AN ANALYSIS OF HOSPITAL MICROFILMING

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ABSTRACT

This paper describes a three month microfilming project conducted by the Health Sciences Centre in Winnipeg. Operations Research techniques allowed the development of performance and work flow indices for microfilm groups of varying sizes. Such groups could serve institution and businesses with similar microfilming needs.

UNE ANALYSE DU SYSTEME DE MICROFILM UTILISE DANS LES HOPITAUX

RESUME

Cette étude décrit un projet microfilm de trois mois éffectué par le centre des Sciences du Bien Etre à Winnipeg. Les opérations de recherches ont permis le développement d'un système d'indexation indicant les travaux accomplits par ces groupes de microfilm. De tels groupes pourraient servir aux besoins des institutions ou des bureaux d'affaires.

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INTRODUCTION

A three month microfilm project was conducted during the summer of 1977 by the Department of Medical Information, Health Sciences Centre in Winnipeg.

The microfilm services were shared by several centres within the complex, and significant space recovery was realized in each instance.

Operations Research techniques were applied to questions concerning comparative costs between In-House and Service Bureau microfilming services, and our results suggested that an efficient In-House Microfilm Operation could reduce per-unit microfilm costs by up to 40%.

ANALYSIS METHODOLOGY

The structure of the project was shaped to answer two fundamental questions:

1. What elements of data collection would be valuable for monitoring work flow, and allow a cost breakdown of the various components of the microfilming process?

2. How should human and material resources be allocated to provide optimal work flow?

The data collection instrument used for the study was acceptable in that it allowed a quantification and analysis of most components of the system. It failed to answer several critical questions about space reduction, and personnel identification was found to be of little value. The functions which reduced record volume could not be compared because the speed of record processing overpowered the measurement technique, and because appropriate data elements were not originally included on the code sheet. Each working day was considered a case, and when the week was complete, the data was updated and analyzed. The questions the analysis explored:

1. What volume of work was done, at what cost, during the three month project?

2. How much did each record cost to microfilm, broken down by component tasks?

3. How much did the cost of microfilming vary with the volume of work processed?

4. What rate of work flow could reasonably be expected from a microfilming group of a given size?

5. Is there an optimum group size and organization for maintaining an efficient work flow?

Since there was initially little understanding of what data would be amenable to and valuable for analysis, a statistical package (SPSS) was used for the administrative evaluation. This easy descriptive statistical analysis allowed a facile monitoring of organizational structure, and a technique for identification and modification of problem areas.

FINDINGS

Each day, the total number of personnel hours, the number of records pulled, prepared, filmed and reduced, the number of microfilm jackets typed and the number of record inches filmed was coded. Relationships between the various phases of the operation were analyzed, and formulae developed for use in more subtle analysis. As the project evolved, these relationships were manually tested, and when necessary, the formulae were adjusted accordingly. By the end of the project, the most important indices of evaluation were considered reliable.

The project, which employed 16 EFT (EQUIVALENT FULL TIME) personnel to reduce inactive Health Sciences Centre medical records to microfilm, transferred approximately 670 linear feet of shelf space to microfilm. The final floor space required to store the microfilm jackets was approximately 3.31 $ft.^2$ The average cost per microfilm was $72.84, with a resulting cost per record of 2.43¢. (Table 1) These prices include all costs incurred during the project, including a 44% overhead factor for personnel and space. They do not attempt to include or amortize the original cost of the equipment. Since most of the records were inactive, they were stored in secondary floor space, allowing relatively easy access and transportation to the microfilming area. One person could comfortably transport the daily processing requirements of the group. Six people were involved full time in record preparation, with additional help being available as required. The filming was maintained by a pool of approximately five people who were also able to assist with other functions as needed. Two people were able to handle the processing and film cutting, which in turn kept one person busy typing the jackets. Once the records were filmed, and the film checked for quality, all paper was discarded. This freedom to dispose of paper documents allowed a space reduction of approximately 90%. It is on the basis of this operation that the per unit costs contained in this paper are generated. The degree to which they are generalizable is not yet clear.

The following table (Table 2) shows the cost breakdown for one medical record (1 JACKET) assuming that the average record has 25 pages.

Table 2. As the table shows, the average medical record cost approximately 68.6¢ to microfilm (2.74¢ per page).

The average cost for a one hundred foot roll of microfilm, using the above figures, is $82.32. The actual costs incurred during the summer project ranged from $125.00 per film when the group was just beginning, to $56.92 when 15 people were able to produce 20 films in one day. (FIGURE 1) It should be noted that labour accounts for approximately 73.76% of the total microfilm cost, and any cost variations are a direct

RESULTS OF THREE MONTH HEALTH SCIENCES CENTRE MICROFILM PROJECT TABLE 1

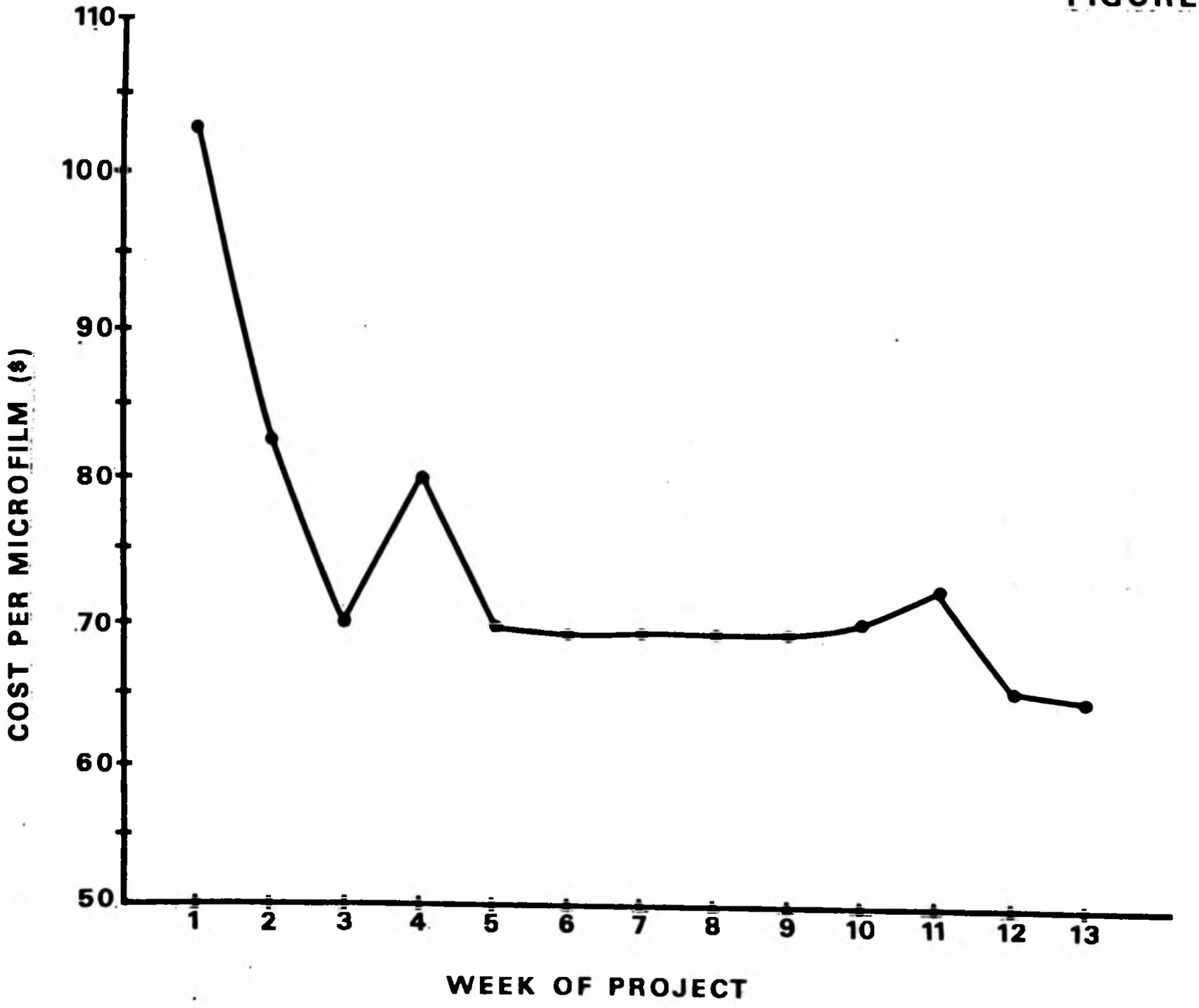
NUMBER OF DAYS WORKED:		58
NUMBER OF RECORDS PROCESSED	: TOTAL	48,592
	: AVERAGE PER DAY	837.79
FILM PRODUCED	: TOTAL	837
	: AVERAGE PER DAY	14.43
RECORD LINEAR FEET RECOVERED	: TOTAL	688.39
COST PER MICROFILM (100')	: MEAN	72.84
	: MEDIAN	69.85
COST PER RECORD PAGE (CENTS)	: MEAN	2.43
	: MEDIAN	2.33
	: MODE	2.21
NUMBER OF FILMS PER PERSON -DAY (F/PD)	: MEAN	0.966
	: MEDIAN	1.00
	: MODE	1.00

INDUSTRY STANDARDS FOR AVERAGE (25 PAGE) MEDICAL RECORD TABLE 2

COMPONENT	COST PER RECORD	% OF TOTAL COST
1. CHART PREPARATION	$.289	42.14
2. MICROFILM LABOUR	$.112	16.32
3. FILM COST	$.049	7.14
4. RECORD INDEXING	$.056	8.16
5. JACKET COST	$.131	19.10
6. JACKET LOADING	$.049	7.14
	$.686	100.00

AVERAGE COST PER FILM BY WEEK

FIGURE 1

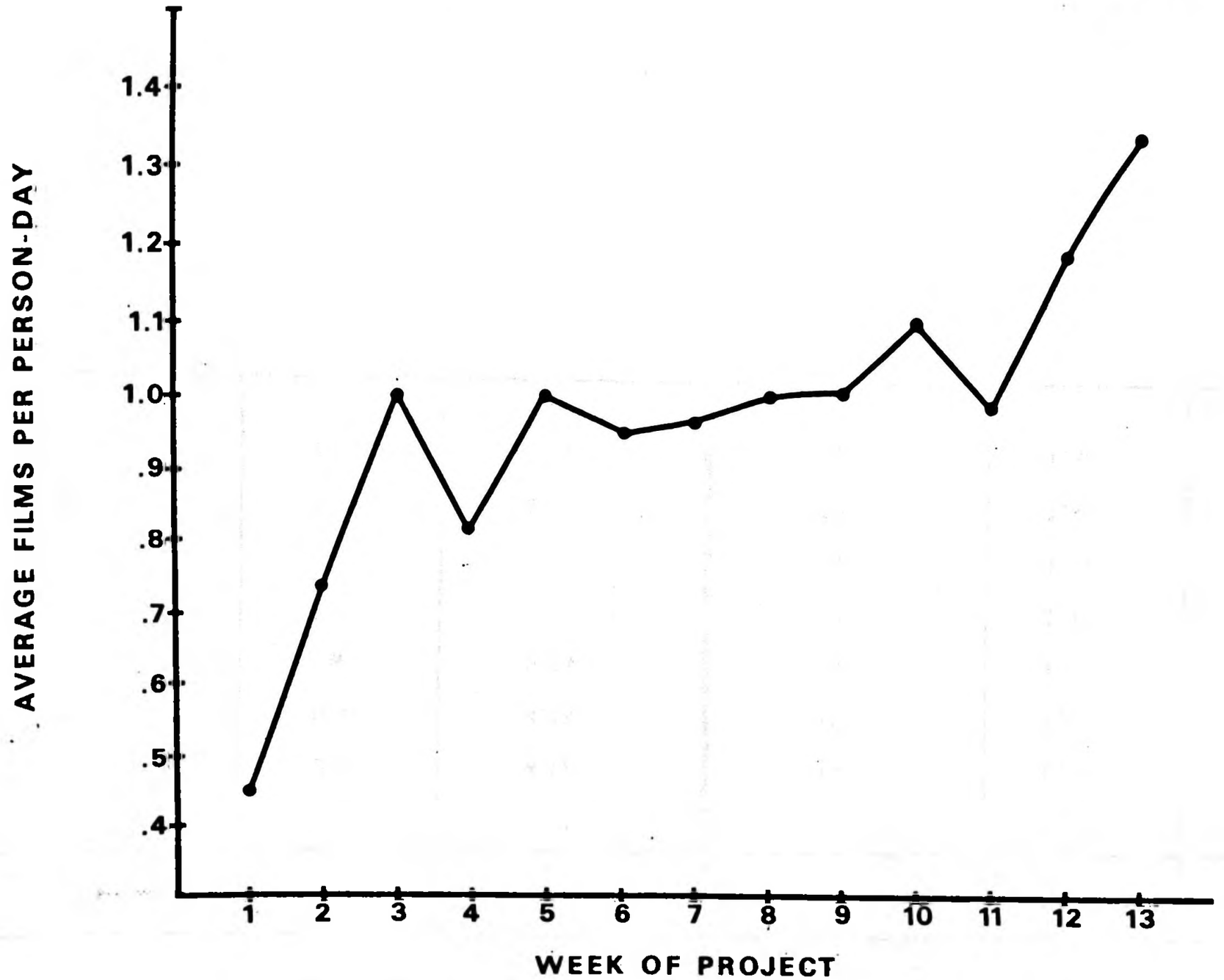


RATE OF PRODUCTION AND COST PER RECORD PAGE TABLE 3

NUMBER OF FILMS PER DAY	FILMS PER PERSON-DAY	COST PER RECORD PAGE (¢)	NUMBER OF FILMS PER DAY	FILMS PER PERSON-DAY	COST PER RECORD PAGE (¢)
5	0.34	5.59	13	0.92	2.56
6	0.40	4.77	14	0.94	2.43
7	0.47	4.18	15	1.01	2.31
8	*	3.74	16	1.12	2.21
9	*	3.40	17	1.17	2.12
10	0.63	3.13	18	1.44	2.03
11	0.77	2.90	19	1.46	1.96
12	0.81	2.72	20	1.33	1.90

AVERAGE FILMS PER PERSON-DAY BY WEEK

FIGURE 2



function of the productivity of the group. As the next table shows (Table 3), the cost per record page is a function of the number of films produced by the group per day.

Table 3. To deal with this fact, it was necessary to develop an arrangement where each of the three film units was kept operating constantly for 11 hours per day, an average of 33 film-hours per day. This allowed the filming group to keep up to the record preparation group who were preparing an average of 150 records per person per day.

The rate of production was measured with one index - the number of FILMS PER PERSON-DAY (F/PD) produced by the group. As the graph demonstrates (FIGURE 2), a large group working efficiently to reduce a medical record to a microfilm jacket can maintain an average of 1.00 F/PD. It should be noted that when records are well maintained, (weeks 11, 12, 13), the efficiency increases significantly.

Data is not yet available which indicates what rate of work may be expected for a group which must not only microfilm a medical record, but also must combine the diazo duplicates with the remaining record and re-insert them in the shelves. The amount of paper handling to be done is significantly increased, so the rate of flow would likely be significantly less than 1.00 films per person-day.

The following table (Table 4) attempts to relate average hourly output of all the manual operations studied in the project to 1 FILM UNIT (the average volume of charts required to complete 100 ft. of microfilm).

Table 4. It should be noted initially that the labour requirement per FILM UNIT (FU) is very high (11.75 PERSON-HOURS) and therefore expensive ($79.08, assuming a labour and overhead cost of $6.73/hour). The figures are intended to be averages, and reflect an EFFICIENCY LEVEL of 0.64 FILMS/PERSON-DAY. All figures used in the table were derived during the summer project, except the figure for RECORD EXTRACTION where no record selection was required. The figure used in Table 4 (100 RECORDS PER PERSON-DAY) for record extraction reflects the effort required to extract a record from active files, check to see if it meets appropriate criteria, and if it does, to log the number and name of the record. As Table 4 defines, Record Extraction accounts for 44.64% or 3.6 EQUIVALENT FULL TIME (EFT) personnel of an 8 person group.

The next most labour-intensive operation, RECORDS PREPARATION (29.85%), would require at least 2.4 EFT personnel. The rate at which this component functions is highly dependant on experience, (Figure 3) since less experienced personnel are onl, able to maintain a preparation rate of 50 - 100 records per day.

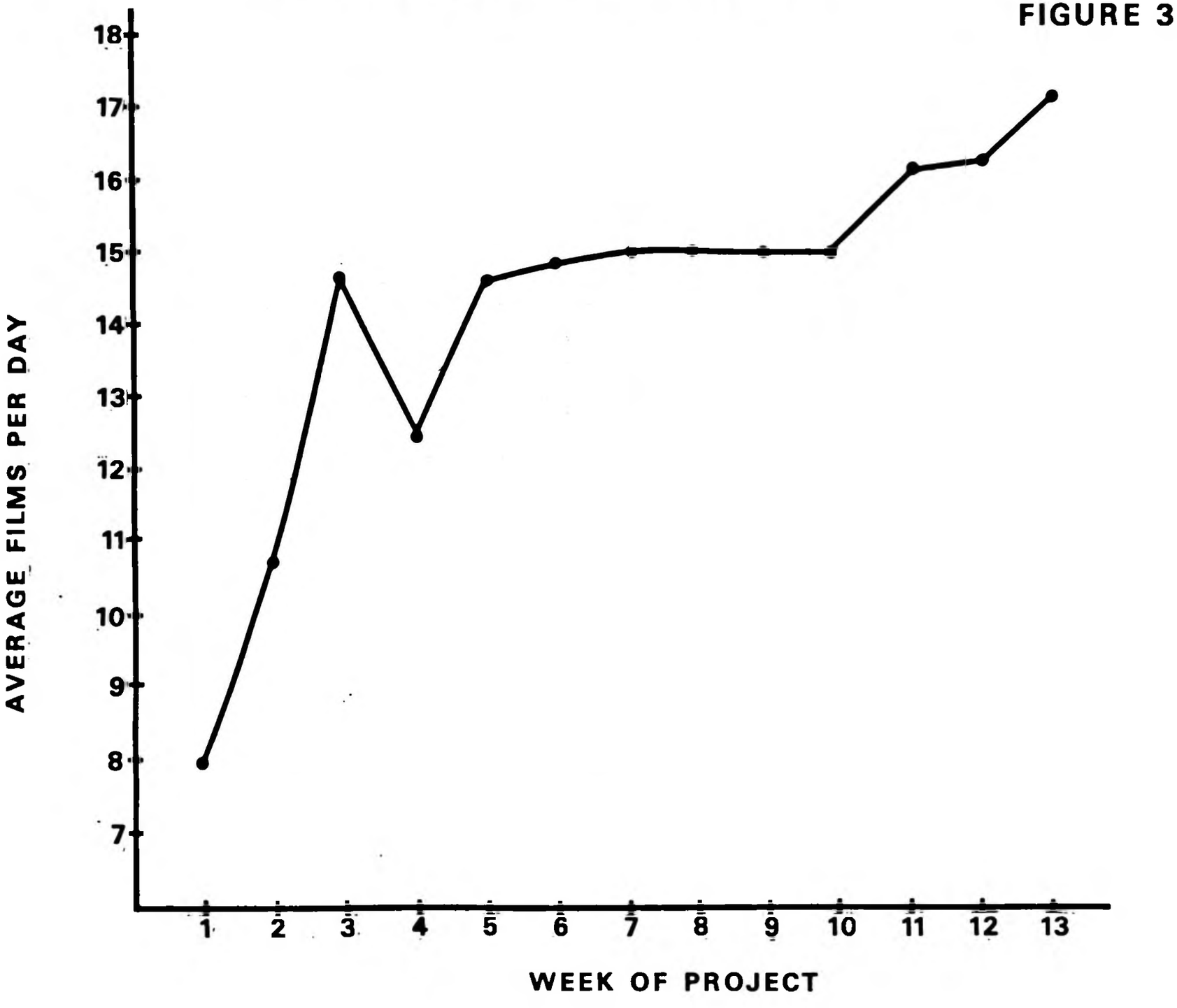
WORK VOLUME FACTORS OF MICROFILM WORK COMPONENTS TABLE 4

WORK FUNCTION	RECORDS PROCESSED PER DAY	POTENTIAL FILMS UNITS PER DAY	MAN-HOURS PER FILM UNIT	% OF TOTAL MAN-HOURS	LABOUR ALLOCATION 4 EFT	8 EFT	16 EFT
RECORD CULL AND LOG (EXTRACTION)	100	1.43	5.25	44.64	1.79	3.58	7.16
RECORD PREPARATION	150	2.14	3.51	29.85	1.19	2.38	4.76
FILMING	262	3.74	2.00	17.00	0.68	1.36	2.72
PROCESSING AND CUTTING	1050	15.00	0.50	4.25	0.17	0.34	0.68
JACKET TYPING	1050	15.00	0.50	4.25	0.17	0.34	0.68
TOTAL			11.76	100.00	4.00	8.00	16.00

ASSUME: 70 RECORDS PER MICROFILM (1 FU).

AVERAGE FILMS PER DAY BY WEEK

FIGURE 3



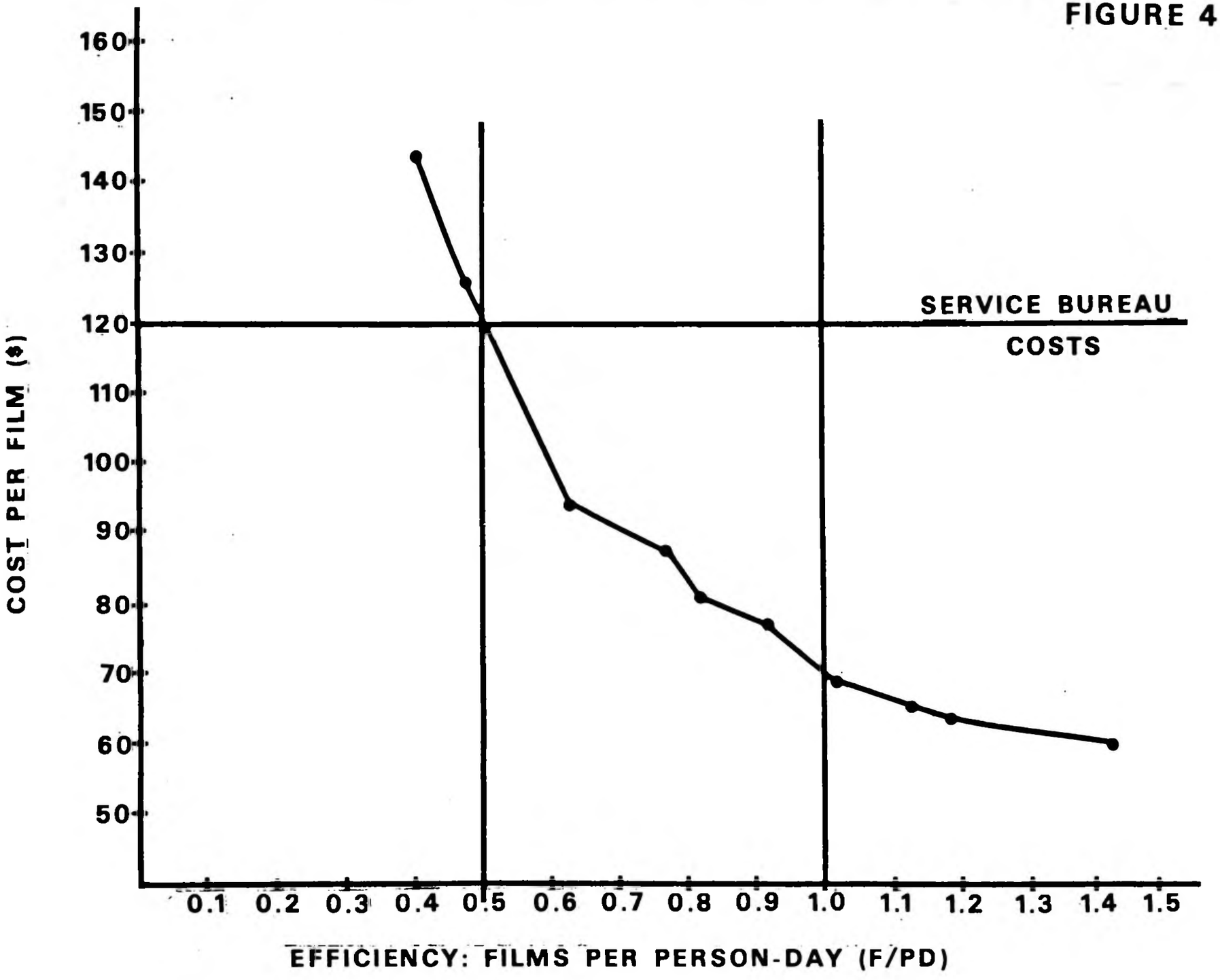
In an 8 person group, two people (2 EFT) would be sufficient to maintain the filming, jacket typing, and assist with the record preparation when required.

It becomes obvious, when one notes the length of time required to extract and prepare enough records for one film (1.00 FU), that a larger group can be much more efficient than a small group. Since medical records are highly complex, and variable in terms of composition, it becomes mandatory to develop a significant degree of specialization within functions. Such specialization can more easily be fostered in a group of more than four personnel. It has not yet been possible to plot the level of group efficiency versus group size for various types of operation, but it has been possible to demonstrate the value of clean organization on the unit cost of a completed microfilm (1 FU). Figure 4 depicts the change in the cost per microfilm. As the number of FILMS PER PERSON-DAY (F/PD) rose, the cost saving per FU increased to $50.00 per film, resulting in an approximate saving of $40,000 when compared to the cost of having a service bureau do the work.

It should also be noted that the percentage of total film cost (Figure 5) attributable to the labour factor dropped from 86% at 0.64 F/PD to 64% at 1.44 F/PD. This ability to reduce significantly the cost per unit record justifies the development and maintenance of experienced health records personnel effectively trained in the information needs of the institution.

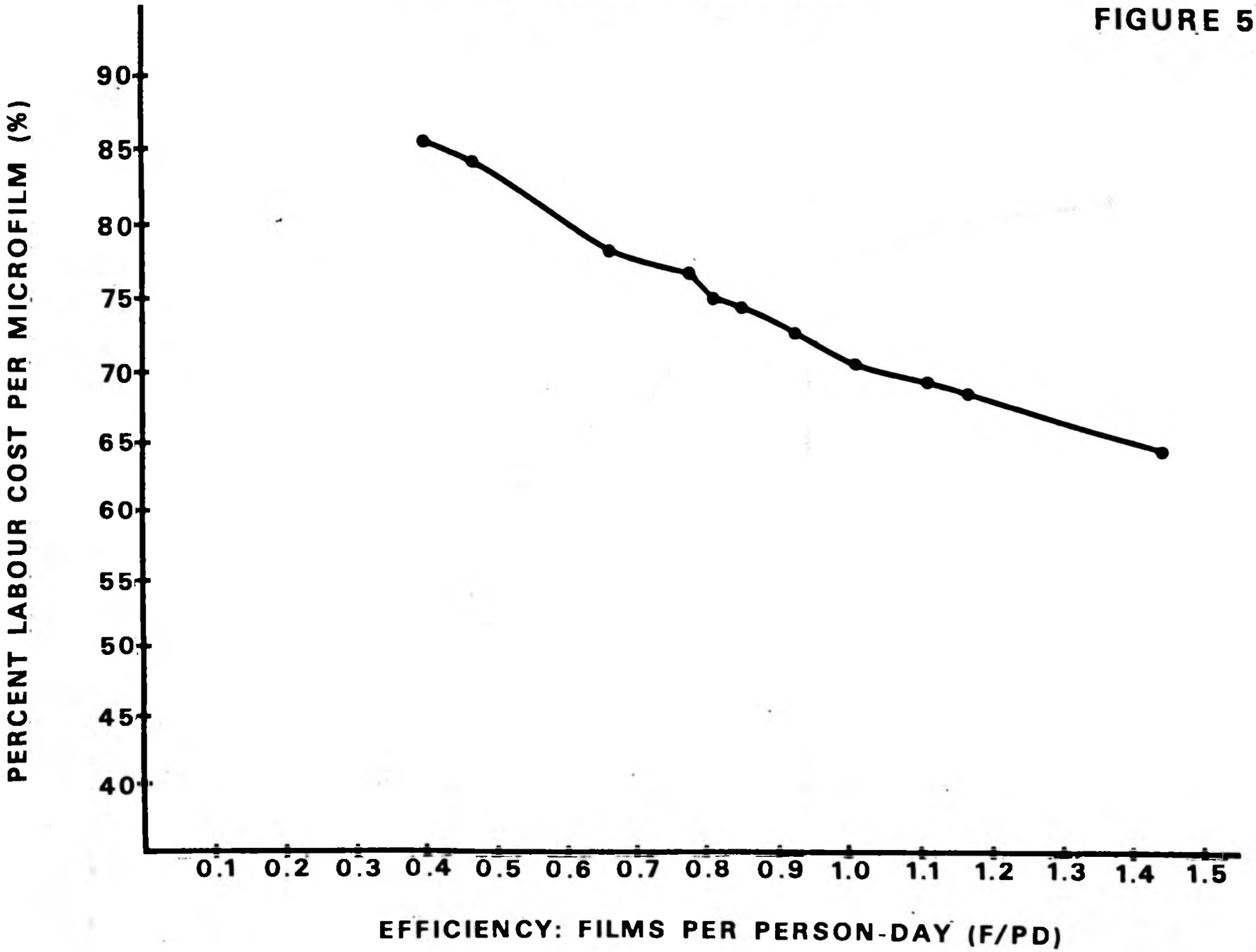
COST BENEFIT OF IN-HOUSE -vs- SERVICE BUREAU MICROFILMING

FIGURE 4



LABOUR COST AS PERCENT OF TOTAL MICROFILM COST BY EFFICIENCY

FIGURE 5



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DISCUSSION

The literature concerning itself with health record related microfilming has not been helpful in quantitatively defining and comparing the various components of a microfilm operation. Little effort has been made to compare the dollars spent on microfilming to the results gained, though the need for such definition and comparison is especially acute when health expenditures are being curtailed by government funding agencies.

The record utilization patterns of the health care community are unique, and the appropriate microfilming requirements may differ significantly from those maintained by banks or insurance companies. The procedures used within a given hospital may also fluctuate according to the size and complexity of the record, and the use to which it will be put after it has been microfilmed. In hospitals where the number of records recalled are a small percentage of the total processed, there is little need to put the film into jackets, a process which increases the cost of the microfilm operation by approximately 30%.

The development of the functional relationships between the subset microfilming operations and their attendant costs was made possible with the combined approaches of Operations Research (O.R.) and Management by the interrelationships of the microfilm operation, and from them, the setting of realistic objectives. These objectives were agreed to with the group and the organization structure was geared to meeting the objectives. As the group changed and evolved to meet the demands of different types of records, the FILM UNIT workload for each section increased tremendously. Since materials accounted for only 15 - 35% of the total cost of the operation, the efficiency of the group determined the final unit cost of a microfilmed record.

The cost per unit record is a direct function of the FILMS/PERSON-DAY produced by a group, and the level of efficiency attained determines whether one's total microfilming cost will be higher or lower than the costs incurred with a service bureau. It should be noted immediately that whatever the efficiency of the group, quality control is of the utmost importance, and no effort can be spared to produce and maintain a final product of less than the highest integrity.

The need for high quality microfilmed health records argues for the development and retention of skilled health record microfilm personnel. Not only is a skilled group able to maintain consistently lower per unit costs, but the procedures that are established to handle any type of record will be consistently upheld-even though the procedures may, of necessity, be very complex.

The points made in this paper lead, it is hoped, to the conclusion that if microfilming is considered an integral component of the

data management and retrieval mechanism of a health care institution, the microfilm group be allowed to develop a cost-effective mechanism. This can be done if the objectives set for the group are high, and if the group is given an opportunity to develop and hone its skills as an integral part of the larger organization. There should be enough work available on a regular basis that it must work efficiently to maintain a "0" record storage growth for the institution.

If one institution cannot keep such a group busy, thought should be given to developing a MOBILE HEALTH RECORDS MICROFILM TEAM on a community or regional basis. If such a group were able to replace two or three single person installations, the cost of saved capital equipment alone would be recovered in a very short time.

It is not yet fully understood what practical minimum or maximum size a microfilming group should be, but the authors feel that the group should be able to process as many records per year as there are discharges from the institution, and if that requirement can be performed by less than four people in one institution, a regional approach should be considered. Future work will focus on efficiency levels for various size groups and on cost benefit considerations for the institution.

CONCLUSIONS

1. There was an approximate space saving of 90% when 48,500 inactive medical records were reduced to microfiche during a 3 month summer project at the Health Sciences Centre.

2. The average cost of reducing 1 medical record to microfiche was 68.6¢ (2.74¢ per record page). Labour accounted for approximately 75% of the total cost of microfilming.

3. Microfilming costs per medical record were reduced by 40% by increasing the efficiency of the microfilming group.

4. In-House microfilming costs equalled Service Bureau costs when the In-House group was producing one microfilm per day for each two people. (0.50 FILMS/PERSON-DAY (F/PD)). The In-House Group consistently exceeded this level of efficiency.

5. A well trained In-House microfilming group can maintain an efficiency level of between 0.75 and 1.00 FILMS/PERSON-DAY (F/PD).

6. Health Care Institutions should explore the advisability of an In-House Microfilm Program to maintain high standards for quality control, patient information confidentiality, and cost-effectiveness.

7. The concept of a MOBILE MICROFILM TEAM to provide microfilming services to small hospitals on a regional basis should be considered.