specialties, for example geriatrics, more staff tend to have been there for a longer time and will therefore be on above median pay points for a particular grade. In other cases this situation may be the opposite. However given more time it would be a fairly simple matter to use individual staff paycodes which are readily available from the manpower database, thus avoiding this averaging problem. To these salary mid-points was added the incentive leads payable to nurses working in geriatric and psychiatric specialties (165 p.a.) and the standard additional pay which all night-duty staff receive of time

and one third (irrespective of specialty). In this exercise allowance was not made for the time and two-thirds pay for Sunday working nor for day-duty staff working at weekends on the enhanced rates. Overtime payments were not included either as this would require a more detailed investigation of hours worked over a longer time period. A 15% "oncost" was then added to each salary. This is a standard practice done by the district's Treasurer's department to account for the cost to the district of national insurance and superannuation contributions etc. (table 3). From there it was a relatively simple step to calculate total nursing costs per day by hospital, grade and specialty (table 4) and to derive the costs per inpatient day by specialty using the SH3 returns (table 5).

It must be stressed, of course, that these figures are only to be regarded as generally rather than precisely indicative of manpower costs. The basic salary and principal increments account for the major share of salaries expenditure; it should be feasible to account for additional overtime allowances from the payroll information, but it is debatable as to the significance of such marginal expenditure. This would obviously vary with the staff sectors concerned, being more important when accounting for ancillary and technical staff than administration for example. Neither is it practical to attempt to account for temporary allocations of staff among specialties. The aim is to provide a general manpower planning tool rather than a detailed accounting system.

5.0 Conclusions

A method for utilising existing information related to employees and patients in order to produce manpower specialty costs has been demonstrated using an electronic spreadsheet package on a micro-computer. The time taken to set up the initial system for clinical nursing staff was approximately two weeks - subsequent updating of information should only take a matter of minutes - and this is a dramatic improvement on previous manual attempts at deriving similar information. It also has the advantage of being further expanded to account for other staff sectors and to be adapted to use additional information as it becomes available. Thus, for example, with some extra survey work it should be feasible to consider allocating theatre staff costs over theatre-using specialties.

Spreadsheets, however, form only a part of the contribution that computer-based information systems offer to planning in the NHS. As health services continue to demand more resources than are allotted to them by government so information systems as a basis for planning the future provision of services must be used in a more aggressive manner. This means being able to examine a range of possible outcomes to policy decisions taken at the district level and on a data base which is up-to-date and can also be used as a benchmark against which to monitor plan progress. The efficiency and effectiveness of resource use is also of paramount importance and, pending any major overhaul of the data collection in the NHS, better use must be made of what currently exists. The use of a spreadsheet package in this exercise is complementary to this philosophy

and means that "waiting on better data" is no longer always
a valid excuse for inaction in planning.

Bibliography

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Ortho. hospital 2.

Geriatric hospital 2

Geriatric hospital 1

Grade	Day	Nights	Grade	Day	Night	Grade	Day	Night	Day hosp.
SN7	0.00	0.00	SN7	0.00	0.00	SN7	0.00	0.00	0.00
SN8	0.20	0.10	SN8	0.30	0.00	SN8	0.00	0.00	0.15
SR/CH1	0.00	0.00	SR/CH1	0.00	0.00	SR/CH1	0.00	0.00	0.00
SR/CH2	2.00	1.00	SR/CH2	2.00	1.00	SR/CH2	0.00	3.10	1.00
SRN	0.00	0.00	SRN	2.00	2.00	SRN	1.50	1.30	0.00
Sr-SEN	0.00	0.00	Sr-SEN	0.00	0.00	Sr-SEN	1.00	0.00	0.00
Sr-SEN	3.20	1.00	Sr-SEN	5.50	3.20	Sr-SEN	13.50	7.50	1.00
Nrsv Nrs	0.00	0.00	Nrsv Nrs	0.00	0.00	Nrsv Nrs	0.00	0.00	0.00
Nrs Aux.	3.00	2.20	Nrs Aux.	15.00	5.50	Nrs Aux.	23.50	11.00	0.00
Std/Pup	0.00	0.00	Std/Pup	0.00	5.50	Std/Pup	0.00	0.00	1.00
	8.45	4.30		24.80	11.90		48.35	23.10	3.15

General hospital 1

Work area	Medical	Surgical	Gynae.	Ophthalm.	AE	Theatre	Thre. night	Nights
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SN7	1.00	0.00	0.00	0.20	0.25	0.15	0.00	0.00
SN8	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
SR/CH1	0.00	2.00	1.00	1.00	1.32	1.00	0.00	0.00
SR/CH2	4.00	3.00	1.00	2.00	2.12	3.00	0.00	8.70
SRN	7.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Sr-SEN	0.00	0.00	0.00	0.00	1.80	3.39	1.30	13.00
Sr-SEN	10.35	3.00	1.50	3.00	0.00	0.00	0.00	0.00
Nrsv Nrs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nrs Aux.	3.50	3.00	1.50	2.00	1.00	2.95	0.00	14.30
Std/Pup	10.50	9.00	3.50	1.50	1.00	0.00	0.00	6.00
TOTAL	38.35	20.55	8.75	9.70	7.49	10.26	14.40	50.50

General hospital 2

Work area	Medical	Paediat.	Surgical	Gynae.	Geriatric	Ger/day	Ger/night	Theatre	Thre. night	M.I. day	Nights
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SN7	0.67	0.00	0.40	0.25	0.35	0.15	0.00	0.35	0.00	1.00	0.00
SN8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
SR/CH1	0.00	0.00	2.00	2.00	3.00	1.00	0.00	3.00	0.00	3.00	4.75
SR/CH2	3.00	3.00	0.00	2.00	3.00	0.00	1.00	4.00	0.00	3.00	12.00
SRN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sr-SEN	4.50	3.50	2.00	4.50	14.40	1.00	9.00	2.00	1.30	5.03	12.00
Sr-SEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nrsv Nrs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nrs Aux.	3.50	2.00	1.75	1.50	20.40	1.70	17.00	2.50	0.00	2.00	22.00
Std/Pup	15.00	8.00	10.00	3.00	10.50	0.00	0.00	3.00	0.00	0.00	6.00
TOTAL	30.17	21.83	21.35	13.25	51.85	3.85	27.00	16.85	2.10	9.13	59.35

Ortho. hospital 1

Work area	Medical	Nrsvs	Nrsvs night	AE/Opd	day	AE/Opd	night	Theatre
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SN7	0.00	0.00	0.00	0.60	0.20	0.25	0.00	0.00
SN8	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SR/CH1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SR/CH2	4.00	3.00	3.00	1.00	1.50	1.54	0.00	0.00
SRN	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sr-SEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sr-SEN	11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nrsv Nrs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nrs Aux.	11.00	0.00	0.00	1.75	0.00	0.00	0.00	0.00
TOTAL	30.00	6.00	6.00	2.35	1.75	1.54	0.00	0.00

TABLE 1 - Nurse units for all district hospitals.
 (1) = 1 unit available in addition to the students; (2) = 2 units available in addition to the students; (3) = 3 units available in addition to the students.

TABLE 2
Apportionment of night-duty staff costs among
specialties at the two general hospitals.

These are calculated on the basis of the
proportion of inpatient days each specialty generates
excluding outpatients, day hospital and theatres.

General Hospital 1

NIGHT DUTY COSTS

Specialty	Proportion	Cost
Gen. Med.	0.56	601.39
Gen. Surg.	0.28	300.69
Gynae.	0.08	85.91
Ophthal.	0.08	85.91
TOTAL	1.00	1073.91

General Hospital 2

Specialty	Proportion	Cost
Gen. Med.	0.35	438.67
Paed.	0.15	189.00
Gen. Surg.	0.37	463.73
Gynae.	0.13	162.93
TOTAL (excl. geriatrics)	1.00	1253.33

TOTAL NURSING COSTS (DAY AND NIGHT STAFF)

Specialty	Cost
Gen. Med.	1242.99
Gen. Surg.	628.42
Gynae.	226.77
Ophthal.	250.63
GRAND TOTAL	2348.82

Specialty	Cost
Gen. Med.	925.04
Paed.	536.03
Gen. Surg.	809.59
Gynae.	391.44
Geriatrics	1361.65
GRAND TOTAL (incl. geriatrics)	4023.75

TABLE 3 SALARY SCALES

Mid-points of salary scales as of 1-4-84 plus 15% oncost added by district treasurers. Geriatric and psychiatric leads shown are shown separately. Night duty and weekend payments are not given.

		Standard		Plus geriatric/psych. leads	
Grade		Annual cost	Cost/day	Ann. cost	Cost/day
D A Y	SN 7	10232.13	28.03	10421.88	28.55
	SN 8	9623.20	26.36	9812.95	26.88
	SR/CN1	9623.20	26.36	9812.95	26.88
	SR/CN2	8957.35	24.54	9147.10	25.06
	SRN	6888.50	18.87	7078.25	19.39
	SRSEN	6888.50	18.87	7078.25	19.39
	SEN	6166.88	16.90	6356.63	17.42
	Nrsry N.	5368.20	14.71	5557.95	15.23
	NA	4947.88	13.56	5137.63	14.08
	Stdtd/Pup	4711.55	12.91	4711.55	12.91
N I G H T	SN 7	13301.76	36.44	13548.44	37.12
	SN 8	12510.16	34.27	12756.84	34.95
	SR/CN1	12510.16	34.27	12756.84	34.95
	SR/CN2	11644.56	31.90	11891.23	32.58
	SRN	8955.05	24.53	9201.73	25.21
	SRSEN	8955.05	24.53	9201.73	25.21
	SEN	8016.94	21.96	8263.61	22.64
	Nrsry N.	6978.66	19.12	7225.34	19.80
	NA	6432.24	17.62	6678.91	18.30
	Stdtd/Pup	6125.02	16.78	6125.02	16.78

TABLE 5
Nursing costs per inpatient day by specialty and hospital.
(Excluding day hospital, outpatient and theatre costs.)

Hospital	Specialty	Average daily no. inpatients	Cost per inpatient day
General Hospital 1	Gen. Med.	38.91	23.77
	Paed.	17.11	31.33
	Surg.	42.01	19.27
	Gynae.	14.48	27.03
	Geriatric	91.80	14.83
General Hospital 2	Gen. med.	59.80	20.79
	Surg.	29.68	21.17
	Gynae.	8.95	25.34
	Ophth.	8.27	30.31
Orthopaedic Hospital 1	Ortho.	58.30	18.43
Orthopaedic Hospital 2	Ortho.	17.37	14.19
Geriatric Hospital 1	Geri.	95.48	14.14
Geriatric Hospital 2	Geri	46.23	14.44

