

**ECONOMIC ASPECTS OF HUMAN RESOURCE
DEVELOPMENT IN HEALTH & FAMILY PLANNING
IN BANGLADESH:**

Costs Of Education and Training of Health Workers In Bangladesh

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Acronyms

AHI	Assistant health inspector
ARI	Acute respiratory Infection
BCPS	Bangladesh College of Physicians and Surgeons
BIRDEM	Bangladesh Institute of Research & Rehabilitation in Diabetes, Endocrine and Metabolic Disorders
BMA	Bangladesh Medical Association
BMDC	Bangladesh Medical and Dental Council
BRAC	Bangladesh Rural Advancement Committee
CHW	Community Health Worker
CMC	Chittagong Medical College
CME	Continuing Medical Education
DFID	Department for International Development
DGFP	Director General Family Planning
DGHS	Director General Health Services
DMC	Dhaka Medical College
EPI	Expanded Programme of Immunization
ESP	Essential Service Package
FCPS	Fellow of the College of Physicians and Surgeons
FP	Family Planning
FPI	Family Planning Inspector
FWA	Family Welfare Assistant
FWC	Family Welfare Visitor
FWVTI	Family Welfare Visitor Training Institute
GoB	Government of Bangladesh
GP	General Practitioner
HA	Health Assistant
HPSP	Health and Population Sector Programme
HEU	Health Economics Unit
HRD	Human Resource Development
ICDDR, B	International Centre for Diarrhoeal Disease Research, Bangladesh
IPGMR	Institute of Postgraduate Medicine and Research
IRR	Internal Rate of Return
LIP	Local Initiatives Programme
MA	Medical Assistant
MBBS	Bachelor of Medicine, Bachelor of Surgery
MC	Medical College
MCH-FP	Maternal and Child Health and Family Planning
MCPS	Member of the College of Physicians and Surgeons
MMCH	Mymensingh Medical College Hospital
MO	Medical Officer
MOHFW	Ministry of Health and Family Welfare
NGO	Non-governmental Organisation
NIPORT	National Institute of Population Research and Training
NIPSOM	National Institute of Preventive and Social Medicine
NPV	Net Present Value
ODA	Overseas Development Assistance

PHC	Primary Health Care
PhD	Doctor of Philosophy
RCT	Regional Training Centre
SSMC	Sir Salihmullah Medical College
STD	Sexually Transmitted Disease
TBA	Traditional Birth Attendant
TFPO	Thana Family Planning officer
THC	Thana Health Complex
THFPO	Thana Health and Family Planning Officer
Tk.	Taka
UNICEF	United Nations Children's Fund
USC	Union Sub-centre
WDR	World Development Report
WHO	World Health Organisation

Executive Summary

The Government of Bangladesh has committed itself in its Health and Population Sector Programme (HPSP) to institutionalise a needs based approach to Human Resources Development (HRD). Expenditure on human resources by public and private health care providers represents the largest part of total health sector resources. Obtaining value for money on this expenditure is a high priority. Under the current financial pressures it is increasingly important to look carefully at the roles and contributions of different health care professionals and to adapt the skills of each to service needs so that needs are met in a more efficient way.

The HRD-project of the MOHFW has carried out valuable work on the present situation and developed a strategy for change of human resource development in Bangladesh (HRD 1997). The aim of this series of reports (HEU Research Papers Nos. 12, 13 and 14), of which this paper is a part, is to complement this work by analyses on the cost of staff supply, on economic incentives and on the organisation and financing of training.

The reports address key economic aspects of the HRD process by exploring ways of

- Providing staff in a way which ensures a better match between service needs and professional skills,
- Improving performance management through appropriate incentives to staff to provide services efficiently and to high quality standards.
- Improving efficiency in education, training and continuing staff development

The different components of the project are presented in three Research Papers.

Research Paper 12 focuses on the flow of funds in health care human resources under the current arrangements in the government health sector. Based on preliminary work by the HRD project we developed a cost model that provides expenditure estimates by professional categories, geographical areas, function and level of service, civil service class and mode of financing. The study provides also data for modelling the consequences of a unified service structure between DGFP and DGHS.

Research Paper 13 uses a framework of quantitative and qualitative research to study earnings profiles of medical doctors and to investigate the current structure of economic incentives for the medical profession. Emphasis is being placed on exploring strategies to improve medical staff supply in rural areas

Research Paper 14 evaluates the cost of education and training for health professionals in Bangladesh. Based on the assessment of annual equivalent cost the study models the economic consequences of staff attrition and explores options to improve efficiency of training. It addresses also the question of who should pay for education and training and evaluates options of cost recovery from private sector providers.

The following provides short summary of this Research Paper.

Objectives:

- To establish costs of education and training of health professionals and to estimate opportunity costs incurred through attrition of trained staff
- To estimate relative costs and benefits of training programmes and to explore options of recovery of training costs

Design:

Economic evaluation assessing cost of education and training of health workers on basis of a staff time allocation approach. Modelling of wastage and attrition rates and calculating internal rate of returns on educational investments.

Subjects:

Time allocation survey of 73 medical academic teachers. Costing data from 5 medical colleges, the IPGMR, the Directorate of Nursing services, the College of Nursing and NIPORT.

Main outcome measures:

Total costs and annual equivalent cost of training. Calculation of the Net Present Value (NPV) and Internal Rate of Return (IRR) of investment in education and training.

Results:

On average each medical college spends Tk.33 million on undergraduate medical education. Of this cost 29% is borne by the attached College Hospital This is equivalent to Tk.250,000 per undergraduate medical student. Ninety-three percent of the costs are covered by the revenue budget, 2.2% by the development budget, 4.1% by tuition and hostel fees and 0.3% by other income. The overall cost of basic nursing education is Tk.149,000, including the stipends for student nurses which total Tk.44,000. Basic training for PHC workers is provided at cost of Tk.200-Tk.400 per training day.

The annual equivalent cost of education and training (the present value of the educational investment, discounted and apportioned at 5% to the persons working life years) is Tk.19,607 for GPs, Tk.46,035 for doctors with Diploma, Tk.73,758 for medical specialists, Tk.5,310 for basic nursing education and Tk.31,229 for post-basic nursing education. Wastage rates were estimated for students with prolonged study time and graduates being unemployed or going abroad.

The IRR on private costs of medical education and training is relatively high by international comparison (22.3% for GPs and 30% for specialists), indicating that students bear only a minor part of the total cost. If the full cost of education and training had to be financed by the students themselves the IRR would drop to 12.6% for GPs and 16.1% for specialists, a range which is deemed adequate in other countries.

Conclusions:

Expenditure on medical education is the largest public investment in education and training in the health sector, followed by training for PHC personnel and nurses. Costs per student are relatively low for both medical and nursing students, underpinning that education of these professions is largely based on formal instruction of high student numbers rather than on intensive training in small groups. Since only around 51% of

doctors who receive medical training, work in the government health services, the cost to government of training for these roles is inflated by the numbers doing private work or going abroad. The data demonstrate that there is scope for a recovery of public subsidies from the graduates themselves or from institutional providers in the private sector who do not engage in education and training. If full cost recovery were possible in cases where doctors work outside the government or NGO sectors, then the net government subsidy for training would be reduced by around 32%. In the case of nurses, the rate of employment in government services should be increased and incentives changed to encourage qualified nurses to work in services in country. Currently the return on investment in training nurse education is almost a complete waste since government services have not employed newly trained nurses during the last 5 years and large numbers are assumed to work abroad or to be unemployed. The NIPORT system for training of PHC workers needs to be more focused, however the data suggest that the institute does not run at its full capacity and several courses are more expensive than they could be.

1. Introduction

As the third in a series of reports this paper focuses on the economics of education and training of health professionals in Bangladesh. The HPSP programme implementation plan stressed the need for continuing efforts to improve the quality of education and training of doctors, nurses and other health personnel. In its strategy for change the HRD project has critically addressed the problems related to the capacity and appropriateness of undergraduate and postgraduate training of key professions and made recommendations to achieve a sustainable quality improvement.

2. Background

Few studies have assessed the cost of training and staff development of health care human resources in Bangladesh. According to an estimate of disaggregated funds, training for the health sector totalled US\$ 5m and for the population sector US\$ 8.4 in 1994/5. (HEU 1996). This is equivalent to 2% of the health sector and 5% of the of the population sector public expenditure in 1994/5. In our study on expenditure on health care human resources we examined staff costs for teaching and training which account for 4% percent of the total expenditure on health and family planning human resources.

There are, however, no studies of costs and returns of these human resources investments in terms of analysis of training costs per professional group and assessment of needs for future investment or options for cost recovery.

2.1. Medical education and training

Thirteen government colleges and 8 private colleges provide undergraduate medical education with a total capacity of 1,531 students in the government sector (Table 1). The MBBS is a 5 year course, with the first two years dedicated to pre-clinical subjects and bedside teaching starting in the 3rd year. The final exams are taken after 5.8 years on average and are followed by one year of internship in a hospital. A number of initiatives have aimed to improve medical education and training (NIPSOM 1997, Molla and Thwe 1995, Bullough 1997), to adapt curricula and teaching to the needs of the priority areas of the health sector and to develop community based teaching sites.

The level of postgraduate training activity depends largely on the capacities of training institutions and does not explicitly follow a needs-based approach (HRD 1997). The Institute of Postgraduate Medicine and Research (IPGMR)¹, medical colleges and other specialised institutions such as the Cancer institute (Table 1) offer specialist training courses. The total cumulative number of physicians who have obtained a postgraduate degree was 3,451 in 1995. Of these graduate 1,510 had a PG Diploma, 943 a FCPS and 560 a MCPS.

¹ The Institute of Post Graduate Medicine and Research became autonomous in April 1998, changing its name to the Bangabandhu Medical University (BMU).

Table 1: Capacity of Medical Education in Bangladesh

	Capacity	total
<i>Undergraduate Medical Education:</i>		
8 established government colleges		
Dhaka MC, Sir Salimullah MC Dhaka, Mymensingh MC, Rajshahi MC, Chittagong MC, Rangpur MC, MAG Osmani MC Sylhet, Sher-e-Bangla MC, Barisal	150	1200
5 new government colleges		
Faridpur MC, Comilla MC, Bogra MC, Dinajpur MC, Khulna MC	50	250
Foreign students[]		50
Freedom fighters		15
Reserve		16
Total		1531
<i>8 private colleges</i>		
Bangladesh MC, Dhaka, Z H Shikder Women's MC Dhaka, Uttara Women's MC Dhaka, National MC Johnson Rd Dhaka, Community based MC , Mymensingh, Zahurul Islam MC, Kishorgonji, Jalalabad Rashib Rabeya MC Sylhet, Institute of Applied Health Sciences Chittagong.		400
<i>Postgraduate Training</i>		
IPGMR, Medical Colleges, Cancer Institute, Institute of Ophthalmology, NIPSOM, Institute of Cardiovascular Diseases, Institute of Child Health, Ministry of Defence.		

2.2. Nursing education

Nurses are trained in 11 nursing training centres which are attached to district hospitals and medical colleges and centrally administered by the Directorate of Nursing Services. In 1997 there were 40 centres with a capacity of 1335 students. Training is based on a 4-year course. Only a small number of nurses go on for further training at the College of Nursing. However, many graduates complement their basic training with a one-year course in midwifery (female students) or orthopaedic nursing (male students). After graduation many nurses remain unemployed and a substantial number take on jobs abroad. It appears that it is the inability of the government services to absorb graduates rather than a shortage of trained nurses that is the obstacle to increasing the numbers of nurses in health services (HRD 1996). The low quality of nursing has been related to defective basic education and lack of qualified practice instructors. Since 1994 the project on strengthening nursing education and services has focused on capacity building and support of training and identified the need for improved basic nursing skills as well as communications and management skills. (Thomson 1997).

2.3. Education of PHC and FP workers

There are two paramedical institutes and five medical assistant training schools with a capacity of 150 and 250 places, respectively. The National Institute of Population Research and Training (NIPORT) provides basic training for PHC and FP workers in 20 regional training centres that are attached to Thana Health Complex headquarters. A number of reports have addressed the inadequate provision and capacity for training which have been identified as a major constraint to the quality of MCH and FP programmes (ICDDR,B 1997). There is no similar institute for training of PHC

personnel under DGHS and strong recommendations have been made to integrate training for personnel under a unified service delivery structure to make more efficient use of resources (HRD 1997). A recent study has evaluated the costs of training field-based staff offered by NIPORT (Shanton-Tan 1997) but similar studies on training capacities and costs are not available for other training programmes.

3. Approach Taken

Developing human resources is best seen as an investment, where the benefits can be enjoyed over a number of years. The analysis in this report takes this approach, viewing the investment both from the point of view of the health sector and the individual undertaking the training.

The internal rate of return approach:

Most economic evaluation of human resources has been based on the human capital approach (Becker 1964). This has been used to investigate a range of economic issues at both micro and macro level. These studies have focused on returns to education and examined the impact of education on the economy and the productivity of labour. The approach compares the flow of costs and returns to investment in education within a discounted cash flow framework. It has been recognised that schooling and training has strong effects on the labour markets as it leads to a differentiation of earning profiles between professions (Schultz 1997)

In the health sector, expenses on education and training have the ultimate objective of improving the health status of the population by providing an adequate supply of appropriately qualified health professionals. But education costs are also a major factor in the supply and demand for health professionals, as the labour market responds sensibly to the price of education. For example, demand can exceed supply persistently when the cost of education for the individual and for government forms a barrier to entry of the labour market (Mott and Kreling 1994).

A standard economic method of ranking the profitability of an investment is calculating its internal rate of return (IRR) and this method has been applied also to a number of studies evaluating returns on education of health professionals (Weeks et al, 1994, Mott and Kreling 1994, Wilson RA 1987). Education is seen as an investment that yields returns over a defined number of years, for example the working lifetime. During the years of study the cash flow is negative as education costs are incurred, and earnings are low or zero. In later years earnings are higher than the costs of education and cash flow is positive. The IRR is a measure of yield which is calculated as the rate equalising the discounted cash flow on an educational investment over its duration (Weeks et al, 1994). The costs of education include (1) direct costs (salaries, materials) and (2) opportunity costs incurred by the individual when undertaking the training programme. Benefits are measured by the present value of future additional income attributable to the programme. At aggregate level these are the gains to national income through education.

Conceptually it is important to distinguish between social and private costs and benefits. As Schultz (1997) has emphasised, a criterion for policy making should be that the surplus of social over private benefits must exceed or at least be equal to the

social costs borne by the consumer of health services. Consequently any education programme must first meet the requirement to provide sufficient incentives to individuals who undertake it and then satisfy the requirement that social returns justify social costs.

Like any other health care expenditure, expenses for training and education should be directed to the priority areas of the sector where they produce the greatest returns. Attrition of trained staff is an important factor, which influences efficient investment in training of human resources. In particular the large numbers of trained doctors and nurses going abroad have been considered as a problem in many developing countries (WDR 1993). The high attrition rates of female graduates who never enter the profession and the mismatch between output of trained professionals and the capacity of the labour market have been identified as major sources of wastage of resources.

A related issue is who should pay for education of health professionals. There is a growing concern that private sector facilities that do not provide education and training use health professionals who have been trained at expense of the public sector, without sharing the cost. Similarly health professionals who had free education, may achieve relatively high wage returns, for example through private practice. As examples from recent health care reforms demonstrate, a number of policies for recovery of education costs have been put forward with the intention of improving efficiency and to reinstating the balance between social and private returns.

4. Objectives of the study

It is the objective of this study:

- To establish costs of education and training of doctors, nurses and PHC staff.
- To estimate opportunity costs incurred through attrition and wastage of trained staff
- To estimate relative costs and benefits of different education and training programmes using a rate of return approach.
- To explore options of cost recovery of training for health professionals

5. Methods

5.1. Definitions and sources of data

Direct cost:

Cost information was obtained from 5 medical colleges (Mymensingh, Sir Salimullah, Dhaka Medical College, Rajsahi MC, and Chittagong MC) for undergraduate medical training, the IPGMR for postgraduate medical training, and the Directorate of Nursing for nursing training centres and the College of Nursing. Costs of training programmes for PHC workers were obtained from the NIPORT study on training costs for field based staff (Shanton-Tan 1997). These institutions provided data on capacity as well as actual annual intake and output of students or trainees.

Medical undergraduate and postgraduate education:

The direct costs of teaching and training consist of academic staff salaries, overheads and accommodation costs, medical costs, and salaries for internships. Costs of teaching and training occur in both the Medical Colleges and the attached College Hospitals. Academic staff from the College are involved in patient care and, beginning from the 3rd study year, staff employed by the hospital are involved in training of medical students. We separated the costs of teaching and training from patient care by use of a staff time allocation approach, as follows:

Medical colleges: A survey was carried out among 73 academic teachers from 4 different institutions (MMC, SSMC, DMC and IPGMR) to assess the time allocated to teaching/training and to patient care. The sample took account of grade (professor N=13, associate professors N= 21, and assistant professors N=39) and the subject taught (theoretical subjects N=17, and clinical subjects N=56). Staff time was assessed for formal teaching and practical training for both undergraduate and postgraduate students.

Annual costs were obtained from the college budgets for 1996/7. Line item costs were apportioned to categories of undergraduate training, postgraduate training and patient care using the staff time allocation method where appropriate. This method was not used for cost items such as medical supplies and drugs, which were all apportioned to patient care.

Medical College Hospitals: Numbers and salaries of staff involved in teaching were obtained from the Mymensingh College Hospital (MMCH) study (Eason 1997), which was used as a template to assess the costs of the other College Hospitals. Data of hospital staff time dedicated to training of medical students were also available from this study (DI unpublished) indicating that registrars and resident physicians and surgeons spend 15 hours per week on training and teaching. The MMCH study also provided data on overhead costs, which were added to the salary costs and on costs of medical treatment of students. Numbers of staff of the other College Hospitals were obtained from the HRD database (HRD 1996).

Postgraduate Training:

Expenditure data for the IPGMR were obtained from the budget 1996/7. Costs of postgraduate training were apportioned to the different courses offered (Diploma and advanced degrees) on basis of survey data on time allocation of academic staff. Salaries for trainees were added to the total cost, assuming that trainees hold posts of registrars during their further training.

Unit costs

Total cost for teaching and training were divided by numbers of students/year to obtain annual costs per student.

Nursing education:

The cost for basic nursing education was obtained from the Directorate of Nursing Services. In addition students receive practical instruction between year 2 and 4 from senior nurses of the hospital to which the training centre is attached. The costs of this clinical component were estimated to be equivalent of 15% of the staff time of senior nurses and assistant nurses and of 10% of Nursing Supervisors. Basic nursing training

takes place in centres attached to Medical College Hospitals (475 places) and District Hospitals (660 places). Nursing staffing patterns and costs from the MMCH study were used to calculate the cost of practical training per student nurse in tertiary care facilities. Data on staffing of district hospitals were obtained from the HRD database and used to calculate costs of the practical component of training attached to secondary care facilities. Total cost and activity for postgraduate nursing education was obtained from the College of Nursing.

Training of PHC staff:

Data were obtained from the NIPORT costing study (Shanton–Tan 1997)

Opportunity cost:

The opportunity cost is the income a person would have generated if he or she had not undertaken the training under consideration. Estimates of annual earnings of secondary school graduates without further training were obtained from the Bangladesh Bureau of Statistics (1996). Estimates for hospital staff without further training was obtained from our study on expenditure on health care human resources in Bangladesh and the MMCH costing study (Eason 1997)

Income and working hours

Estimates of average earnings of medical doctors, stratified by age groups and speciality were obtained from the doctor's income study. This study also provided information on weekly hours worked in both government services and private practice. Figures for annual working hours were calculated on the assumption of 48 working weeks per year and ranged between 1920 and 2640 hours per year. These data were then used to calculate the hours-adjusted income over a working lifetime for 4 scenarios: government doctors without private practice (i), government doctors who double their income through private practice (ii) doctors with diploma and earnings from private practice up to Tk.14,000 per month (iii), Specialists at tertiary care hospitals with additional private earnings of up to Tk.26,600 per month. (iv). Living costs during the years of study was assumed to be TK.24,000 per year (Schah Monir Hossein 1998). This is the amount a student needs to cover personal expenses that are not covered by scholarships. Income levels were assumed to decline by 20%, after the age of 55, when doctors retire from civil service.

5.2. Calculating annual equivalent cost of training

For this exercise the annual equivalent cost (AEC) of medical and nursing skills was calculated from the point of view of the government as the main financer of training. The costs for each year of the curriculum (of doctors with MBBS qualification, of GPs with Diploma, Specialists, and nurses with basic and post basic education,) were added and discounted at 5% to obtain the present value of training costs for each profession or professional subgroup. Discounting is necessary to reflect the greater value of costs that are incurred at the beginning of the curriculum as opposed to costs incurred in later years. The AEC was calculated in the normal way, dividing the present value of training costs by the annuity factor for the number of years worked discounted to allow for the timing of the years worked. This allows a fair comparison of cost of training between staff categories.

5.3. Calculating the Internal Rate of Return

The calculation of the IRR followed the method described by Weeks et al (1994). First the cash flow per hour (CF) was calculated as

$$CF = \frac{Y - E - O}{H}$$

Where, Y is annual income, E expenditure on training, O annual opportunity costs and H is the number of hours worked annually. Calculating hourly cash flows allows correction of differences in hours worked each year between professional subgroups and across a working lifetime.

The average of the annual cash flows over a working lifetime is the net present value (NPV). The NPV was discounted as shown by the following equation:

$$NPV(CF) = \sum_{j=0}^n \frac{CF_j}{(1+i)^{j+1}}$$

j denotes the number of periods and i the discount rate. The average NPV represents the difference in present value of the future income between a trained professional and a person who has not undertaken this specific training programme, for example between a trained doctor and a person who works after graduating from high school without any further education.

The IRR was then calculated by solving the following expression for r:

$$\sum_{j=0}^n \frac{CF_j}{(1+r)^{j+1}}$$

Where r is the annual interest rate which equalises the negative and positive cash flow (CF) on the educational investment. IRRs were calculated on basis of the public subsidiaries of the course(i), on basis on privately borne costs of undertaking the course (ii) and on the assumption of a student loan (at 8% , repayable over 15 years) that covers all costs of the course.

5.4. Sensitivity analysis

Sensitivity analyses were carried out to examine the effects of changes in key variables of the model, assuming: (i) different discount rates (5.0%, 7.5% and 10%); (ii) variations in attrition rates of students which affect unit cost; and (iii) variations of earnings of trained professionals (80% and 120% of the initial income).

6. Results

6.1. Allocation of academic staff time to teaching and training

Table 2 (see annex) shows the results of the staff time allocation survey. Academic teachers of pre-clinical subjects are spending 85-100% of their time on teaching, whereas in clinical subjects the rate varies between 13 and 73% and more time is being spend on postgraduate training and patient care. The highest teaching workload was reported by associate professors for clinical subjects and assistant professors for pre-clinical subjects. Academic teachers at the IPGMR reported that they spend 64% of their time on teaching and training. The highest teaching workload has been reported by assistant professors.

6.2. Undergraduate medical education

Table 3 (see annex) shows the cost of undergraduate medical education in 5 medical colleges and the weighted average. On average each college spends Tk.33 million on undergraduate education. Of this Tk.9.6 million (29%) are borne by the attached College Hospital. The cost of undergraduate education makes up 79% of the total college expenditure, the rest is being spent on postgraduate education programmes and clinical care.

This is equivalent to Tk.250,000 per student for the MBBS course, which takes 5.8 years on average. Data on total cost, activity and unit cost for medical education as well as for other professions is shown in **Table 4** (see over). Expenses for medical education are equally distributed among medical colleges, with the exception of Dhaka Medical College that has costs 22% above the average due to higher staffing levels for academic personnel.

The cost recovery through tuition fees is nominal. Students tuition and examination fees plus hostel costs account for a small part of the total revenue of the college. Complete data on sources of funding were obtained for MMC and CMC. 93% of the costs are covered by the revenue budget, 2.2% by the development budget, 4.1% by tuition and hostel fees and 0.3% by other income. It needs to be taken into account that scholarships are granted to 60% of the students. Ten percent receive a grade A scholarship of Tk.1400 per month, 50% receive Tk.700 per month. Approximately Tk.2,000 per month is required for food and other expenses.

6.3. Drop out and attrition rates

In Bangladesh drop out rates of medical students are low compared with international experience. We found an average rate of 1.2 percent in the 5 medical colleges. The national average for all government colleges has been estimated at 2 %. Most of the drop outs are male students. In the UK drop out rates are higher (9%)(Wallace and Berlin 1998).

Table 4: Total cost, activity and unit cost of medical and nursing staff education and training

	Total cost						Activity and unit cost			
	Total institutional expenditure	Training	Other	Clinical training (1)	Total	Salaries (2)	Annual enrolment	Duration of course (3)	Cost per course and trainee/student	Cost/ student year
	Tk.	Tk	Tk	Tk	Tk	Tk	Years	Years	Tk	Tk
Undergraduate medical education (5 medical colleges)										
Dhaka Medical College	40,964,444	30,241,248	10,723,196	10,886,953	41,128,201		150	6.8	310,746	45,698
Sir Salimullah Medical College	29,899,134	23,835,505	6,063,629	9,207,337	33,042,842		150	6.8	249,657	36,714
Rajshahi Medical College	25,785,826	21,034,922	4,750,904	9,627,882	30,662,804		150	6.8	231,675	34,070
Mymensingh Medical College	21,579,522	16,952,729	4,626,793	9,110,354	26,063,082		150	6.8	196,921	28,959
Chittagong Medical College	30,152,560	25,140,487	5,012,073	10,200,627	35,341,114		150	6.8	267,022	39,268
Average of 5 medical colleges	29,676,297	23,440,978	6,235,319	9,647,010	33,087,988		150	6.8	249,998	36,764
Postgraduate medical education (IPGMR)										
Diploma		11,681,528			11,681,528	80,000	144	1	161,122	161,122
Advanced courses		17,522,292			17,522,292	320,000	250	4	390,089	97,522
Total IPGMR	118,507,000	29,203,820	89,303,180		29,203,820					
Basic nursing education and training (Directorate of Nursing Services)										
tertiary care facility	72,549,120	35,429,520	37,119,600	19,155,108	54,584,628		475	4	114,915	28,729
Secondary care facility	100,186,880	48,926,480	51,260,400	7,502,220	56,428,700		660	4	85,498	21,375
Total	172,736,000	84,356,000	88,380,000	26,657,328	111,013,328		1,135	4	97,809	24,452
College of Nursing										
MSc 1 year	3,829,600	3,829,600			3,829,600	64,000	69	1	119,501	119,501
1) Cost of clinical training in hospitals attached to Medical College or Nursing Training Centre										
3) Avg. course duration for undergraduate medical students, NIPORT short courses in days.										
2) Annual cost, if trainee receives salary. Stipends are part of training costs.										

A more severe problem affecting efficiency of resource use is the relatively high proportion of students who do not graduate within the regular time of 5 years. The average time to finish the MBBS is 5.8 years (Schah Monir Hossein 1998). This estimate does not take into account closures of colleges due to political unrest which is quite common and which affects all students equally. In our sample 8.3 % of the students had graduated after 6 years and 2% after 7 years. As repeat students share resources with ordinary students their prolonged study time affects quality of teaching and has significant opportunity costs. The efficiency gains by achieving a regular throughput of 5.8 years for all students were estimated at 4.5% of the total expenditure assuming that repeat students use half of the resources of regular students during their extra study time.

We also estimated the opportunity cost of having trained doctors in the priority areas of government health services. The proportion of female doctors under DGHS is 15.5% (21.1% under DGFP). Of 6 Medical colleges, for which admission data for 1996/7 were available, 34% were female. It is assumed that a larger number of female graduates do not enter the profession, although exact figures are not known as the BMDC does not keep records of annual registration of doctors. The cost elasticity of female attrition is 0.034, i.e. a 10% attrition of the female workforce increases overall opportunity cost by 3.4%.

The estimated workforce distribution of doctors and nurses is shown in **Table 5**. (HRD 1997, Begum 1997). The medical workforce in Bangladesh totals approximately 18,000 doctors. Fifty-one percent of these are employed in government services (The MOHFW and other Ministries), 22% are self-employed or work with the NGO-sector and 27% are working abroad or are unemployed. The fact that many doctors who complete training in public medical schools work in relatively low priority areas, go abroad or are unemployed means that significant public resources are supporting these lower priorities. Unless the public support for training is changed to focus more clearly on priority areas, there is a continuing additional training cost associated with ensuring that the high priority jobs can be filled with suitably qualified doctors.

Table 5: Estimated distribution of medical doctors and nurses

	Doctors	Percent	Nurses	Percent
DGHS	6750	38%	6460	43%
DGFP	850	5%		0%
MOD	850	5%	140	1%
other ministries	750	4%	420	3%
NGO	1000	6%		0%
self employed/private sector	3000	17%	2900	19%
Abroad	2800	16%	3000	20%
Unemployed	2000	11%	2000	13%
	18000	100%	14920	100%
Source: (HRD project, Begum K 1997)				
Distribution by area of care:				
PHC Government and NGO sector	6135	34%	3440	23%
Other	7065	39%	6480	43%
Unemployed or abroad	4800	27%	5000	34%
	18000		14920	

6.4. Postgraduate Medical education

The cost of postgraduate medical education at the IPGMR is shown in Table 4. The institute offers postgraduate training for 71 Diploma students and 122 specialist students, with admissions twice a year, in January and July. Of the total intake of 394 students in 1996/7, 222 were funded by government (56%). The tuition fees paid by private students are Tk.8,000 per year, or equivalents of this sum for shorter or longer courses. Trainees are entitled to receive a stipend of Tk.2,000 per annum but no stipends were paid during 1996/7. Hostel accommodation is available free of charge. The training for the FCPS consists of 4 years training on the job, which can be conducted at the IPGMR or at any tertiary care training centre acknowledged by the BCPS. The formal part of study involves a course of two parts that the students undertake at the IPGMR. The Diploma consists of a one part course. It is assumed that doctors hold a post as assistant registrar/registrar during their postgraduate training. Without these salaries, the costs per students of the taught course components total TK.75,000 for the Diploma and Tk.147,000 for the FCPS.

6.5. Basic nursing education

Basic education takes place in training centres attached to secondary and tertiary care hospitals throughout the country. The annual intake is 1135 students. The curriculum includes a one-year midwifery course following the three-year nursing course. The overall costs of the four year course are estimated to be Tk.149,000, including the stipends for student nurses which total Tk.44,000 (between Tk.10,200 per year in year one and Tk.12,000 in year 4). Total training costs comprise also a clinical component of Tk.23,000 on average. Practical training is more expensive at tertiary care facilities, because of the higher staffing levels of nurses who are involved in practical instruction. In the larger training centres at Medical College Hospitals, the costs of the practical component are estimated at Tk.40,000 per student and course as opposed to Tk.11,000 in district hospitals.

In terms of the return on investment in training, nurse education is currently almost a complete waste since government services have not employed trained nurses during the last 5 years (HRD 1997) and large numbers are assumed to work abroad or to be unemployed (see **Table 5**).

6.6. Post-basic nursing education

The College of Nursing offers post-basic training with an annual capacity of 125 places. In 1996, only 69 students were trained and, on the basis of a course of one year duration, total costs per student were for Tk.55,500. During this time students are on secondment from Government hospitals and continue to receive their previous salary.

6.7. Training of field workers at NIPORT

To compare training costs between professions, we have added the data on activity and unit costs from the NIPORT costing study (Table 6). The mechanism of enrolment to these courses is different, as trainees are not admitted on an annual but to a variety of short courses, which provide basic and further training. The unit of output is cost per TTD and cost per course. These unit costs are high where number of

trainees are low. For example, in headquarter courses and basic training of family welfare assistants (FWAs) were planned for only 32 participants in 1996. Relative to the annual cost of undergraduate medical education, the cost of courses offered at NIPORT headquarters is high. A 12 day management course for MOs with 50 participants accounted for Tk.23,800 per trainee, which is somewhat lower than the annual amount spent per medical student at Mymensingh College.

Family Welfare Visitors (FWVs) undertake 3 six-month segments of training, of which one segment is undertaken in the field and two at the FWVTI. Unit costs per year vary with the number of participants between Tk.35,000 and Tk.88,000. On the basis of a weighted average of 301Tk. per TTD, the annual training costs are Tk.47,000 per student per year.

Basic training for FWAs was offered to only 32 participants in 1996. If an average of Tk.383 per TTD is assumed for training in Regional Training Centres (RTCs), the cost of a 48 day basic training for PHC personnel is Tk.18,400.

Table 6: Total cost, activity and unit cost of PHC staff education and training under NIPORT

	Total institutional expenditure	Training	Other	Annual enrolment	Duration of course (1)	Cost per course and trainee/student	Cost/student year	TTDs (2)	Cost per TTD
	Tk	Tk	Tk	Years	Years	Tk	Tk	N	Tk
Headquarters									
Training of field workers (NIPORT)(5)									
Regional Training centres									
Training for trainers, MOs and Sen. Mgt.									
	13,705,932			1,791	6-24d	449,223		13,190	1,039
Family Welfare Visitors Training Institutes (FWVTIs)									
Basic Training for FWAs									
	18,554,839			32	48 days	579,839		1,536	12,080
	4,638,710			3,875	12 days	1,197		46,500	100
In-service training (including gender component)									
	5,411,828			2,100	14 days	2,577		29,400	184
In-service training for FPIs									
	4,638,710			1,800	12 days	2,577		21,600	215
Team training (in-service)									
	4,638,710			550	12 days	8,434		6,600	703
Subtotal	37,882,796			7,807		594,624		99,036	383
Family Welfare Visitors Training Institutes (FWVTIs)									
Basic Training of GOB NGO FWVs (continued)									
	18,572,288			555	1.5	33,464		87,885	211
Basic Training of New GOB-NGO FWVs									
	18,572,288			220	1.5	84,419	47628	34,760	534
In-service training for GOB FWVs									
	1,410,554			840	12 days	1,679		10,080	140
In-service training for female MAs									
	1,410,554			250	12 days	5,642		3,000	470
In-service training of GOB FWVs									
	3,526,384			662	30 days	5,327		19,860	178
In service training of male MAs									
	1,410,554			260	12 days	5,425		3,120	452
Subtotal	44,902,621			2,787		135,957		123,945	362
Total NIPORT	100,728,487	96,491,349	4,237,138						

1) avg. course duration for undergraduate medical students, NIPORT short courses in days.

2) Trainee training days, the product of course duration and number of enrollees

3) Source: Shanton-Tan 1997

6.8. Annual equivalent cost of training

From the costs of training, we can calculate the annual cost of skills being available per practising doctor. This is potentially a useful statistic since it indicates, for example, the size of levy that might be placed on private sector employers of doctors, doctors who wish to work abroad after qualification or doctors engaging in private practice. It also allows us to assess more sensibly the numbers of doctors that should be trained, and how the existing doctors should best be deployed since the cost of 'renting' the skills of doctors is really the annual salary added to the annual equivalent cost of the training. If we calculate this cost only over the number of doctors working in government service, we can assess the additional burden that results from the failure to focus government training resources. **Table 7** presents annual equivalent training costs for doctors and nurses. The cost of medical training is 2.7 times the cost of nursing training and subsidies for medical specialists are 3.1 times higher than those of physicians with MBBS qualification. Annual equivalent cost of training is sensitive to delay in starting work in government services. Each year of prolonged study time increases annual equivalent cost by 3.2%.

Table 7: Present value (discounted at 5%) and annual equivalent cost of education and training of doctors and nurses

	Present value	Working years	Annual equivalent cost
	(Tk)	(years)	(Tk)
Medical doctors			
GP	228,142	31	19,607
Diploma	442,091	28	46,035
Specialist	578,852	25	73,758
Nurses			
Basic	71,530	35	5,310
post-basic	294,722	30	31,229

6.9. Internal rates of returns

The internal rate of return was calculated to explore options of cost recovery for medical teaching and training. **Table 8** (see annex) shows income, opportunity cost and cash flow according to age and professional specialisation. The discounted cash flow is negative during the years of medical education and becomes positive in later years. It reaches initially higher levels in doctors with Diploma than in specialists, which reflects the higher cost of training for an advanced degree. Later the cash flow of specialist education exceeds that of doctors with a Diploma.

The average net present value and the IRR are presented in **Table 9**. The IRR and the NPV increase with levels of earnings through private practice and with cost of the training programme. The gap between the IRR of GPs with private practice and doctors with Diploma is smaller than between GPs and specialists, suggesting that the additional returns of undertaking a Diploma course are relatively small in comparison to those of an advanced specialist degree.

Table 9: Hours adjusted net present value (Tk) and internal rate of return of investment in Medical education and training by specialities at a discount rate of 5%

	Based on publicly borne cost		Based on privately borne cost		Based on a loan at 8% of over 15 years	
	NPV (Tk)	IRR	NPV (Tk)	IRR	NPV (Tk)	IRR
General medicine public sector employment	2.3	7.8%	3.7	15.9%	1.4	4.4%
GP, government employment & private practice	8.7	13.9%	10.1	22.3%	7.9	12.6%
Diploma & private practice	14.2	15.3%	16.3	24.8%	12.7	12.4%
Specialist tertiary care & private practice	29.1	20.4%	31.3	29.9%	27.0	16.1%

If only privately borne cost of education are considered, the IRR is relatively high (22.3% for GPs and 30% for specialists), indicating that students bear only a minor part of medical education and training costs. In countries where students have to pay substantial amounts for tuition, the rate of private returns is lower, for example 15.9% for GPs and 20.8 for specialists in the USA (Weeks et al 1994).

If the full cost of education and training had to be financed by the students themselves (through a grant with a loan repayment over 15 years at an interest rate of 8%), the IRR would drop to 12.6 and 16.1 for GPs and specialists respectively. These data show that there is scope for cost recovery of education cost through cost sharing, allowing the IRR for both practitioners and specialists to stay in a range which is deemed adequate in other countries.

6.10. Sensitivity analyses

Sensitivity analysis was carried out on a range of reasonable assumptions, which affect the NPV and the IRR. The data presented in **Table 10** demonstrate the responsiveness of the NPV and of the IRR to variations in incomes and discount rates. Assuming 80% of the initial income produces a negative NPV in the group of GPs who do not have additional income from private practice indicating that their life time earnings do not offset the costs of training. This means that cost recovery is not an option in government doctors with moderate earnings although it could be considered in groups of doctors whose additional private practice earnings form the basis of a high IRR.

Table 10: Sensitivity Analysis on variation in discount rate and initial income

discount rate	5 Percent		7.5 Percent		10 Percent	
	NPV (Tk)	IRR	NPV (Tk)	IRR	NPV (Tk)	IRR
General medicine public sector employment	2.3	7.8%	0.7	5.3%	-0.1	2.9%
GP, government employment & private practice	8.7	13.9%	4.5	11.2%	2.2	8.7%
Diploma & private practice	14.2	15.3%	7.6	12.6%	4.0	10.1%
Specialist tertiary care & private practice	29.1	20.4%	16.1	17.6%	9.2	14.9%
income	initial income		80% initial income		120% initial income	
	NPV (Tk)	IRR	NPV (Tk)	IRR	NPV (Tk)	IRR
General medicine public sector employment	2.3	7.8%	-0.2	1.8%	4.8	12.9%
GP, government employment & private practice	8.7	13.9%	5.1	9.3%	12.3	18.3%
Diploma & private practice	14.2	15.3%	9.3	11.1%	19.0	19.3%
Specialist tertiary care & private practice	29.1	20.4%	21.2	16.3%	36.9	24.4%

7. Discussion

The study has compared the cost of training and education of groups of health professionals in Bangladesh and explored options of cost recovery for medical training. The cost of undergraduate and postgraduate training for doctors is the largest public investment in education and training in the health sector. This is followed by expenses on training for PHC personnel and on basic education of nurses. Annual costs per student are relatively low for both medical and nursing students, which underpins that education of these key professions is largely based on formal instruction rather than on practical training or bedside teaching in small groups (HRD 1997).

There is also evidence that medical graduates have not gained the necessary competence to practice in the field (Bhuiya and Bullough 1995). A number of recent initiatives have addressed the need to improve quality of education and to produce graduates who are better trained for the community setting (HRD 1997). These costs of training on the job and of further quality improvements add substantially to the cost of formal training.

In addition to these costs, medical and nursing education caters for private sector demand and the government system is not able to absorb all graduates, which has led to high attrition rates. As a result, the opportunity cost of having trained doctors or nurses in government PHC services are relatively high. Since only around 51% of trained doctors work in the government health services, the cost to government of training for these roles is inflated by the large numbers doing private work or going abroad. If full cost recovery were possible in cases where doctors work outside the government or NGO sectors, then the net government subsidy for training would be reduced by around 32%.

The situation in nurse education is complicated, because it would be feasible to increase substantially the efficiency of health services with more use of nurses in place of doctors, and in other ways. However, since there is a reluctance to employ the newly qualified nurses, the present training programme appears largely pointless. The policy issues lie in decisions on development of appropriate teams of professionals to meet the objectives of HPSP, and to agree the scale and content of nurse training in the context of policies to deploy those trained.

In contrast, the NIPORT system ensures that all trainees work in the priority areas of the health and family planning sector. It also has the advantage of greater responsiveness to changing demography and changing health care needs, as it tries to meet annually agreed training targets. In practice, however, the institute does not run at its full capacity and several courses are much more expensive than they could be.

Public subsidies for medical education and training are justified on grounds of having a medical workforce in the priority areas of the health sector, under conditions where the social returns of such a policy exceed returns to individual providers. The approach we used did not measure social returns of investment in education and training directly but compared levels of IRR internationally. The data demonstrate that the current incentive system generates private returns on medical education, which are high relative to international comparison. Ample private returns to education are not uncommon in developing countries because higher education is free

and private health care markets produce large income for relatively small numbers of providers (Schultz 1996). The average private IRR would be even higher if the prospects of trained individuals working abroad were taken into account. There may be some social benefits from this activity, since the funds from earnings of migrant health workers are sent home and re-enter the domestic economy in form of the remittances of hard currencies.

Generally, governments use a combination of different ways to adjust high private returns to socially acceptable levels. A common approach is to increase the supply of graduates and allow market forces to set competitive prices for professional labour. However, this approach is limited due to the well-known failures of health care markets and it would put additional strain on public resources. A large part of the demand for medical and nursing skills in Bangladesh comes from the government sector, and some parts of this still have shortages of professionals. At the same time, many graduates of the training programmes cannot find suitable employment. There is an urgent need to bring together policy on deployment of professional staff and those on training and staff development. Given the relatively inelastic supply of professionals this may require high rates of return to some groups to bring numbers up to the required level.

Under these conditions, cost sharing is a more appropriate option to reinstate the balance between social and private benefits of training. The data presented in this study show that there is scope for such a policy. Public subsidies for education could be recovered from the graduates themselves or from institutional providers in the private sector who do not engage in education and training. Individual educational grants, in the form of repayable loans, are common in many countries. This policy instrument allows health care priorities to be supported, as well as social objectives of equal access to higher education to be pursued, if grants are means tested. For example, doctors can be exempted from repayment of study grants if they serve for a defined period in rural areas. Along with other incentives, such as a non-private practice allowance, this could attract more providers to government health services in rural areas.

Annex:**Table2: Self-reported time allocation for teaching and patient care, by designation of respondent (N=73), department and institution**

	N	Training		Total	Patient care
		Undergraduate	postgraduate		
Medical Colleges					
<i>By designation</i>					
Pre-clinical					
Professor	1	89%	0%	89%	11%
Associate Professor	6	81%	7%	88%	12%
Assistant Professor	7	90%	5%	95%	5%
Clinical					
Professor	9	27%	15%	43%	57%
Associate Professor	11	36%	13%	49%	51%
Assistant Professor	21	33%	11%	44%	56%
<i>By departments</i>					
Pre-clinical					
Anatomy	3	92%	8%	100%	0%
Biochemistry	2	100%	0%	100%	0%
Community Medicine	1	100%	0%	100%	0%
Forensic	1	63%	0%	63%	37%
Microbiology	2	85%	9%	94%	6%
Pathology	2	65%	0%	65%	35%
Pharmacology	1	100%	0%	100%	0%
Physiology	2	83%	17%	100%	0%
Clinical					
Anaesthesiology	2	18%	10%	28%	72%
Cardiology	3	33%	12%	44%	56%
Community Medicine	1	100%	0%	100%	0%
Dental	1	33%	31%	64%	36%
Dermatology	1	46%	0%	46%	54%
ENT	1	73%	0%	73%	27%
Eye	2	22%	21%	44%	56%
Medicine	2	36%	20%	56%	44%
Neuromedicine	1	39%	17%	57%	43%
Neurosurgery	1	12%	0%	12%	88%
Obs/Gynae	5	38%	17%	56%	44%
Ophthalmology	1	13%	13%	27%	73%
Orthopaedic	1	47%	9%	56%	44%
Paediatric	1	26%	0%	26%	74%
Paediatric Surgery	2	0%	25%	25%	75%
Paediatrics	2	25%	27%	53%	47%
Psychiatry	3	24%	9%	33%	67%
Radiology	5	30%	3%	33%	67%
Surgery	6	39%	10%	49%	51%

Table2 (cont.): Self-reported time allocation for teaching and patient care, by designation of respondent (N=73), department and institution

By Institution					
Pre-clinical					
DMC	6	82%	10%	92%	8%
MMC	6	88%	0%	88%	12%
SSMC	2	91%	9%	100%	0%
Clinical					
DMC	13	24%	15%	39%	61%
MMC	12	36%	6%	42%	58%
SSMC	16	37%	14%	52%	48%
IPGMR					
Clinical subjects	15	0%	64%	64%	36%
Theoretical subjects	3	0%	100%	100%	0%
By designation (clinical subjects only)					
Professor	2	0%	55%	55%	45%
Associate Professor	3	0%	57%	57%	43%
Assistant Professor	10	0%	67%	67%	33%

Table 3: Cost of undergraduate medical education - Mymensingh Medical College

	Teaching and Training				patient care
	Total	Undergraduate	postgraduate	subtotal	
EXPENDITURE (College)					
Salaries & allowances	17,078,513	13,152,787	1,793,562	14,946,349	2,132,164
Supplies:					
Stationery					
Maintenance	46,739	41,130	5,609	46,739	
Field side training		0	0	0	
Transport		0	0	0	
Communication		0	0	0	
Utilities	1,999,088	1,759,197	239,891	1,999,088	
Taxes	113,974	100,297	13,677	113,974	
Other contingency costs	499,321	439,402	59,919	499,321	
Medicine & medical supplies	399,998	351,998	48,000	399,998	
Land tax	80,919	71,209	9,710	80,919	
Common room/Sport	50,000	44,000	6,000	50,000	
Books	198,263	174,471	23,792	198,263	
Other		0	0	0	
Subtotal	20,669,078	16,134,493	2,200,158	18,334,651	2,132,164
EXPENDITURE FROM OTHER SOURCES					
Personnel Salary					
Sports, Common room	45,000	39,600	5,400	45,000	0
Student scholarship	250,000	220,000	30,000	250,000	0
Books	200,000	176,000	24,000	200,000	0
Field Side training		0	0	0	
Subtotal	495,000	435,600	59,400	495,000	0
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	21,437,483	16,810,690	2,292,367	19,103,056	2,132,164
CENTRE FOR MEDICAL EDUCATION	142,039	142,039		142,039	
HOSPITAL EXPENDITURE	9,110,354	8,972,638	137,716	9,110,354	
Grand total	30,689,876	25,925,366	2,430,083	28,355,449	2,132,164

Table 3 (cont.): Cost of undergraduate medical education - Sir Salimullah Medical College

	Total	Teaching and Training			patient care
		UG	PG	subtotal	
EXPENDITURE (College)					
Salaries & allowances	23,193,777	17,791,947	1,976,883	19,768,830	3,424,947
Supplies:				0	
Stationery					
Maintenance	250,000	225,000	25,000	250,000	
Field side training		0	0	0	
Transport	5,040	4,536	504	5,040	
Communication	240,000	216,000	24,000	240,000	
Utilities	1,800,000	1,620,000	180,000	1,800,000	
Taxes	390,000	351,000	39,000	390,000	
Other contingency costs	1,700,000	1,530,000	170,000	1,700,000	
Medicine & medical supplies	400,000	360,000	40,000	400,000	
Land tax		0	0	0	
Common room/Sport	250,000	225,000	25,000	250,000	
Books	1,000,000	900,000	100,000	1,000,000	
Other					
Subtotal	29,228,817	23,223,483	2,580,387	25,803,870	3,424,947
EXPENDITURE FROM OTHER SOURCES					
Personnel Salary	254,873	229,386	25,487	254,873	
Sports, Common room		0	0	0	
Student scholarship		0	0	0	
Books		0	0	0	
Field Side training		0	0	0	
Subtotal	254,873	229,386	25,487	254,873	
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	29,757,095	23,693,466	2,638,683	26,332,148	3,424,947
CENTRE FOR MEDICAL EDUCATION	142,039	142,039		142,039	
HOSPITAL EXPENDITURE	9,207,337	9,060,367	146,970	9,207,337	
Grand total	39,106,471	32,895,871	2,785,653	35,681,525	3,424,947

Table 3 (cont.): Cost of undergraduate medical education - Dhaka Medical College

	Teaching and Training				
	Total	UG	PG	subtotal	patient care
EXPENDITURE (College)					
Salaries & allowances	33,243,000	23,356,273	2,886,730	26,243,003	6,999,997
Supplies:					
Stationery	200,000	178,000	22,000	200,000	
Maintenance	257,000	228,730	28,270	257,000	
Field side training		0	0	0	
Transport		0	0	0	
Communication	262,000	233,180	28,820	262,000	
Utilities	5,793,000	5,155,770	637,230	5,793,000	
Taxes	54,000	48,060	5,940	54,000	
Other contingency costs	690,000	614,100	75,900	690,000	
Medicine & medical supplies		0	0	0	
Land tax		0	0	0	
Common room/Sport		0	0	0	
Books		0	0	0	
Other	50,000	44,500	5,500	50,000	
Subtotal	40,549,000	29,858,613	3,690,390	33,549,003	6,999,997
EXPENDITURE FROM OTHER SOURCES					
Personnel Salary					
Sports, Common room					
Student scholarship					
Books					
Field Side training					
Subtotal	0	0	0	0	0
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	40,822,405	30,099,209	3,723,199	33,822,408	6,999,997
CENTRE FOR MEDICAL EDUCATION	142,039	142,039		142,039	
HOSPITAL EXPENDITURE	10,886,953	10,656,617	230,336	10,886,953	
Grand total	51,851,397	40,897,865	3,953,535	44,851,400	6,999,997

Table 3 (cont.): Cost of undergraduate medical education - Chittagong Medical College

	Teaching and Training				
	Total	UG	PG	subtotal	patient care
EXPENDITURE (College)					
Salaries & allowances	21,360,270	17,134,922	1,694,663	18,829,585	2,530,685
Supplies:	0				
Stationery	0				
Maintenance	127,539	116,060	11,479	127,539	
Field side training	280,000	254,800	25,200	280,000	
Transport	75,000	68,250	6,750	75,000	
Communication	204,965	186,518	18,447	204,965	
Utilities	4,094,009	3,725,548	368,461	4,094,009	
Taxes	883,315	803,817	79,498	883,315	
Other contingency costs		0	0	0	
Medicine & medical supplies	390,674	355,513	35,161	390,674	
Land tax		0	0	0	
Common room/Sport	50,000	45,500	4,500	50,000	
Books	1,079,000	981,890	97,110	1,079,000	
Other		0	0	0	
Subtotal	28,544,772	23,672,819	2,341,268	26,014,087	2,530,685
EXPENDITURE FROM OTHER SOURCES					
Personnel Salary	33,344	30,343	3,001	33,344	
Sports, Common room		0	0	0	
Student scholarship	879,000	799,890	79,110	879,000	
Books		0	0	0	
Field Side training	280,000	254,800	25,200	280,000	
Subtotal	1,192,344	1,085,033	107,311	1,192,344	
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	30,010,521	24,998,448	2,481,387	27,479,836	2,530,685
CENTRE FOR MEDICAL EDUCATION	142,039	142,039		142,039	
HOSPITAL EXPENDITURE	10,200,627	10,054,595	146,031	10,200,627	
Grand total	40,353,187	35,195,082	2,627,419	37,822,501	2,530,685

Table 3 (cont.): Cost of undergraduate medical education - Rajshahi Medical College

	Teaching and Training				
	Total	UG	PG	subtotal	patient care
EXPENDITURE (College)					
Salaries & allowances	20,963,897	16,598,321	1,443,332	18,041,653	2,922,244
Supplies:					
Stationery					
Maintenance	83,813	77,108	6,705	83,813	
Field side training		0	0	0	
Transport		0	0	0	
Communication	208,904	192,192	16,712	208,904	
Utilities	1,936,486	1,781,567	154,919	1,936,486	
Taxes	758,775	698,073	60,702	758,775	
Other contingency costs	380,106	349,698	30,408	380,106	
Medicine & medical supplies		0	0	0	
Land tax		0	0	0	
Common room/Sport	50,000	46,000	4,000	50,000	
Books	200,000	184,000	16,000	200,000	
Other	200,001	184,001	16,000	200,001	
Subtotal	24,781,982	20,110,959	1,748,779	21,859,738	2,922,244
EXPENDITURE FROM OTHER SOURCES		0	0	0	
Personnel Salary		0	0	0	
Sports, Common room		0	0	0	
Student scholarship	526,400	484,288	42,112	526,400	
Books		0	0	0	
Field Side training	62,000	57,040	4,960	62,000	
Subtotal	588,400	541,328	47,072	588,400	
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	25,643,787	20,892,883	1,828,660	22,721,543	2,922,244
CENTRE FOR MEDICAL EDUCATION	142,039	142,039		142,039	
HOSPITAL EXPENDITURE	9,627,882	9,490,834	137,048	9,627,882	
Grand total	35,413,708	30,525,757	1,965,707	32,491,464	2,922,244

Table 3 (cont.): Cost of undergraduate medical education - Weighted average of 5 medical Colleges

	Teaching and Training				
	Total	UG	PG	subtotal	patient care
EXPENDITURE (College)					
Salaries & allowances	23,167,891	17,606,850	1,959,034	19,565,884	3,602,007
Supplies:	0	0	0	0	
Stationery	40,000	35,600	4,400	40,000	
Maintenance	153,018	137,606	15,412	153,018	
Field side training	56,000	50,960	5,040	56,000	
Transport	16,008	14,557	1,451	16,008	
Communication	183,174	165,578	17,596	183,174	
Utilities	3,124,517	2,808,417	316,100	3,124,517	
Taxes	440,013	400,249	39,763	440,013	
Other contingency costs	653,885	586,640	67,245	653,885	
Medicine & medical supplies	238,134	213,502	24,632	238,134	
Land tax	16,184	14,242	1,942	16,184	
Common room/Sport	80,000	72,100	7,900	80,000	
Books	495,453	448,072	47,380	495,453	
Other	50,000	45,700	4,300	50,000	
Subtotal	28,754,730	22,600,073	2,512,196	25,112,270	3,602,007
EXPENDITURE FROM OTHER SOURCES	0	0	0	0	
Personnel Salary	57,643	51,946	5,698	57,643	
Sports, Common room	9,000	7,920	1,080	9,000	
Student scholarship	331,080	300,836	30,244	331,080	
Books	40,000	35,200	4,800	40,000	
Field Side training	68,400	62,368	6,032	68,400	
Subtotal	506,123	458,269	47,854	506,123	
HOSTELS OPERATING COSTS	273,405	240,596	32,809	273,405	
Total College	29,534,258	23,298,939	2,592,859	25,891,798	3,602,007
CENTRE FOR MEDICAL EDUCATION	142,039	142,039	0	142,039	
HOSPITAL EXPENDITURE	9,806,631	9,647,010	159,620	9,806,631	
Grand total	39,482,928	33,087,988	2,752,479	35,840,468	3,602,007

Table 8: Income, opportunity cost, hourly cash flow by age and medical speciality

variable	19	20	21	22	23	24	25-29	30-39	40-49	50-54	55-64
Annual income (Tk)											
General medicine public sector employment	16,800	16,800	16,800	16,800	16,800	48,000	72,000	77,000	85,000	106,000	106,000
GP, government employment & private practice income > Tk8,000/m	16,800	16,800	16,800	16,800	16,800	48,000	72,000	115,500	170,000	212,000	212,000
Diploma & private practice income Tk14,000/m	16,800	16,800	16,800	16,800	16,800	48,000	72,000	173,250	253,000	274,000	274,000
Specialist tertiary care & private practice income Tk 26,600/m	16,800	16,800	16,800	16,800	16,800	48,000	72,000	236,600	464,200	475,200	475,200
Annual opportunity costs	24,000	24,000	24,000	24,000	24,000	24,000	30,000	36,000	48,000	60,000	60,000
Hours worked annually											
General medicine public sector employment	1,920	1,920	1,920	1,920	1,920	1,920	2,000	2,000	2,000	2,000	2,000
GP, government employment & private practice	1,920	1,920	1,920	1,920	1,920	1,920	2,000	2,300	2,640	2,640	2,640
Diploma & private practice	1,920	1,920	1,920	1,920	1,920	1,920	2,000	2,300	2,640	2,640	2,640
Specialist tertiary care & private practice	1,920	1,920	1,920	1,920	1,920	1,920	2,000	2,300	2,640	2,640	2,640
Annual cash flow per hour (Tk) based on publicly borne cost of education and training											
General medicine public sector employment	-37.4	-36.4	-17.2	-16.4	-15.6	-3.0	15.7	12.0	6.6	5.1	4.0
GP, government employment & private practice	-37.4	-36.4	-17.2	-16.4	-15.6	-3.0	15.7	20.2	16.6	12.7	9.9
Diploma & private practice	-37.4	-36.4	-17.2	-16.4	-15.6	-3.0	15.7	34.9	27.9	17.9	14.0
Specialist tertiary care & private practice	-37.4	-36.4	-17.2	-16.4	-15.6	-3.0	15.7	27.1	56.6	34.7	27.2

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