COST OF MEDICAL EDUCATION IN WEST VIRGINIA

Policy Research and Analysis

FINAL REPORT

December 23, 1983

Volume 1 of 2

COST OF MEDICAL EDUCATION IN WEST VIRGINIA

Policy Research and Analysis

FINAL REPORT
from the
Leonard Davis Institute of Health Economics
University of Pennsylvania
Philadelphia, Pennsylvania

December 23, 1983

Volume 1 of 2

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ACKNOWLEDGEMENTS

From 1981-1983, the Leonard Davis Institute of Health Economics pursued a study of the cost of medical education in West Virginia. The considerable scope and depth of this endeavor was made possible by a grant from the Claude Worthington Benedum Foundation. Their encouragement and sustained support have provided an added dimension to the traditional relationship between research team and foundation.

The West Virginia Board of Regents, in particular the Health Affairs Committee, provided significant contributions and guidance that were essential in helping us to understand the special needs of the State of West Virginia in medical education. In addition, we extend our deepest appreciation to the many deans, faculty, administrators, and staff at Marshall University, the West Virginia School of Osteopathic Medicine, and West Virginia University for their exceptional commitment of time, energy, and counsel. This project benefitted from an exemplary level of collaborative policy research, without which our efforts would not have been possible.

West Virginia made major investments of public resources in medical education to graduate 168 physicians in 1981-82. In that year, Marshall University School of Medicine, West Virginia School of Osteopathic Medicine, and West Virginia University School of Medicine had institutional budgets totalling $43,058,161. Fifty-one percent (51%) of this total, $21,859,334, was provided by state funds.

The West Virginia Board of Regents has expressed concern for the costs to the state for educating needed practitioners. Accordingly, a study of the costs of medical education was proposed. Financial support for such a study was sought from and granted by the Claude Worthington Benedum Foundation. The study, conducted from July 1981 through 1983 by the Leonard Davis Institute of Health Economics (LDI) at the University of Pennsylvania, has been prepared and organized to assist policy makers in understanding the issues and impact of alternative actions.

A. Objectives

The Cost of Medical Education Project had two major aims:

(1) To identify the costs of the four basic program areas of medical education (education, research, patient care, and professional development) and the allocation of joint time and costs to the interactions of these basic areas.

(2) To evaluate specific policy options and develop scenarios demonstrating effects of policy proposals on various state resource allocations and physician manpower decisions.

The pursuit of these aims involved several component studies, extensive data collection, the development of computer models, and the analysis of alterntive strategies. These several initiatives can best be visualized in the context of the Scenario Development and Evaluation Process (SDEP) illustrated in Figure A. The specific elements of the SDEP are described in detail in the body of the report. The description that follows provides an overview of the methodology and analyses utilized in this project.

1. Scenario Development and Evaluation Process (SDEP)

The primary objective of this study was to determine the costs of educating a physician at each of the West Virginia schools of medical education. This required the collection of extensive data concerning costs related to faculty, students, programs, facilities, and practitioners. These **data inputs** were utilized by computer models to generate **outputs** of physicians and total, state, and proportional costs of the system.

The secondary objective was to develop a planning tool which could be used by the Board of Regents to assess the implications of various policy alternatives for medical education. This planning tool, which consists of a set of computer models, incorporates financial, faculty, and student-related data that have been developed in such a manner as to permit various users to examine the effects of hypothetical strategies or events on the costs and output of the medical education system in West Virginia. These computer models are linked to and form the **Decision Support System** (DDS) (Figure A).

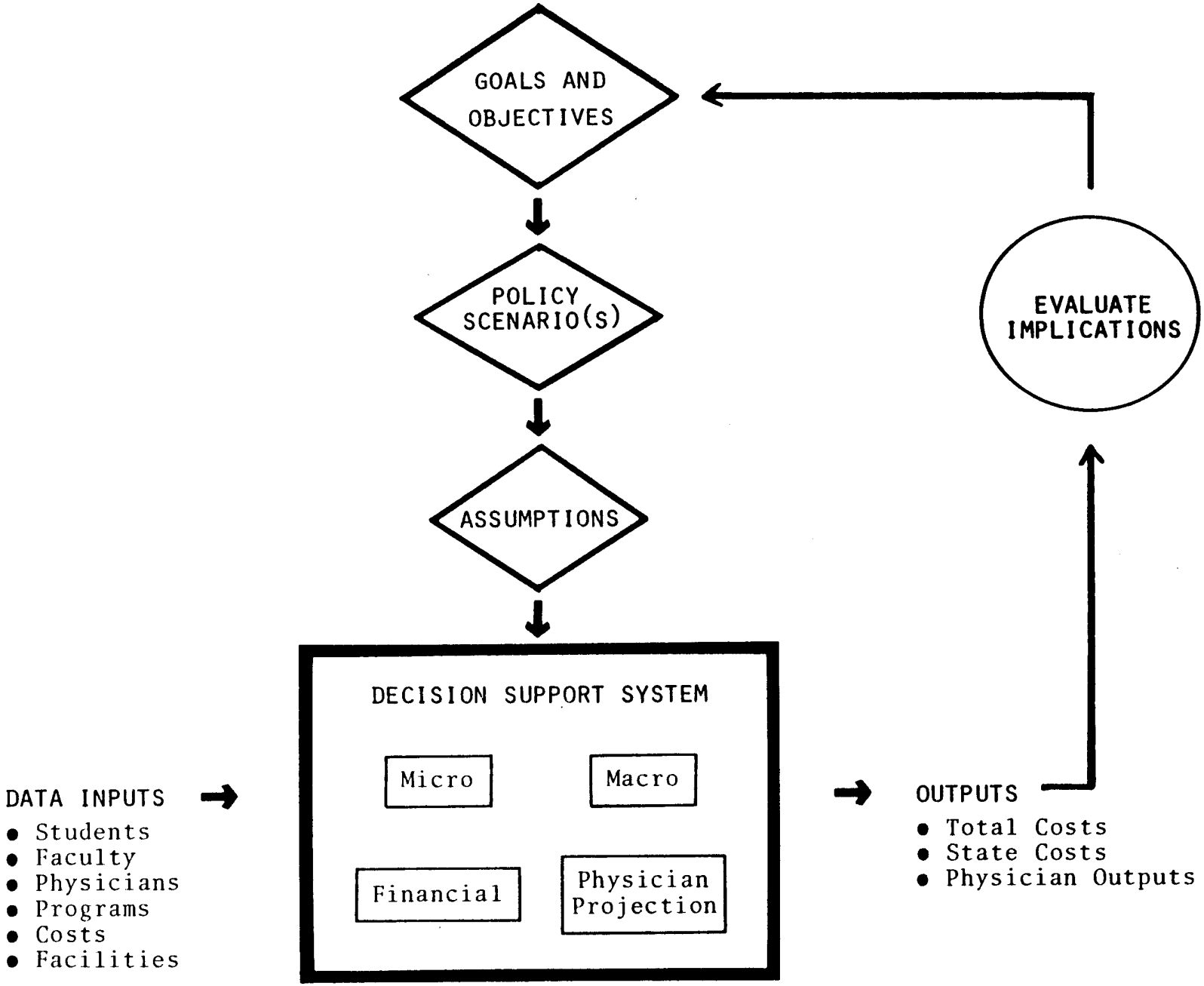


Figure A: SCENARIO DEVELOPMENT AND EVALUATION PROCESS

2. Data Requirements

The first step in the scenario development and evaluation process was to develop the historical data base. A log diary was the primary source used to determine the time faculty devoted to a variety of functions; e.g., teaching, research, patient care, and professional development. Log diaries for a selected seven-day week in each of the fall and spring semesters in 1981-82 were utilized. Direct and indirect cost data were collected for each of the institutions as were curricula materials, course-specific data, student trend data, and documentation of physician practice patterns.

These **data inputs** were utilized to document the status of the various costs of medical education circa 1981-1982. The data are also the resource base on which forecasts are developed to reflect various policy options considered by the Board of Regents. This step requires the utilization of specific computer models developed to facilitate the analysis of alternative futures.

3. Decision Support System

1. **Micro Model** - specifies the resources required to educate a given number of students.
2. **Financial Model** - translates the increase or decrease of resources from the micro model into dollar values.
3. **Macro Model** - measures the output of the educational system; given some number of incoming students and based on recent experience, it forecasts the number of graduates that will practice in West Virginia according to (urban/rural) practice location and specialty choice.
4. **Physician Supply Projection Model** - projects the total number of physicians practicing in West Virginia by specialty group and practice location through the year 2000.

These models translate data inputs (i.e., students, faculty, physicians, programs, and costs) into outputs (i.e., total costs, state costs, and physician outputs) to reflect the impact of assumptions and policy guidance. The selection of assumptions and determinaton of policy guidance is key to the utilization of the Scenario Development and Evaluation Process (SDEP). The assumption and policies can be modified by the Board of Regents and the individual institutions in working with the SDEP.

Referring back to Figure A, we move now to the Goals and Objectives at the top of the diagram. This third step in the process was carried out simultaneously with the collection of the data inputs and the design of the computer models.

4. Systems Goals and Objectives

In order to identify policy issues addressed in this study, the Health Affairs Committee of the West Virginia Board of Regents was asked to specify the goals and objectives for medical education in the state. The group agreed on eight key points. These goals and objectives were used to guide the development of scenarios and their subsequent evaluation.

5. Policy Scenarios

The study team in conjunction with the staff of the West Virginia Board of Regents prepared a comprehensive list of scenarios following a variety of strategies; e.g., maintain the status quo, change revenues, reduce, or enter new

markets. When individual scenario elements are considered, there are dozens of specific options. For the purposes of this report, four scenarios are presented to illustrate a range of policy options that can be evaluated using the Scenario Development and Evaluation Process (SDEP).

The following scenarios were selected for analysis:

(1) Status Quo

Assumes a continuation of current medical education policies in West Virginia to project medical education costs and physician practice patterns over the next decade (1983-1992).

(2) Increased Tuition

Assumes current medical education policies (status quo) and an increase in the tuition for each of the schools of medical education. Various levels of tuition increases are calculated in order to reduce state funds by 10 percent and 20 percent.

(3) Increase Tuition and Establish a State Revolving Loan Program

This scenario adds a state revolving loan program to tuition increases. Two variations are calculated, one without forgiveness provisions and the other with loan forgiveness for primary care practice and/or location in a rural community.

(4) Reduce Enrollment

The intent of this scenario is to reduce program costs by reducing enrollments by 10 percent, 20 percent, and 30 percent at each of the schools of medical education in West Virginia.

6. Assumptions

For each policy scenario, assumptions are made concerning aspects of a school or the system overall that can be changed (e.g., enrollment and state funding levels). The values for these assumptions are based on informed judgment, experience from other settings, or possible policy alternatives. The assumptions affect the parameters of the models, which in turn affect the outputs of the system. The assumptions can be modified for subsequent running and evaluation of the scenarios.

7. Outputs

The selected scenarios, using the assumptions, data inputs, and Decision Support System, can now be run to calculate the **outputs** for each alternative future; e.g., status quo, increased tuition, or reduced enrollment. Alternatively, the output of these scenarios can be utilized as a basis for generating new scenarios.

The potential application of the Decision Support System (DSS) and the Scenario Development and Evaluation Process (SDEP), not attempted in the project to date, is for individual institutions to use the data base and models to test

scenarios unique to their goals, objectives, and strategies. The DSS software and operating instructions will be available to the West Virginia Board of Regents and each medical institution to assist in their planning processes.

8. Evaluation

The remaining step in the SDEP (Figure A) is the evaluation. This has been pursued in two ways. First the output of each scenario was assessed in terms of impact on:

(1) Quality of Medical Education
(2) Health Care Delivery
(3) Economics
(4) Psychological
(5) Social
(6) Political

Further, the implications for the following stakeholders are reviewed:

(a) State of West Virginia.
(b) Regions within which the institutions are located.
(c) Institutions of Medical Education.
(d) Faculties of Medical Education.
(e) Students of Medical Education.
(f) Population of West Virginia.

The thirty-six (36) intersecting stakeholders/areas (e.g., Faculty/Quality of Medical Education, Students/Economics, or Population/Health Care Delivery) are each reviewed. This level of assessment will provoke modification of strategies to reflect best the aspirations of the multiple constituencies in West Virginia. The analyses by the study team are as objective as possible but are recognized as preliminary.

The second dimension of evaluation entails the analysis of the outputs of the scenarios arrayed against the goals and objectives developed by the Health Affairs Committee of the Board of Regents. Each scenario is scored positively, neutrally, or negatively against each goal/objective. Composite scores for each scenario suggest an overall priority as a policy recommendation. The score also suggests possible modifications in scenarios to become more supportive of a goal or objective.

This evaluation thus stimulates a recycling of the process vis-a-vis goals and objectives, scenario construction, selection of assumptions, generation of outputs, and evaluation. The Scenario Development and Evaluation Process (SDEP) is an iterative process to be utilized by the Board of Regents in formulating policy and the institutional executive leadership in program planning. Repetition of the policy analyses with refinement will lead to greater utility in decision making.

B. Cost Analysis

It is important to recognize at the outset that three very distinct kinds of institutions of medical education are being considered, four if the Charleston clinical campus is included. West Virginia University School of Medicine (WVU) is

a mature, established school of medicine with substantial full-time faculty and a university teaching hospital. Marshall University School of Medicine (MU) is still evolving and utilizes affiliated community, Veterans Administration, and state hospitals for clinical rotations. The West Virginia School of Osteopathic Medicine (WVSOM) is essentially a basic science school, with some ambulatory teaching and hospital linkages across the country for clinical instruction. As one might expect, each institution has a different educational philosophy which is reflected in its curriculum strategy.

What of quality? The products are no doubt different. However, other research efforts to measure quality as an outcome have not been successful. The state of the art does not support using quantitative measures to assess quality. There is lack of consensus on criteria used to define quality. Furthermore, studies conducted to date show no statistically usable correlation between pre-selection criteria, education, performance, and outcome of care. The definitive random control trial has yet to be conducted, if indeed it is possible in a rapidly changing environment. For these reasons, this study did not attempt to measure quality; the quality of educaton has been assumed at each of the schools of medical education to be sufficiently high so as to produce qualified practicing physicians. (See Appendix A for a completed literature review.)

For this study, data were collected on three dissimilar institutions, each graduating licensable and certifiable physicians. This, however, is but one of the products of a school of medicine. Research and patient care also represent sizeable contributions to individuals, communities, the region, and the state. This study did not attempt to measure the quantity or the quality of the outputs of these latter activities.

For a given institution, it is possible to discuss costs of education in different ways. In this report, we identify five categories of costs: medical student instructional costs, medical student educational costs, total costs for the schools of medical education, allocated educational total costs, and state costs.

Before addressing the five categories of costs, it is important to review the character of clinical teaching of medical students at the bedside, in a patient care conference, attending diagnostic studies, and so forth. In each instance, attending physicians are often teaching residents and medical students. When the faculty member is teaching both groups at the same time, the question of how to allocate joint costs arises. Economists argue that theoretically it cannot be done. Accountants insist on "best judgments."

This study has turned to the professional judgment of the Institute of Medicine (IOM). In a study of the cost of medical education, an IOM panel addressed the issue of joint teaching-patient care. The panel concluded that on average across clinical departments approximately 43 percent of the joint cost of time spent attending a patient and teaching could be attributed to medical education. In another study, IOM sought professional judgments as to the portion of teaching time and joint-teaching patient care time that ought to be allocated to resident teaching and medical school teaching. These ratios have been utilized in this study to calculate the various costs of medical education at the institutions of medical education in West Virginia.

1. Alternative Costs

As has been suggested, various measures of cost are valid depending on one's perspective. Herein, data are reported in several categories. The reader can apply appropriate qualifications.

(1) Medical Student Instructional Costs. Within a medical school, a portion of costs can be identified as resulting from activities that directly involve the teaching of medical students; these include course preparation and curriculum development, teaching, a portion of teaching associated with patient care and all teaching associated with research.

These direct instructional costs, however, do not provide a full picture of the costs of medical education. This is primarily due to the fact that clinical practice is an important component of education. This is true in terms of both student exposure to patients and maintenance of faculty clinical skills.

(2) Medical Student Educational Costs. These costs are defined to include instructional costs and the remainder of the medical student portion of the joint teaching/patient care activity. Both instructional and educational costs include a share of the school's operational costs.

(3) Total Costs of the Schools of Medical Education are defined to include educational costs plus the large sets of supportive activities which are vital to quality education. These include resident/other teaching, biomedical research, and patient care (exclusive of patient care conducted jointly with teaching).

(4) Allocated Educational Total Costs allocate these total costs to medical student training and resident/other student training based on the ratio of the sum of their direct and indirect expenses. This figure allows the construction of a total cost per medical student calculation which attributes a portion of teaching, research, and patient care costs to medical student training.

(5) State Costs. These represent the State funds appropriated directly to the schools and other relevant tax dollars that contribute to the support of medical education. Public funds provide approximately half ($21.9 million) of the total costs ($43.1 million) of medical education in West Virginia. The costs for the three schools are presented in Table A. Figures B, C, and D display the comparison of the various costs of medical education.

Medical schools have a variety of sources of revenue to offset these remaining total costs: fees for patient care, endowment and grant income, federal support and tuition revenue. Figure E depicts the sources of financing. The size of each slice is proportional to its share of total revenues.

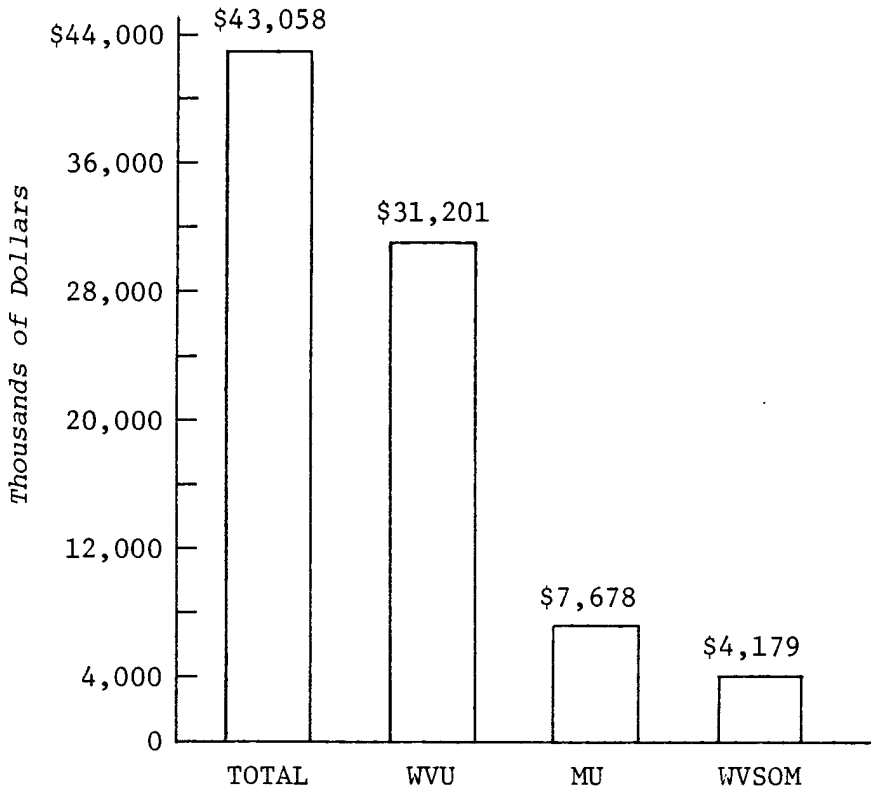


Figure B: Total Medical Education Costs by School, 1981-82

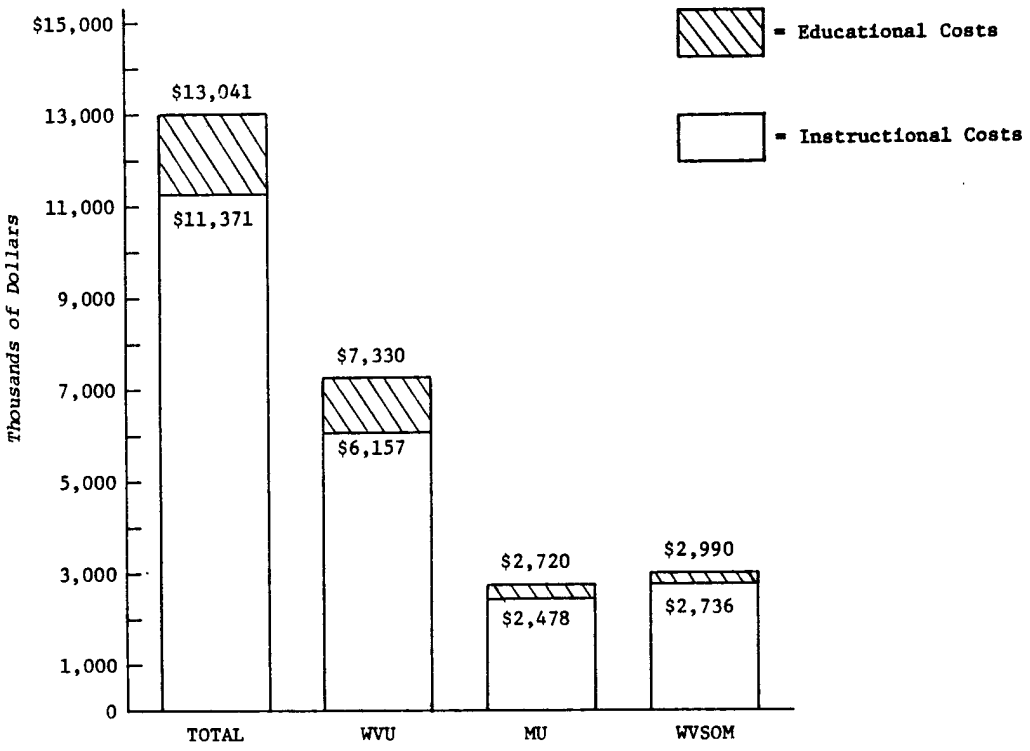


Figure C: Instructional and Educational Costs for Medical Teaching, 1981-82

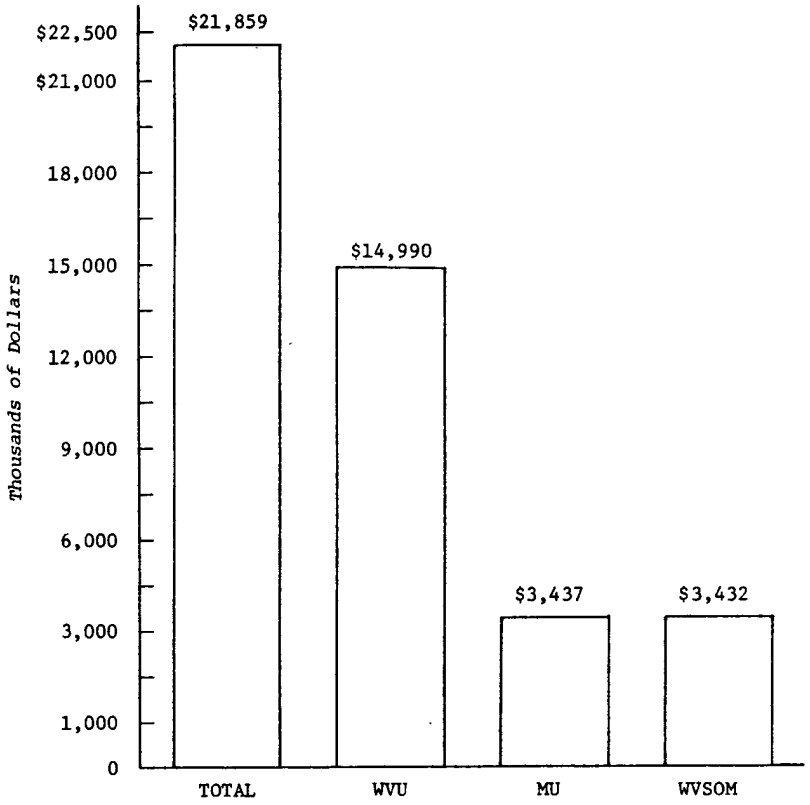
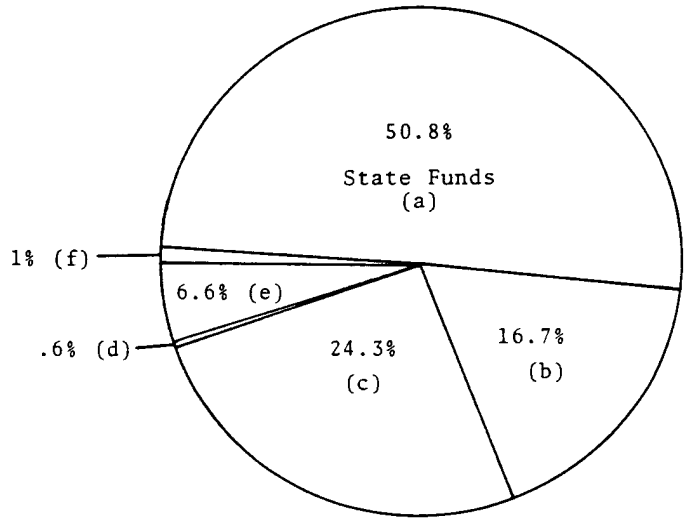


Figure D: State Revenues by School, 1981-82



(a) State Funds
(b) Federal Grants, Local Grants, Contract, and VA Grants
(c) Practice Plan and Other Clinical Income
(d) Financial Aid to Students
(e) Private and Other Funds
(f) Tuition and Fees

Figure E: Total Revenues by Sources of Financing 1981-82

TABLE A
WVA Medical Education Costs for 1981-82

	Medical Student Instructional Costs	Medical Student Educational Costs	Total Costs
MU	$ 2,478,012	$ 2,720,912	$ 7,677,758
WVSOM	2,736,127	2,989,807	4,179,051
WVU	6,157,329	7,330,314	31,201,352
TOTAL	$11,371,468	$13,041,033	43,058,161

Allocated Educational Total Costs

	Medical Students	Resident/Other Students	State Costs
MU	$ 4,057,012	$ 3,620,746	$ 3,436,572*
WVSOM	4,148,124	30,927	3,432,230
WVU	12,872,089	18,329,263	14,990,532
TOTAL	$21,077,225	$21,980,936	$21,859,334

C. Scenarios

The study estimates the impact of alternative scenarios on state costs for each of the schools over the next decade (e.g., increase tuition, establish a loan program, and reduce enrollment). The scenarios are hypothetical formulations of strategies to realize goals and objectives. As such, they are constructed to focus attention on causal processes and decision points. The outputs of the total and unit costs for institutions and the state, as well as the estimated supply of physicians through the year 2000 for each scenario, can suggest further modifications in strategies and new scenarios.

Four scenarios have been selected to illustrate the application of the Scenario Development and Evaluation Process to alternative strategies for addressing the cost of medical education in West Virginia:

(1) Status Quo
(2) Increase Tuition
(3) Revolving Loan Fund
    (a) Without Forgiveness
    (b) With Forgiveness
(4) Reduced Enrollment

The scenarios are discussed in detail in the report and will only be highlighted here.

* This figure does not include the Veterans Administration Grant that was discontinued after 1982/83.

(1) The Status Quo scenario projects the various costs of medical education over the next decade along with sources of revenue in order to estimate the requirement for state funding to maintain the current levels of activity. Assuming continuation of current medical education policies 850 new West-Virginia trained physician will be practicing in the state at the end of the decade at a cost to the state of approximately $331 million.

(2) The Tuition Increase scenario calculates the tuition increase necessary to reduce the state costs by 10 percent and 20 percent respectively. Status quo assumptions are maintained. Launching this program in the current academic year would increase tuition by $3,718 in order to reduce state costs by 10 percent. The resulting total tuition would be close to $6,000 and in excess of the average in state tuition for the Southern Regional Education Board schools. By 1991-1992 tuition increases of $5,326 (10 percent savings in state costs) and $10,653 (20 percent savings in state costs) would be required.

(3) The Revolving Loan Fund scenario recognizes that the tuition increase suggested in Scenario 2 would be prohibitive for many students in West Virginia and their families. Further loan forgiveness is proposed to encourage graduates of the West Virginia schools of medicine to practice in the state in primary care specialties and in rural communities. The detailed tables presented in the body of the report illustrate the cash flow for tuition increase and loan fund without loan forgiveness and with forgiveness. The ten year savings range from $21.5 million to $34.4 million under various options.

(4) Reduce Enrollment is suggested as a scenario because physician output over the next decade forecast a surplus of physicians for West Virginia when contrasted with adaptions of national requirements. The scenario calculates the savings in state funding compared with the status quo for enrollment reduction of 10 percent, 20 percent, and 30 percent. These would reduce first year enrollment at all three schools by 19, 39, and 58 respectively. Savings after the phased reduction had been achieved over four years, in 1981/82 dollars, would total $816,812 for a 10% reduction and $1,608,968 for a 20% reduction and $2,392,512 for a 30% reduction.

Additional scenarios have been discussed and can be developed using the Decision Support System and the data base in pursuit of goals and objectives. The study team will be working with the Board of Regents and the individual institutions to assist in further policy formulation.

Concluding Remarks

This extensive and detailed study of the cost of medical education is not exhaustive. For example, the whole issue of the cost of graduate medical education and its relationship to the cost of patient care was outside the boundaries of our study. This is a major policy concern of the Federal Government.

For the state of West Virginia, a major initiative has been undertaken. The several schools of medical education and particularly their respective executive leadership have devoted considerable time, energy, and talent to an examination of the issues related to the cost of medical education. Their common goal is quality programs to serve the residents of the state. Without their committment to this project, the endeavor would not have been possible.

I. INTRODUCTION

Academic health centers are a critical element in our nation's health care system. Their missions and scope have changed rapidly and radically over the past few decades. As the setting for undergraduate and graduate education, research, and patient care, academic health centers shoulder a complex mix of societal mandates and community responsibilities. Due to the current restrictive financial environment, these centers are now faced with difficult resource allocation decisions. In order to make these decisions effectively, detailed knowledge of medical education costs and benefits must be available.

The goal of this study has been to develop a policy analysis of the costs of medical education that will enable deeper understanding of cost changes resulting from various policy decisions. Specifically, our objective has been to create a planning and policy tool that can be used by administrators of academic health centers, public policy decision makers, and state legislators to help determine and assess benefit and cost trade-offs associated with policy decisions at the institutional and regional levels. The West Virginia schools of medical education have been the focus for this research.

This final report reviews the current issues facing medical education and the specific aims of the project. It also describes the overall approach used to develop scenarios, as well as the methodology involved in creating, running, and analyzing each scenario. It presents an analysis of the log diary, the costs, and the status quo scenario of the medical education system, as well as alternative strategies for resource allocation in the system.

II. BACKGROUND

The responsibilities of U.S. medical schools have expanded from their original mission of educating physicians to include major roles in graduate (Ph.D) education, graduate medical education (residencies), continuing medical education, biomedical research, delivery of health services, and the achievement of societal goals involving physician distribution, specialty choices, and careers for disadvantaged groups. These changes were made in response to interrelated pressures--scientific, economic, social, and political--and the current structure of schools of medical education has been shaped by their changing function. As their responsibilities have grown, the level of expenditures for these complex, multi-purpose institutions has also increased.

As a brief summary, several leading factors responsible for the growth of faculties and physical plants of schools of medical education are:

1. Increased federal support for biomedical research and the consequent responsibility for overseeing Ph.D instruction in biomedical sciences;

2. Increased federal and state funding to promote increased medical school class size and the construction of new schools of medical education in response to the public perception of an inadequate physician supply;

3. Issuance of a variety of commission reports during the 1960's which led to medical schools assuming increasing responsibility for graduate medical education;

4. Increased sophistication and cost of medical care delivery, with teaching hospitals assuming a disproportionate share of complex and specialized care.

The following summary statistics (Table 1) highlight a few of the rapid changes in enrollment affecting the educational responsibilities of medical school faculties:

Table 1

MEDICAL EDUCATION ENROLLMENT STATISTICS

	1962-63*	1981-82**
Medical Students	31,491	66,485
Interns and Residents	38,044	69,738
Graduate Students[a]:	8,754	16,701
Total	78,289	152,924

*72a.
**73a.
[a]Based on students taught by medical school faculty; statistics are unavailable for students taught outside medical schools.

Although there is still much diversity among schools of medicine, all have been affected by changes over the last twenty-five years. Faculties, facilities, activities, and services have expanded substantially. The growth in this period was largely unplanned, and decision makers responded to the aforementioned pressures using foreshortened time horizons. Decisions often were made without appreciation for the long-term financial and other consequences of changes in interrelated programmatic activities. In times of growth and adequate funds, such shortsightedness may not be seriously dysfunctional. However, the environment has changed. After a decade of increasing federal financial support for medical education, the government has drastically changed its position. Federal capitation dollars have been eliminated; federal financial aid to medical students has been decreased; federal support for biomedical research through the National Institutes of Health has had only modest increases in recent years; and Veterans Administration support for health professions' education has been modified.

The financial stability of schools of medicine is threatened by the reduction of government support. After increasing their size in response to two decades of public pressure, schools of medicine are now faced with substantial and increasing costs for tenured faculty salaries, facilities, equipment, and energy.

As federal support diminishes, a greater portion of the costs of educating health professionals is being shifted to state governments. States have opportunities and obligations that drive state legislative policy to support and direct medical education. However, they are also faced with the problems of containing increases in the overall cost of medical education, as well as tuition and fees, of meeting the financial needs of low-income students, and of addressing the manpower needs of the state, especially medically-underserved areas. Since there is evidence that these trends will continue, especially those of declining revenues and increasing costs, the major issue is to plan for an orderly adaptation to the changing environment.

To adapt effectively, a comprehensive understanding of the relationship between medical education costs, available physician resources, and health needs of the population must be gained. Within a restrictive financial environment, such information is a prerequisite for appropriate planning and management.

III. SPECIFIC AIMS

The intent of this project is to provide decision makers with a framework within which to understand the impact both of changes in allopathic and osteopathic school policies and of changes resulting from various policy decisions. **This work does not attempt to determine public policy but rather to provide information, as well as planning and policy tools, so that readers may better assess trade-offs associated with specific policy decisions.** The policy analysis emphasizes two major areas: resource allocation and manpower.

Specifically, the project:

1. Identifies the costs of the basic program areas of medical education (i.e., teaching, research, and patient care) and allocates joint time and costs to these basic areas.

2. Determines production functions for medical education programs.

3. Identifies data needs and collection instruments necessary to conduct a cost analysis of the schools of medical education.

4. Develops models for examining the costs and benefits of medical education.

5. Evaluates specific policy options and develops scenarios demonstrating the effects of policy proposals on various resource allocation and physician manpower decisions.

These objectives have been pursued by a detailed analysis of the various institutions of medical education in West Virginia.

West Virginia shares in the experience confronting the nation where policy decisions concerning the allocation of limited resources must be made. In medical education, the state faces three main problems: (1) containing overall costs, (2) meeting the financial needs of low-income students, and (3) addressing the manpower needs of West Virginia, particularly in medically-underserved areas. The current trends and needs of the medical education system must be analyzed so that rational actions can be taken to implement appropriate strategies to ensure an efficient system that provides quality medical education for the state.

Historically, West Virginia has experienced physician shortages; since the 1970's, however, the state has pursued an aggressive development strategy to resolve those shortages. Two additional schools and new clinical campuses were established to train physicians, and residency training opportunities were expanded. Many primary care clinics or health centers were also established.

At present, the state's medical education system comprises a university medical center and clinical campus, a VA model school of medicine, and an osteopathic school of medicine, each pursuing its own goals and objectives. Numerous high-quality undergraduate and graduate medical education opportunities are provided

which serve the region and population, possibly more than are required to help meet the state's physician manpower needs. The state has made a substantial economic and political commitment to medical training as a means of providing adequate physician manpower. However, the legislature has indicated that resources may no longer be available to sustain the current situation.

To deal with this issue, the impact of past policy decisions must be assessed in terms of current system objectives, and new policy proposals must be made in light of the challenges facing the state's future medical education system. The question is whether West Virginia can increase the cost effectiveness of its dollars and/or find an alternative means of increasing public funds.

The analysis provides a factual base from which to assess the effects of the state's current investment in medical resources and various potential policy proposals on the total costs of medical education, on state costs, and on physician manpower issues. In concert with the West Virginia Board of Regents, scenarios were formulated to address the concerns of future resource allocation and medical manpower needs. While the ultimate choices remain societal and political, these analyses examine a manageable number of possible, illustrative, alternative futures for the medical education system to aid in the state's search for allocations that will best achieve its medical training goals and its general health objectives within fiscal requirements. Changes in the cost of medical education that may be expected to result from changes in policy were estimated. The results of this research can provide an important tool to guide policy deliberations affecting schools of medical education.

IV. THE SCENARIO APPROACH

A. Definition

The scenario approach was used to link all phases of this policy research and analysis. Scenarios are hypothetical sequences of events constructed for the purpose of focusing attention on causal processes and decision points (131a). As a planning and policy tool, they are used as a means for improving the understanding of long-term consequences of current or potential trends, policies, and their interaction. Scenarios are also used to explore and assess the implications of alternative futures in order to open lines of communication between policy analysts and decision makers. They provide an organizing framework within which to stimulate further discussion and elicit reactions to those possible futures.

The scenarios are linked to a Decision Support System (DSS). The DSS consists of four models that help the user understand and predict the impact of various policy options on the West Virginia medical school system.

B. The Decision Support System (DSS)

The primary function of the Decision Support System is to help test a given policy against specified goals. In a very simplified form, the decision process is represented in the following diagram (Figure 1). Based on an extensive data set, the DSS provides estimates regarding the physical outputs, namely, costs of medical education, the number of WVA medical school graduates, and the number of practicing physicians in the state. The policy evaluation and recommendations are analyzed by the users of the DSS, and the policy selection is left to the policy maker. In other words, the DSS may only concern itself with the decision process to the left of the dotted line.

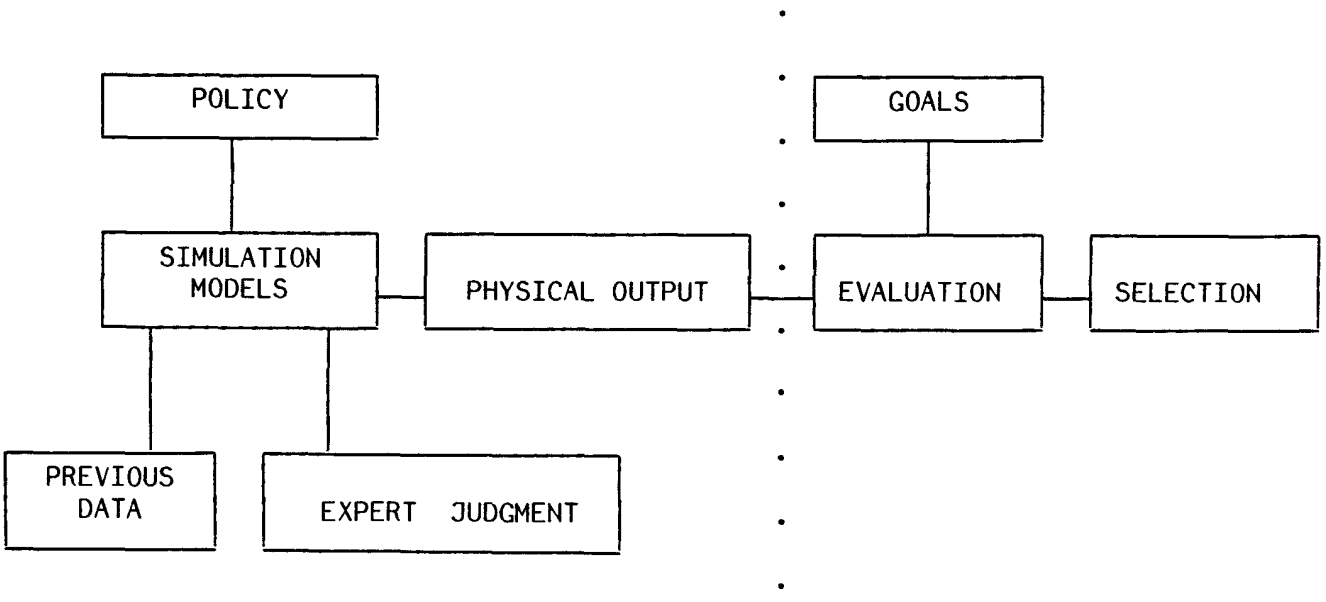


Figure 1: The Decision Support System (DDS)

In addition to the computation within the simulation model, the design of the DSS takes into account:

1. How a particular problem will be fed into the system.
2. How past data and expert judgment should be used.
3. Which representations of the output facilitate the policy makers' conceptualization.

Historical data are stored within the system and are considered relatively fixed. However, there are certain decision points where variable assumptions can be made in accordance with a particular policy option. The decision support system has been constructed to accept a range of assumptions for the following decision points: enrollment size; urban/rural definition; retention rate for schools without a history*; desired goal of reduction of state fund support; tuition increases; impact of increased tuition on quantity and composition of entering students; impact of increased tuition on current class size; impact of loan burden on specialty choice and practice location; size and criteria for state loan program; and assumptions regarding the economy.

The ability to adjust these variables is an essential aspect of this program as a planning tool. This flexibility permits policy makers to examine issues such as the effects of decisions concerning funding, tuition, and loan support or the impact of changes in student composition. The choice of values for assumptions may depend on informed judgment or experience generalized from other settings. In some cases, it may be appropriate to study the effects of a range of values for some variables. This is useful in cases where there is insufficient historical or experiential data to establish a value for a variable with a good degree of certainty. Values for assumptions can also be established by hypothesizing changes in areas such as policy alternatives (e.g., in the case of state funding levels). These assumptions, then, essentially compare "what if" statements to assess the likely impact of policy changes on educational output and costs. In all cases, it is important to emphasize that users can change the values to study the effects of various combinations of assumptions.

There are two major components in the DSS. Specifically, the consultation program selects the appropriate information regarding a policy from the permanent information base (the historical data). The knowledge acquisition program, which accepts different assumptions, temporarily changes and/or augments the permanent information base according to the various scenarios. A specific policy may require an overall change in the permanent information base as a result of a change in definition or meaning of past data (e.g., the urban/rural definition). In that case, the permanent information generator will extract a new permanent information data base from the raw data base. Having the specific information from the user and the information regarding the system (from the permanent information base), the raw output generator computes all the relevant information for the user. Finally, the report generator produces the report or final output.

* The retention rate is determined by examining historical data on the number of medical students who have remained in West Virginia to practice. For schools without historical data, assumptions of retention rates must be made based on informed judgment and experience elsewhere.

C. Description of the Scenario Approach

Figure 2 delineates the scenario approach, which uses the DSS consisting of the micro, financial, macro, and physician projection models (described in detail in Section V) to evaluate a variety of policy options. For each policy option, the underlying scenario assumptions associated with the option are stated and discussed. Depending on the scenario, the parameters of the models are affected in different ways. With the new parameters and model inputs, the models generate new cost data and new physician output data. The outputs are then synthesized and evaluated in a broader framework which analyzes the implications of each scenario against goals and objectives determined by the decision makers.

D. Scenario Development Process

The steps in developing the scenarios used in the LDI research entailed: (1) developing a historical data base; (2) specifying the goals and objectives at the system level (using a nominal group technique) and institutional level (using a goals audit); (3) designing the models to incorporate internal and environmental variables; (4) creating a comprehensive range of possible scenarios; (5) selecting key scenarios; (6) developing a matrix to analyze the implications of each scenario; (7) running the key scenarios; and (8) analyzing their implications.

Each of these steps is described below.

Step 1: Develop Historical Data Base

Primary and secondary data were collected for this study. The following is a list of the specific data and their source. Log diary and cost data are addressed in detail in Sections VI.A and B, respectively.

DATA	SOURCE
TIME DATA	
• Faculty time data for fall and spring.*	Log Diary.
COST DATA	
• WVSOM, MU and WVU direct and indirect costs.*	On site collection from monthly financial cost statements and activity analysis from log diary data.
CURRICULA DATA	
• Course catalogs and curricula sequences.	Supplied by schools.
• Required/elective breakdown.	Supplied by schools.
• Person-specific, fourth-year elective schedules.	Supplied by schools.

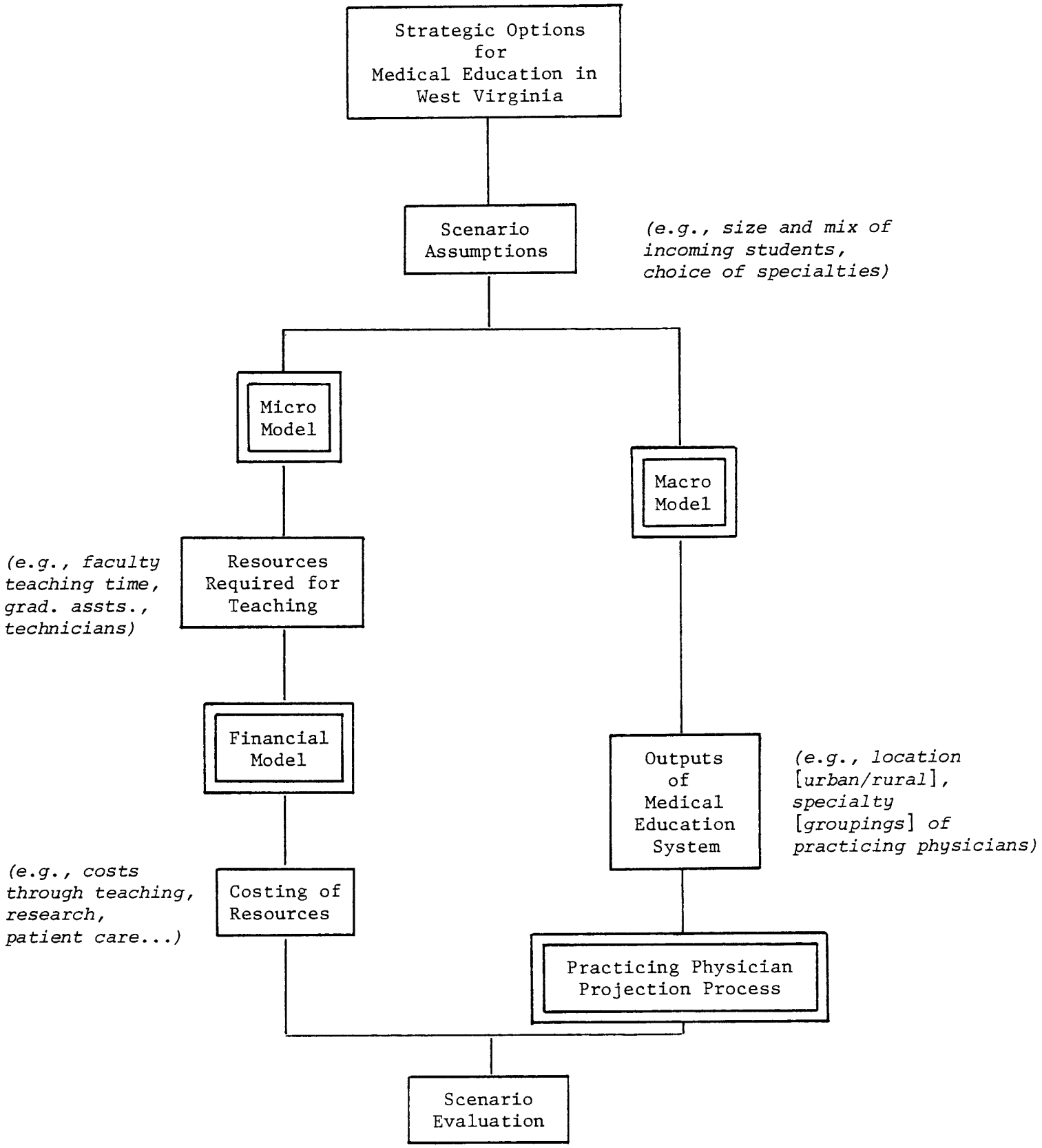


Figure 2: Scenario Approach

COURSE-SPECIFIC DATA (years 1 & 2)	
• Faculty hours of instruction per course.* • Student count per course.* • Mode of instruction per course.* • Maximum/desired number of students per course.* • Postgraduate teaching time.* • Space requirements.	Interviewed basic science department chairpeople.
STUDENT TREND DATA	
• Undergraduate counts by class.	Supplied by schools.
• Undergraduate lists from 1972-82.	Supplied by schools.
• Number of residents by specialty by year.	Supplied by schools.
• Number of WVA residents graduating and remaining in state, as well as those graduating and leaving WVA (from WVA medical schools and from other schools).	Supplied by schools.
• Number of WVA MD/DO graduates from residencies in other states who return to WVA.	Supplied by schools.
PRACTICING PHYSICIAN DATA	Supplied by West Virginia Department of Health for 1979, 1982 from Licensure Survey Data.
QUALITY**	Literature Review by LDI.
ECONOMIC IMPACT STUDY***	Contracted with William H. Miernyk and Associates, data supplied by U.S. Department of Commerce, Bureau of Economic Analysis and the West Virginia Board of Regents.

* Primary data collection effort.

** After reviewing the literature on the quality of medical education, the state of the art does not support using quantitative measures to assess quality. There is lack of consensus on criteria used to define quality. Furthermore, studies conducted to date do not show a statistically usable correlation between pre-selection criteria, education, performance and, most importantly, outcome of care. For these reasons, quality criteria were not included in this study; quality education has been assumed at each of the schools of medical education in West Virginia. However, the inability to measure the quality of medical education does not imply that variations in quality of education do not exist or that it is of no importance. (A complete literature review is presented in Appendix A.)

*** A linear input-output analysis was conducted to assess the economic impact of the three schools of medical education on the counties in which each school is located and on the West Virginia economy. This report was not used or analyzed in the study for it does not include the interrelationship of the medical schools and their patient care settings. The study, carried out by William H. Miernyk and Associates, is presented in Appendix K.

Step 2: Specify Goals and Objectives

a. System Goals and Objectives: Nominal Group Technique

In order to identify policy issues to be addressed in this study, the Health Affairs Committee of the West Virginia Board of Regents was involved in a process of specifying the goals and objectives for medical education in the state. Using the nominal group technique* process, participants were asked to write their responses to the question, "In your judgment, what ought to be the goals and objectives for medical education in West Virginia for the decade ahead?" The group's ideas were recorded in a round-robin fashion from which a list of specific goals and objectives was created. Each idea was clarified in discussion and ranked according to priority by individual ballots. In this way, individual judgments were combined into group consensus.

The themes of the goals and objectives emphasize the following:

1. Develop an organized strategy for providing medical education in the state which is responsive to state needs.
2. Provide quality medical education within available resources.
3. Provide quality medical education in an efficient and effective manner.
4. Emphasize primary care training.
5. Provide a reasonable opportunity for state residents to obtain quality medical education.
6. Provide the appropriate number and type of physicians needed in the state and encourage an appropriate demographic distribution of physicians.
7. Increase cooperation of MDs and DOs in education and services.
8. Improve the health status of West Virginia residents.

(Appendix B contains the specific scores and values of the system goals and objectives, as well as the list of participants.) These goals and objectives were used to evaluate each of the scenarios presented in this report and to determine aspects of the various scenarios to be considered for future scenarios.

b. Institution-Specific: Planning Audit

The specific goals, objectives, and planning environment of each school of medical education were obtained in interviews conducted with key medical school administrators. Their perceptions concerning the following were elicited: 1) school goals and objectives, 2) specification of planning requirements, 3) planning process and environment, and 4) evaluation of existing planning resources. This information provided the qualitative background for model-building and evaluation. (Appendix C contains the interview schedule and each school's composite response.)

Step 3: Design Modelling Methodology

A series of models has been constructed to perform a modified cost-benefit analysis. A brief description of the models follows; more detailed description of the modelling methodology is presented in Section V.

* Nominal Group Technique (NGT) is a structured group process used to aggregate group judgments in a meeting setting.

The **micro model** estimates the relationships between the number of students and the resources required to support those students. These resources should include inputs such as faculty time--for example, teaching hours, course preparation time, and other faculty time for miscellaneous items such as school administration--graduate assistants, laboratory technicians, classrooms (general and seminar), laboratories, and other support staff office space. This model calculates how changes in the number of students affect the level of resources required to maintain training quality.

With changes in resources, the costs of this training change. To estimate the cost of alternate resource needs, the **financial model** has been constructed. This model translates the increase (or decrease) of resources, like faculty teaching time, into dollar values.

To measure the outputs of the system, the **macro model** has been constructed. This model is concerned with the directions students can take at various stages of their medical education and, subsequently, at the final output stage, practice. Given some level of incoming students, the model forecasts the number of graduates that will eventually practice in West Virginia. It also gives the mix in terms of rural/urban location of practice and specialty choice.

The macro model is linked to the **practicing physician supply projection model,** which projects the total number of physicians practicing in West Virginia and accounts for physician in-migration to and out-migration from the state.

Formulation and estimation of the parameters used in these models and described above require a large data input. In addition to obtaining detailed course descriptions and resource specification data, the following data sets are used: accounting data for each institution, facility capacity data, historical student flow data (both at the schools and at residency sites), and practicing physician data. Finally, to supplement these data sets, a log-diary questionnaire was administered to all full-time and available part-time faculty. These data were collected to obtain additional information on the distribution of professional time. Figure 3 illustrates the data sets that support the four models described.

Step 4: Create a Comprehensive Range of Possible Scenarios

The study team in conjunction with the staff of the West Virginia Board of Regents prepared a comprehensive list of scenarios for the following general strategies: (1) merge, (2) reduce, (3) divest, (4) change prices, (5) change revenues, (6) change products, (7) enter new markets, (8) maintain status quo, and (9) combine scenarios. More than forty options were synthesized. (See Appendix D for the specific strategies for scenario development.)

Step 5: Select Key Scenarios

From the numerous potential scenarios, the study team worked with the Board of Regents to select the key scenarios for analysis to illustrate the future consequences of several individual courses of possible action. Four scenarios were selected for presentation in this report:

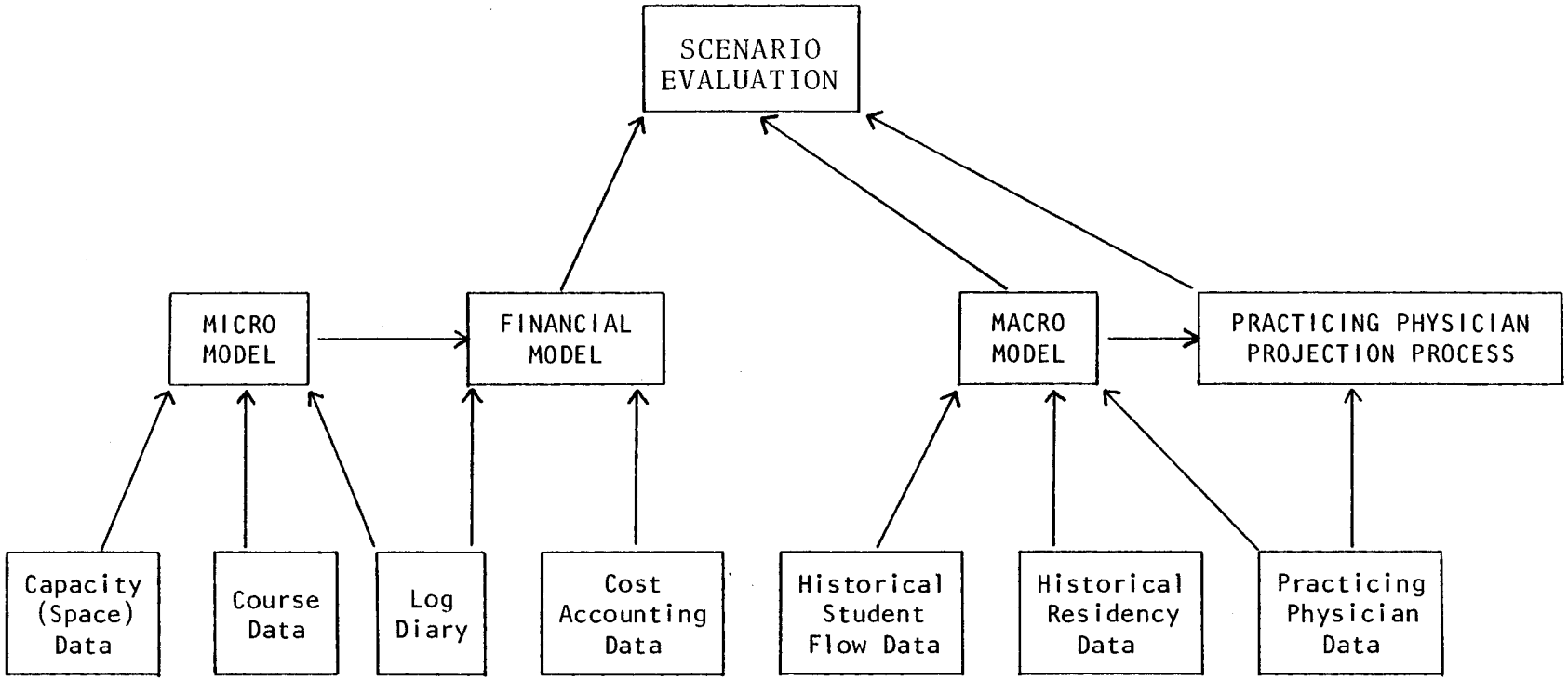


Figure 3: Data Support of Models

1. Status Quo
2. Increase Tuition
3. Increase Tuition and Establish State Revolving Loan Program
   a) Without Forgiveness
   b) With Forgiveness
4. Reduce Enrollment

1. Status Quo: The status quo scenario uses current medical education policies in West Virginia to project medical education costs and physician practice patterns over the next decade (1982-1992).

2. Maintain Status Quo and Increase Tuition: Assuming current medical education policies, this scenario suggests ways to reduce the State of West Virginia's contribution to medical education costs at the three schools of medical education by increasing their tuition levels beginning in 1983-84. To calculate the implications of such increases, both an aggregate method, where all tuition increases are the same amount, and an individual method, where each medical school increases tuition to offset its unique share of the state's costs, are presented to achieve a ten-percent and a twenty-percent reduction of state funds.

3. Increase Tuition and Establish a State Revolving Loan Fund Without and With Forgiveness: This scenario addresses two major policy issues: the rising state costs of medical education in West Virginia, and the physician practice location and specialty choice maldistribution. The first component, as in scenario 2, increases tuition in three separate runs at the schools of medical education in order to reduce the annual state appropriations for medical education by 10%, 20%, and 30%. The second component establishes a revolving loan tuition fund for allopathic and osteopathic students in order to reduce financial barriers to medical training for state residents with and without financial incentives to improve the distribution of physicians in West Virginia.

4. Reduce Enrollment: A possible way to reduce the current $21.9 million West Virginia state expenditure for medical education is to reduce medical school enrollments. This scenario considers the reduction of enrollment by 10%, 20%, and 30% at each of the three medical institutions and analyzes the impact of those reductions on cost and system outputs.

Step 6: Develop Matrix to Analyze the Implications of Each Scenario

Each scenario was analyzed in terms of its implications for stakeholders and specific areas affected. The stakeholders are the state of West Virginia, the regions the institutions of medical education are located in, the institutions of medical education, their faculty, their students and the population of West Virginia. The areas affected are political, social, psychological, economic, health care delivery, and quality of medical education. This organizing framework linking stakeholders and areas affected facilitates a comprehensive review of all the potential effects of each scenario as depicted below.

STAKEHOLDERS	AREAS AFFECTED					
	Political	Social	Psycho-logical	Economic	Health Care Delivery	Quality of Medical Education
State Region Institution Faculty Students Population						

Figure 4: Scenario Implications Assessment Framework

Step 7: Run the Key Scenarios

All key scenarios were run and analyzed and are presented in Section VI.D.

Step 8: Analyze Scenario Implications

The implications of each scenario are assessed within this framework (see Figure 4). The modelling aspects (the DSS) of the study address the economic and health care delivery areas of the matrix. Some of the blocks, however, are difficult to assess quantitatively but must, nonetheless, be addressed and considered when analyzing the impact of a scenario. To supplement the analysis of the health care delivery manpower planning area, physician supply projections were compared to the GMENAC requirement ratios applied to West Virginia for 1980, 1990, and 2000.

The implications of all scenarios were compared to the desired goals of the medical education system as expressed by the Health Affairs Committee of the Board of Regents in a scenario assessment matrix (see Figure 5).

GOALS AND OBJECTIVES SCENARIOS	Systems Strategy to Meet Educational Needs 1.	Quality Education within Resources 2. Effectiveness/Efficiency 3.	Primary Care Training 4. Numbers and Kinds Physicians & Location 6.	Educational Opportunity 5.	M.D./D.O. Cooperation 7.	Improvement in Health Status 8.	TOTAL 9.
Status Quo							
Increase Tuition							
Increase Tuition with Revolving Loan Fund With & Without Forgiveness							
Reduce Enrollment							

Figure 5: Scenario Assessment Matrix

V. MODELLING METHODOLOGY

Detailed descriptions of the decision support system modelling methodology consisting of the micro, financial, macro and practicing physician supply projection models are presented below. Figure 3 (p.17) illustrates the data sets that support the four models described.

A. The Micro

The micro model (Figure 6) specifies the resources needed to educate a given number of students. The largest resource required for the micro model is the faculty teaching hours. To estimate comprehensively the amount of time faculty spend teaching medical students, data were collected from two complementary data sources: the log diary (two one-week collection efforts) and course-specific data (an annual data collection effort).

Stored in the micro model is information for all medical school courses in the first two years at Marshall University (MU), West Virginia School of Osteopathic Medicine (WVSOM), and West Virginia University (WVU). For each course, the following resource requirements were specified:

(1) Faculty in-class lecture hours
(2) Faculty in-class audit hours
(3) Faculty in-class examination hours
(4) Faculty in-class seminar hours
(5) Faculty in-class lab hours
(6) Graduate assistant in-class teaching hours
(7) Graduate assistant seminar hours
(8) Graduate assistant lab hours
(9) Technician lab hours
(10) Voluntary faculty hours of in-class instruction by mode of instruction

It should be noted that for most courses, faculties from more than one department are involved in teaching. Hence, items 1-4 are recorded for faculties from each department involved in teaching those courses. Course data were obtained through personal interviews with the medical school departmental chairpersons at each institution and by reviewing course syllabi.

The basic assumptions for the micro model are that faculty in-class lecture, audit, and examination hours are independent of the number of students in the class, and that faculty seminar and lab hours are proportional to the numbers of seminar and lab sections required to teach that course, respectively. The same assumptions are made for graduate assistants and technicians. These assumptions are based on the notion that lab and seminar classroom size is the major constraint for the number of students in a class. Since students in a lab and seminar require a certain amount of personalized attention, the number of lab and seminar sections is determined by space availability, faculty availability, and the student/faculty ratio.

To determine the number of seminar and lab sections required for a course, information was gathered on the maximum numbers of students allowed for each seminar section and lab section respectively. Once the number of students in a course

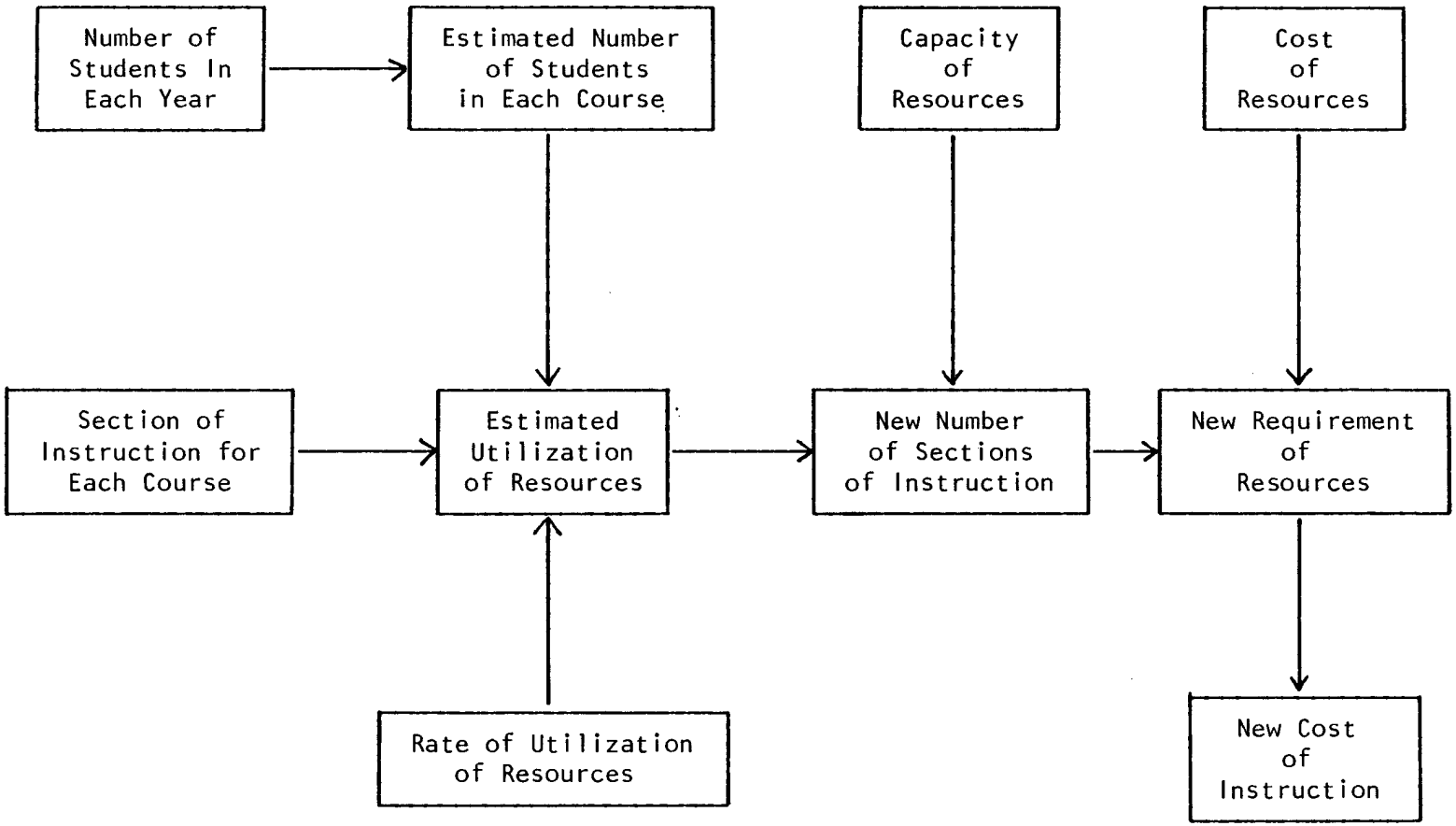


Figure 6: The Micro-Financial Model

is specified, the number of seminar and lab sections required for teaching the course can be determined, following which the necessary faculty, graduate assistant, and technician time for instruction can be computed.

For each department, adding the faculty's lecture, audit, exam, seminar, and lab hours for all the courses taught by the faculty of a department yields the faculty in-class time for the department. Similarly, times are also computed for graduate assistants and technicians.

To calculate the total course-related faculty teaching hours, two average ratios are computed by department: the ratio of faculty course preparation time to total faculty in-class time, and the ratio of total in-class teaching time plus joint teaching time that involves patient care and research to total in-class teaching time. These two ratios, applied to the total faculty in-class teaching time given above, yield the faculty course preparation and total class teaching time respectively, the sum of which gives the total course-related faculty hours. The difference between the total faculty teaching hours per department and the total course-related faculty teaching hours constitutes the other teaching activity hours which are assumed to be proportional to the number of students.

For non-medical basic science and continuing education teaching, the actual number of in-class hours as recorded by each school is used. For the hours faculty taught residents, the log diary design aimed to capture the time faculty spent in a teaching activity by student type. However, that response category was not completed consistently by all faculty, and thus prevented the separation of medical-resident teaching hours. Instead, ratios obtained in the Institute of Medicine's Medicare-Medicaid Reimbursement Policies: Social Security Study Final Report (32a), a larger-scale log diary effort, were applied to our log diary teaching activity data in order to disaggregate teaching activity by student type. The IOM study presents how much physician teaching time was spent with different types of students for four groups of departments. The percentage of faculty time spent in pure teaching, teaching and patient care, and other joint teaching activities for the following student types were identified: 1) residents and fellows, 2) first degree students, and 3) joint resident and first degree students. When both residents and medical students are present, activity time was divided evenly between them. While imperfect, this method was deemed the best available for disaggregating first degree students' teaching hours and costs from resident teaching hours and costs given the project's time frame and cost constraints. Furthermore, the administrator of the university hospital would not permit the use of a log diary for the residents which was intended to establish the time they spent in learning from faculty with and without medical/other students present, as well as in teaching medical students.

It is assumed that the log diary ratio of medical course preparation time to medical in-class teaching hours is required for nonmedical and continuing education courses as well. Without specific data on preparation time for nonmedical and continuing education teaching activities, it is believed reasonable to maintain this assumption. Based on this ratio, total time equals actual plus preparation time.

Also, based on this ratio, the total hours spent in nonmedical and continuing education teaching activities (teaching and preparation) can be obtained. This figure, adjusted to weekly hours, is incorporated in the log diary figures to compute the proportion of time spent on nonmedical and continuing education activities.

As the numbers of seminar and lab sections change, the resource requirement for graduate assistants and lab technicians will also change. Moreover, space utilization also changes. The classrooms, seminar rooms, and lab rooms and their capacities used in teaching the courses are obtained from the data sets. These data provide a means to determine new space needs, if any, when the number of students in classes increases. The detailed mathematical description of the micro model and status quo analysis is given in Appendix E.

B. The Financial Model

The financial model calculates hours and cost data for MU, WVSOM, and WVU, Morgantown. It takes as inputs the output of the micro model, additional log diary data, and cost data, and determines the direct, indirect, and total costs for the basic and clinical science departments at each of the schools. Both instructional and educational costs are calculated (the distinction between these two types of hours and costs is discussed at length in Section VI). Different strategic options require various levels of teaching resources. That is, if a school changes its size (its scale or level of operation) by enrolling more or less students, it may need to change the size of its faculty, its current expenses, its other staff costs, and the like. The financial model can be used to determine both the status quo and these new resource requirements, and is the essential driver for a number of the scenarios that are evaluated.

A major component of a medical school's direct costs is its faculty salaries. The model calculates these both for the status quo and other user-specified levels of operation. To do so, it calculates the number of faculty per department necessary to run the school at a specified level of operation and then multiplies these figures by the average faculty salary per department.

To calculate changes in faculty, the model first disaggregates the current faculty hours at the schools. Total status quo faculty teaching hours are computed by multiplying the number of faculty in the department times the average faculty member's weekly teaching hours times 45, the number of weeks a faculty member works net of vacation, holidays, and sick leave. These hours include both medical and resident/other student teaching hours; they are computed exclusive of research and patient care hours. Total teaching hours are divided into three categories: fixed hours, hours that vary indirectly with the number of students at the school, and hours that vary directly with students. Fixed teaching hours are independent of the school's scale of operation, and are assumed to include resident/other teaching hours and that portion of school administration and curriculum development hours that can be attributed to medical students (the portion of these hours attributed to resident/other students is already captured in the resident/other hours figure). The inclusion of administration and curriculum development in fixed time seems reasonable even if there are fairly broad changes in the number of students in the department. Teaching hours that vary indirectly with the number of students are the classroom hours calculated by the micro model. Finally, hours that vary directly with the number of students are derived by subtracting both fixed hours and hours that vary indirectly with the number of students from the total faculty teaching hours. Figure 7 illustrates the disaggregation of total teaching hours of the faculty.

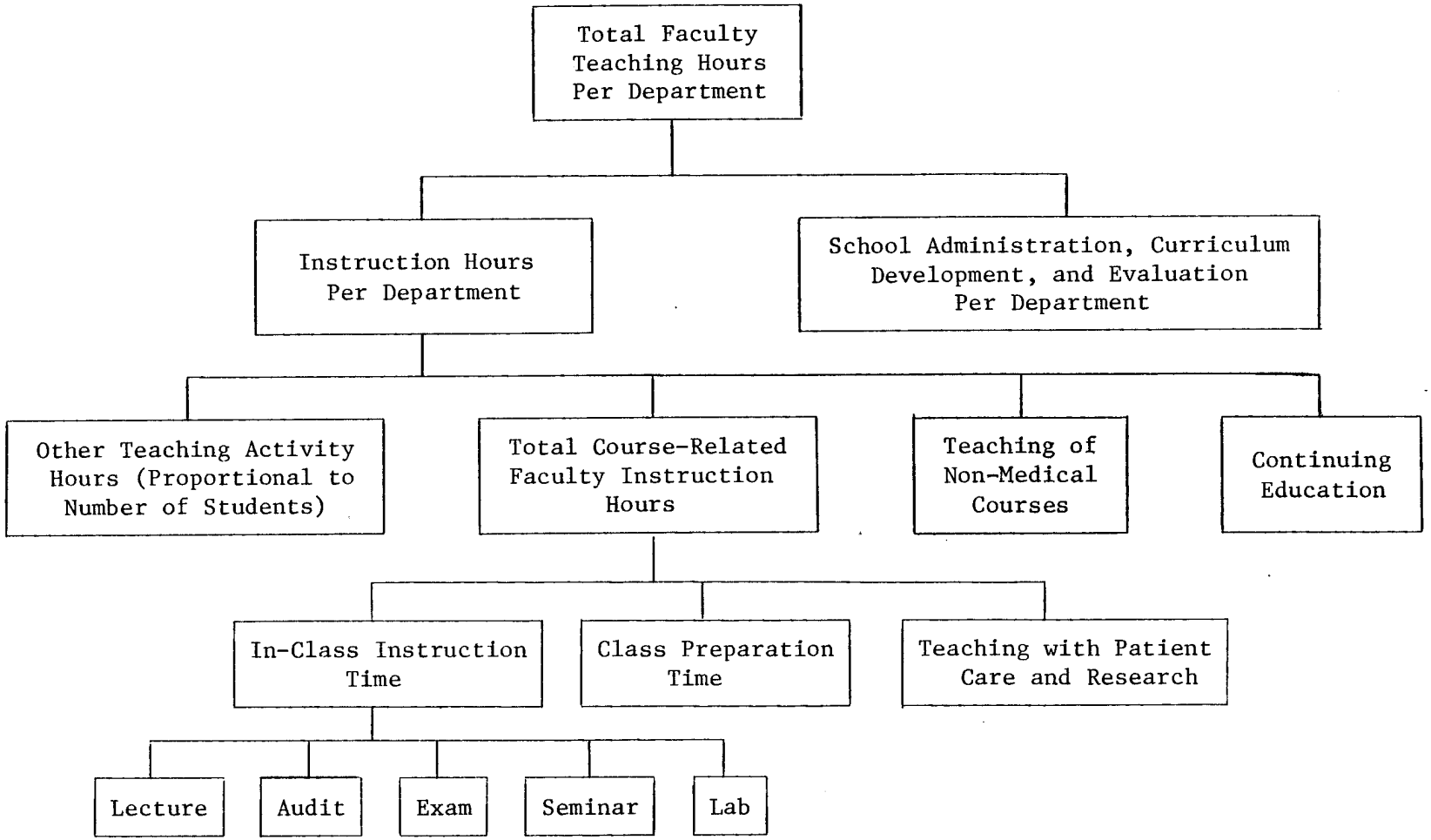


Figure 7: Micro-Financial Model:
Disaggregation of Faculty Teaching Hours

Changes in faculty teaching hours can be met in one of two ways:

1. the current faculty can be retained by altering the time they spend in different activities;
2. the number of faculty can change.

Option 2 is used in the financial model; however, it can be adjusted to take option 1 into account. Option 2 has been adopted, because it is believed that the quality of the faculty would be adversely affected by significant forced changes in the faculty's allocation of its time. Hence, when faculty are added, it is assumed that they carry the same teaching, patient care, and research loads as do current faculty members. Similarly, if reductions are made, it is assumed that the remaining faculty's teaching, research, and patient care activities are maintained in the same proportion as they were before the reduction.

Given that the ratios of teaching to research to patient care remain constant, the status quo hours categories can be used to construct new hours data. To do so, the status quo hours that vary directly with the number of students are multiplied by one plus alpha, where alpha represents the change in the class size (the scale of operation). If alpha equals -.1, the class size is reduced 10 percent; if alpha equals .2, the class size increases 20 percent. This new variable hours figure is added to the in-class hours total for the specified scale of the school; these hours data come from the micro model. Finally, this sum is added to the total fixed hours.

The change in the number of faculty can be calculated by first subtracting total teaching hours from the total new teaching hours and then dividing the result--the net change in teaching hours given a change in the level of operation of the school--by 45 times the average faculty member's weekly teaching hours (including both medical and resident/other student teaching hours). Notice: though the net change in hours includes no time attributable to residents or other nonmedical students, these additional hours must be divided by a faculty member's full complement of teaching hours. The intuition behind this conclusion (for the case of an increase in the size of the school) follows. It is assumed that research and patient care are a fixed portion of a faculty member's time as is teaching time. However, though this later item is fixed, the proportion of hours the faculty member spends teaching residents versus teaching medical students can vary. If the school grows, the status quo faculty already are teaching all of the resident hours. Thus new faculty, in a sense, would not have to teach residents, and that portion of their time would instead be devoted to teaching medical students. Of course, all faculty teach residents; however, it is assumed that the time the new faculty free up for their colleagues (by taking on a portion of the fixed resident hours) will be spent teaching medical students and not doing research or providing patient care.

Although faculty salaries are a large component of a medical school's direct costs, they are not the only cost that must be calculated. The financial model also calculates other personal service, current expense, and repair and alteration figures for teaching, research, and patient care. While the repair and alteration figures are fixed, the other accounts are assumed to vary according to the percentage change in the faculty at the school.

The model is also used to calculate the indirect costs of the schools. Because some of these costs have been allocated based on ratios of either full-time-equivalent students or direct expense, changes in the size of a medical school affect the allocation formula. These changes, then, can vary the indirect costs incurred by the schools. However, though the school's share may be affected, the total indirect costs often remain constant. Thus, the model also reports the increase or decrease in indirect costs born by the rest of the state university system.

The documentation of the financial model and status quo runs are presented in Appendix F.

C. Benefits of Medical Education: The Macro Model

The macro model (Figure 8) considers the flow of medical students through a collection of levels which are defined by the student's year of education, as well as the location of study. The model takes as data inputs the likelihood of student movements from one level (educational year and location) to another. Given these likelihoods, the expected number of students in each level can be computed. This information is useful as the number of students in each level will definitely affect the resource utilization associated with education at that level. The definition of the medical education system by levels also includes graduating physicians or residents practicing at various locations. (See Appendix G.2 for the mathematical description of the macro model.)

1. Student Origin

While it is apparent that every student may be unique in the path taken through his or her medical education (locations as to where to study for the 3rd and 4th years, where and what specialty for residency, where and what specialty for eventual practice), one can nevertheless consider the average behavior of medical students in those levels. It is, however, important to identify the key factor or factors affecting the movement from one level to another so that the impact of policy changes will be represented accurately. From historical analysis of West Virginia University Medical School data, one of the most important factors affecting the likelihood of flows in the various stages of medical education is the **origin of the student.** For example, a student coming from West Virginia is more likely to remain in the state to practice than a student from, say, Georgia. On the other hand, a student from urban West Virginia is less likely to practice in rural West Virginia than a student from rural West Virginia. Specifically, 8% of "urban" WVU graduates who perform their residency in West Virginia and then remain there eventually practice in a rural setting, while 47% of "rural" graduates who do their residency and remain to practice in West Virginia in fact practice in rural areas. 33% of "urban" graduates of WVU who go out of state for their residency return to practice in West Virginia, while only 16% of "rural" graduates return. Of those "urban" graduates who return to West Virginia, only 12% practice in rural areas, while 50% of returning "rural" graduates practice in rural areas. Under present conditions, a rural student is four times as likely to end up practicing in a rural area than an urban student. The urban/rural location of the student's origin also tends to affect specialty choice.

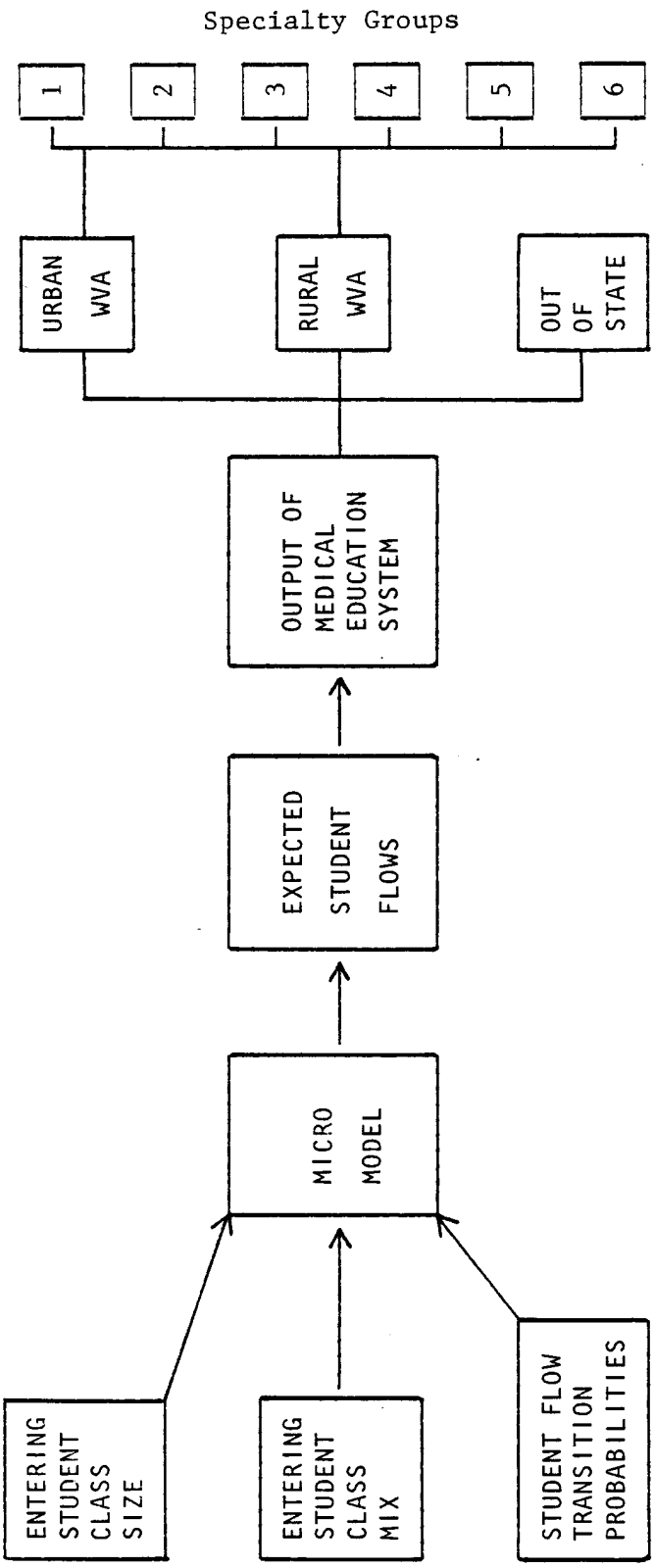


Figure 8: The Macro Model

Hence, the origin of students can affect the likely paths they would take throughout the stages of their medical education and are necessary to include in the model. Consequently, all medical students were classified into the following four groups depending on their origin.

1. urban West Virginia
2. rural West Virginia
3. neighboring states
4. other states

The U.S. Bureau of the Census defines rural as a population of 2500 or fewer (87a). Members of the West Virginia Board of Regents and the Chancellor's Office felt this definition was not appropriate for their state. Examination of population densities throughout the state suggested the following definition of urban/rural areas, providing levels more closely describing the urban/rural mix of the state (see Appendix G.3):

Urban: any city with a population of 10,000 or greater or comprising an urban strip.

Rural: any city with less than a 10,000 population.

"Neighboring states" include those adjacent to West Virginia: Pennsylvania, Virginia, Kentucky, Ohio, and Maryland. (This classification is used in view of the hypothesis that students from neighboring states may behave differently than those from other states.) "Other states" include the remaining United States and foreign countries.

For the purposes of this study, student origin is defined as the student's place of residence at the time of admission to medical school. Because the data sources readily available to the schools did not provide the place where the student attended high school, the place cited by the medical student as his or her place of residence was recorded. It is recognized, in some instances, that the origin may be different from the town in which a student grew up. Some students may have moved from their home town to another setting prior to starting medical school. Generally, it is not felt that this possible discrepancy presents a problem for this study for two reasons. First, data on origin and the relationship of origin to practice location were studied for a four-year period based on WVU data. The relationship between origin (ar defined for this project) was consistent throughout this period, and it is believed that these data are representative of historical experience. Thus, if the definition of origin remains residence at time of admission, no major bias is introduced in the projections of where students will end up practicing.

A second factor which lends confidence to the origin data arises from results of analyses conducted to determine the implications of possible missrepresentation of student origin. The key issue in this area is the rural/urban designation and whether individuals have been long-term West Virginia residents. It is assumed that students whose residence before admission is rural actually do come from a rural background. Students listed as urban, however, may have moved from rural areas or out-of-state areas prior to admission. Sensitivity analyses were conducted to determine the effects of overestimating urban students and underestimating out-of-state students. These analyses reveal that the results only slightly

overstate the number of rural practitioners. The level of overestimation will be reduced with changes in admissions policies to admit more individuals from rural backgrounds and fewer from urban backgrounds.

Detailed descriptions of student flows at each of the schools were designed to clearly delineate the various paths a student can take from the time of entering medical school until practice (see Appendix G.1). Figure 9 illustrates that process for the overall medical education system in West Virginia.

2. Historical Trend Data

Historical student flow data for the years 1972-81 were obtained from WVU to compute the likelihood of students making transitions from one level to another (medical student to residency, residency to practice). Similar data were collected at Marshall University for students that graduated in the years 1981-82 and at WVSOM for students that graduated in 1978-80. While it is preferable to use school-specific retention rates, WVSOM and Marshall are too new to have residency and post-residency practice pattern data. Instead, adjusted WVU figures were used (these adjustments are discussed further below).

Many of the parameters of the macro model are based on students who graduated in 1978-81 to insure that recent trends and environmental factors are incorporated into the model. Specifically, student origin data were based on WVU students who graduated in 1978-81, WVSOM students who graduated in 1978-80, and MU students who graduated in 1981-82; the breakdown of in-state and out-of-state residencies, attending specialty choices, and medical school - residency - practice retention rates are calculated from WVSOM (1978-80) and WVU (1974-77) data.

Retention history used to forecast practice locations of graduates was based on the experience of physicians who graduated WVU in 1974-77 and WVSOM in 1978-80. These latter figures were used to calculate retention histories for osteopathic students who participated in a one-year internship. For medical and osteopathic students who enter three-to-five-year residency programs, the WVU data or adjusted WVU data are used.

Five adjusted sets of WVU retention rates were examined in order to estimate appropriate rates for both MU and WVSOM. They ranged from setting both schools' retention rates at 10% less than WVU's experience, to setting both their rates at 20% greater than WVU's experience.

Table 2 below displays the resulting projections of West Virginia graduates practicing in West Virginia by specialty group and practice location for each of the schemes. By the year 2000, the most conservative scheme, A, yields 1645 West Virginia graduates practicing in West Virginia. The least conservative scheme, E, yields 1781 West Virginia graduates practicing in West Virginia. There is a difference of 136 physicians between the two scheme extremes.

After reviewing the results of using the different rates and taking into account the primary care philosophy and placement activities of the two schools, differential rates were selected for each school. Marshall University's retention rate is set at 10% greater than West Virginia University's retention history, and WVSOM's retention rate is set at 20%. The selected scheme yields 1,749 practicing physicians in West Virginia who graduated from West Virginia schools. The different rates only have a slight effect on the total number of physicians practicing

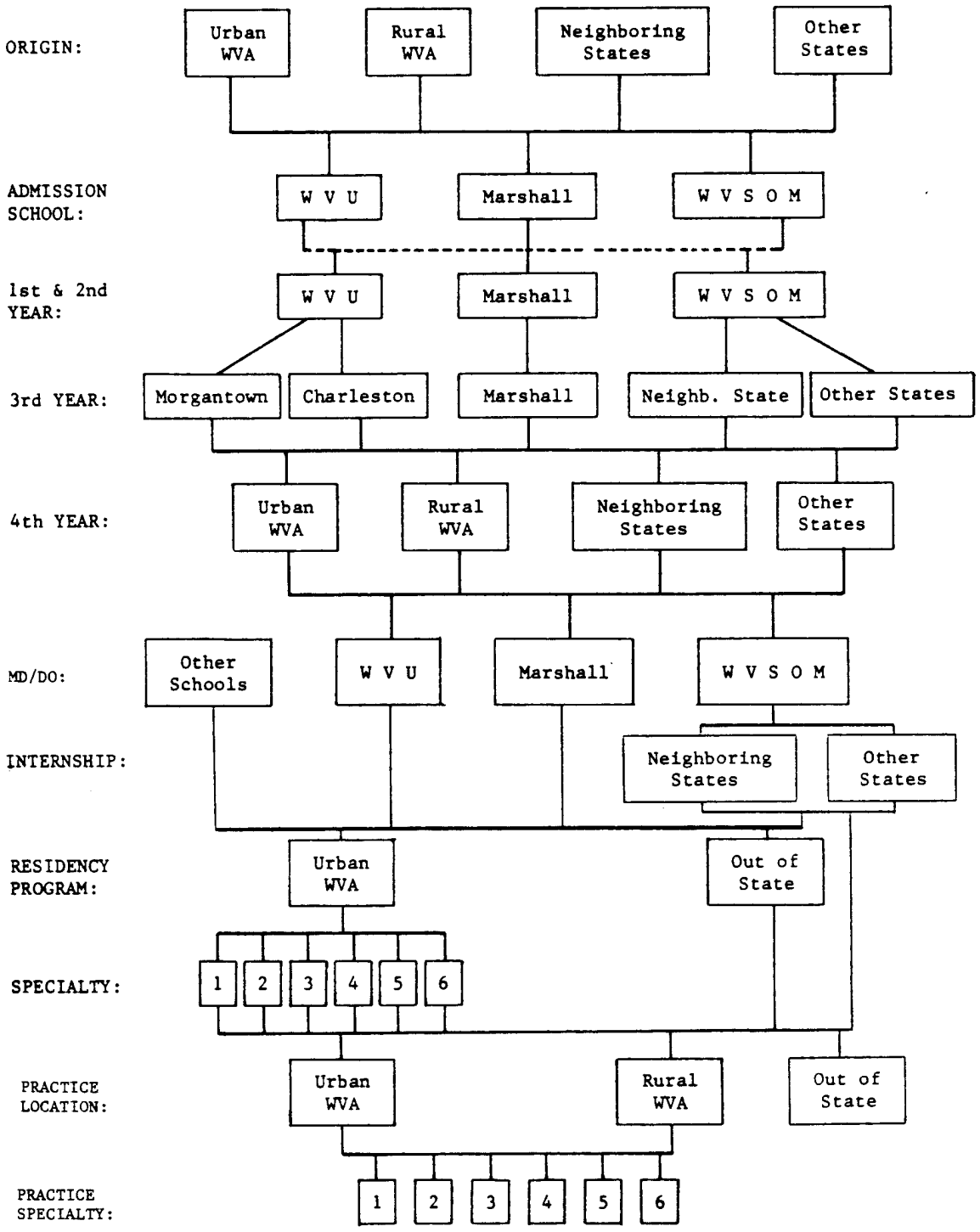


Figure 9: Flow of Students in Macro Model

Table 2

MACRO MODEL OUTPUT USING FIVE DIFFERENT RETENTION RATE SCHEMES

SCHEME A.

MU and WVSOM: 10% less than WVU's retention history

YEAR	URBAN		RURAL		TOTAL		
	1+2+3	4+5+6	1+2+3	4+5+6	1+2+3	4+5+6	TOTAL
1982	105	220	46	16	152	235	387
1985	155	286	94	30	250	316	565
1988	219	362	155	47	374	409	783
1991	290	442	210	66	500	509	1,009
1994	371	520	259	87	629	607	1,236
1997	461	590	290	109	751	699	1,450
2000	565	653	297	130	862	783	1,645

SCHEME B.

MU and WVSOM: WVU's retention history

YEAR	URBAN		RURAL		TOTAL		
	1+2+3	4+5+6	1+2+3	4+5+6	1+2+3	4+5+6	TOTAL
1982	106	219	46	16	152	235	387
1985	156	287	95	30	251	317	568
1988	221	367	157	47	378	414	792
1991	294	451	214	67	508	518	1,026
1994	377	533	264	89	641	622	1,263
1997	469	608	297	112	766	720	1,486
2000	575	675	306	135	881	810	1,691

SCHEME C.

MU and WVSOM: 10% greater than WVU's retention history

YEAR	URBAN		RURAL		TOTAL		
	1+2+3	4+5+6	1+2+3	4+5+6	1+2+3	4+5+6	TOTAL
1982	105	220	46	16	151	236	387
1985	157	288	95	30	252	318	570
1988	223	372	159	47	382	419	901
1991	298	460	217	68	515	529	1,044
1994	383	547	269	91	652	637	1,289
1997	477	626	305	115	782	740	1,522
2000	586	698	314	138	900	836	1,736

SCHEME D.

MU: 10% greater than WVU's Retention History
WVSOM: 20% greater than WVU's Retention History

YEAR	URBAN		RURAL		TOTAL		
	1+2+3	4+5+6	1+2+3	4+5+6	1+2+3	4+5+6	TOTAL
1982	105	220	46	16	151	236	387
1985	157	289	96	30	253	319	572
1988	224	373	159	48	383	421	804
1991	300	463	218	69	518	532	1,050
1994	385	550	271	91	656	641	1,297
1997	480	630	307	116	787	746	1,533
2000	589	703	317	140	906	843	1,749

SCHEME E.

MU and WVSOM: 20% greater than WVU's Retention History

YEAR	URBAN		RURAL		TOTAL		
	1+2+3	4+5+6	1+2+3	4+5+6	1+2+3	4+5+6	TOTAL
1982	105	220	46	16	151	236	387
1985	157	290	96	30	253	320	573
1988	225	376	160	49	385	425	810
1991	301	470	221	69	522	539	1,061
1994	389	560	275	92	664	652	1,316
1997	485	644	312	117	797	761	1,558
2000	596	720	323	142	919	862	1,781

KEY:

1+2+3 = Primary Care Specialty Groups: Internal Medicine, Family/ General Practice, and Pediatrics.

4+5+6 = Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; Indirect Patient Care.

in West Virginia. Scheme A (-10% WVU's retention history) yields 1.8% fewer WVA practicing physicians than the selected scheme D; scheme E (+20% WVU's retention history) yields .5% more WVA practicing physicians than the selected scheme. Furthermore, when each of these schemes is compared to plus or minus 20% of the GMENAC benchmark requirement figures (See Section VI.), all the schemes have consistent results in terms of whether or not undersupply, balance, or oversupply will be experienced.

Table 3 delineates the specific student trend data collected. (See Appendix G.4 for summary tables of the historical trend data.)

Given the class size of incoming students and their origins for each of the three schools, the macro model computes the expected number of students at the various levels and stages as illustrated in Figure 8. These numbers are computed based on the likelihood of movements obtained from the 1978-81 trend data. For example, the proportion of students who remain in urban West Virginia for residency are traced to determine the number who will remain to practice. Students who leave West Virginia to do an out-of-state residency are traced to determine who eventually will return to West Virginia to practice. The output of the system is specified by the number of physicians graduated from the schools in West Virginia who will eventually (after residency and internships) practice in West Virginia. This output is also disaggregated by practice locations in urban and rural West Virginia and by specialty groupings.

Since the macro model was based on historical data, policies enacted after 1981 have not been taken into account. One important factor is that contract students at WVSOM were not accounted for in the model; this new student category was added there in 1982. Contract students are out-of-state residents whose home states subsidize their cost of education in return for a commitment to practice medicine upon graduation in their home state. These students pay an in-state tuition fee and their state pays an additional fee of $4,000 per student per year. We did not account for these students in our model, though it may have been appropriate to do so. However, it is estimated that the difference between the results of the model under these two sets of assumptions is not great. For example, if the status quo macro model scenario is run, the number of practicing physicians is reduced by less than one percent when contract students are taken into account (5,752 practicing physicians if contract students are accounted for, 5,796 if they are not).

3. Specialty Groupings

Students may choose to specialize in one of fifty-three different areas of medical practice, ranging from general internal medicine to public health. To facilitate discussion of the output of the schools with regard to specialty choices of students, it was necessary to reduce these 53 specialty areas into a smaller number of categories. On the advice of three physicians from the University of Pennsylvania Medical School, the project team developed six categories of medical practice based on whether the specialty usually is involved in primary or initial contact with patients, usually is involved on a referral or consultant basis, or is involved in aspects of medical care that do not usually involve direct patient contact. Under these groupings, three specialty categories of primary care are designated (general internal medicine; family practice, general practice, and osteopathic general practice; and pediatrics). A fourth category has been designated for specialties that also frequently involve early or initial patient con-

Table 3

STUDENT TREND DATA

I. FOR ALL UNDERGRADUATES:

NAME	HOME TOWN	MEDICAL UNDERGRADUATE											CURRENT PRACTICE SITE*
		YEAR OF ENTRY	YEAR OF GRAD.	MEDICAL SCHOOL ATTENDED	SITE OF 3rd YEAR STUDY	YEAR STARTING RESIDENCY	YEAR ENDING RESIDENCY	YEAR 1 SITE	YEAR 1 SPECIALTY	YEAR 2 SITE	YEAR 2 SPECIALTY		

II. FOR ALL RESIDENTS WHO DID NOT DO UNDERGRADUATE WORK IN WVA:

NAME	HOME TOWN	MEDICAL UNDERGRAD. STUDY		RESIDENCY							CURRENT PRACTICE SITE**
		Medical School	Year of Grad.	YEAR STARTING RESIDENCY	YEAR LEAVING RESIDENCY	YEAR 1 SITE	YEAR 1 SPECIALTY	YEAR 2 SITE	YEAR 2 SPECIALTY		

III. FOR ALL FELLOWS IN WVA:

NAME	HOME TOWN	MEDICAL UNDERGRAD. STUDY		RESIDENCY				FELLOWSHIP					CURRENT PRACTICE SITE**
		Medical School	Year of Grad.	SITE	DURATION IN YEARS	YEAR LEAVING	SPECIALTY	YEAR OF ENTRY	YEAR LEAVING	Year 1 SITE	Year 1 SPECIALTY		

*Practice site supplied by schools of medical education.

**Determined by West Virginia Practicing Physician Data for those physicians practicing in West Virginia.

tact. A fifth category involves specialties that normally may be involved in care on a consultant or referral basis. The sixth category includes specialties which normally do not include direct patient contact. In considering these categories, it must be emphasized that the categories developed here are approximate, in the sense that there is overlap in some specialty areas. Cardiologists, for example, may be a first point of contact for some patients, while they may act on a consultant basis for others. For purposes of the modelling effort, this overlap does not affect the results. In fact, in some modelling activity, specialties are collapsed into two categories: primary care and all others. In these instances, the precision of the classification system is moot. Table 4 gives a breakdown of how the medical specialties are combined to give rise to these specialty groupings.

4. Practicing Physician Data

The necessary practicing physician data were supplied by the schools for their medical school graduates and by the West Virginia Department of Health for allopathic physicians (MDs) licensed in West Virginia for 1979 and 1982. Data on osteopathic physicians were only available for 1979. The following attributes were recorded: age, specialty, current place of practice (county and city), medical school attended, and year of graduation. This information is also used for the physician supply analysis.

When the environment or scenarios change under different strategic policy changes, the movements of students are revised accordingly. The output of the system, consequently, will also change. The macro model is used for forecasting these changes. (See Appendix G.5,6 for the background construction and status quo analysis of the macro model.)

C. Practicing Physician Supply Projection Model

The movement of physicians into and out of West Virginia by class of graduation, specialty group, and urban/rural practice location has been traced between 1979 and 1982 from physician licensure data tapes supplied by the State Health Department of West Virginia for 1979 and 1982. From these two points in time, migration rates by specialty group and class of graduation (a surrogate for age) have been calculated and are assumed to be constant through 1999. Out-migration includes physicians leaving practice in West Virginia due to settling elsewhere, retirement, or death. Because in-migration accounts for physicians who were not practicing in West Virginia during the previous three years, those physicians entering from graduate medical education (GME) residency programs will be accounted for through GME resident flows. For West Virginia graduates, the number who enter practice in WVA in any three-year period is supplied by the macro model and varies according to policy options specified by each scenario. For non-West Virginia graduates, the number who enter practice in West Virginia between 1979 and 1982 is assumed to be typical of any other three-year period and to remain constant through 1999.

To summarize the process, physicians practicing in WVA in 1982 are used as the initial base. The three-year rate matrix calculated from the flow of physicians in and out of West Virginia between 1979 and 1982 and the GME resident flows are applied to the base to produce a net quantity of physicians distributed by specialty group and practice location for the next three-year period, 1983-85 (the subsequent base). The procedure is iterated until the year 2000 is reached. (See Figure 10.)

Table 4

SPECIALTY GROUPINGS

	Grouping #	Specialty
PRIMARY CARE	1	General Internal Medicine
	2	Family Practice/General Practice Osteopathic General Practice
	3	Pediatrics
DIRECT PATIENT CARE: NON-CONSULTANTS	4	Abdominal Surgery Behavioral Medicine & Psychiatry Cardiology - Int. Med. Cardiovascular Diseases Dermatology Emergency Medicine Gastroenterology - Int. Med. General Psychiatry General Surgery Immunology/Allergy - Int. Med. Neurology Obstetrics/Gynecology Orthopedic Surgery Otolaryngology Otology Rheumatology - Int. Med.
DIRECT PATIENT CARE: CONSULTANTS	5	Anesthesiology Broncho-Esophagology Cardiology Pediatrics Cardiovascular Surgery Child Neurology Child Psychiatry Endocrinology/Metabolism - Int. Medicine Hand Surgery Hematology/Oncology - Int. Medicine Infectious Diseases - Int. Medicine Neonatology Neoplastic Diseases Nephrology - Int. Medicine Neurosurgery Occupational Medicine Ophthalmology Pediatric Surgery Pharmacology, Clinical Physical Medicine & Rehabilitation Plastic Surgery Preventive Medicine Pulmonary Medicine - Int. Medicine Thoracic Surgery Urology Urological Surgery
INDIRECT PATIENT CARE SPECIALTIES	6	Aerospace Medicine Diagnostic Roentgenology Legal Medicine Nueropathology Nuclear Medicine Pathology and Subspecialties Public Health Radiology and Subspecialties

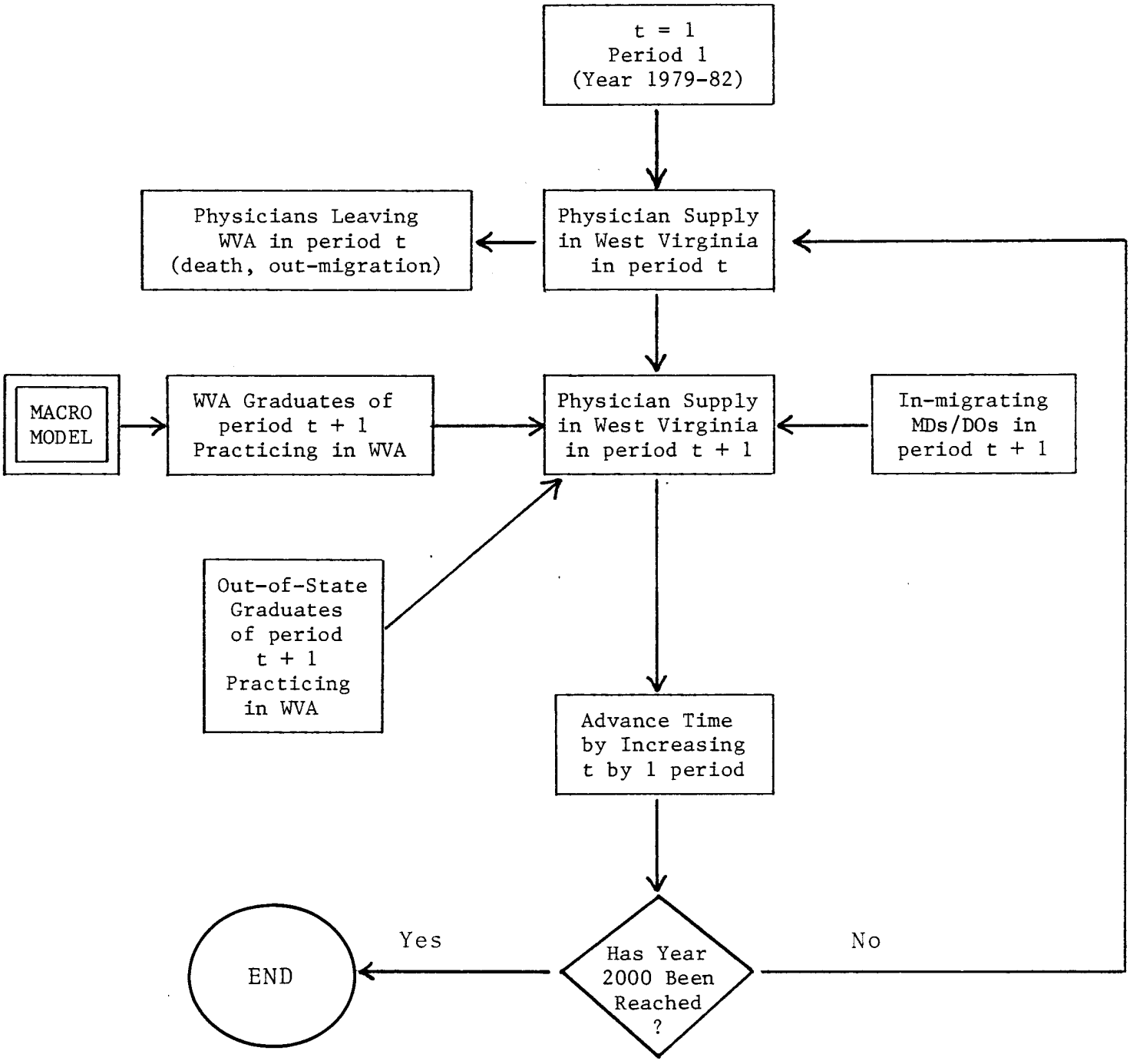


Figure 10: Projection Model

This projection method presents a rough estimate of the number of practicing physicians in West Virginia using the best information at our disposal. In computing these estimates a number of assumptions were made. The major assumptions of the supply projection procedure include:

- Class of medical school graduation is a surrogate for a physician's age.
- Physician immigration and emigration rates are a function of a physician's age.
- The migration of physicians in and out of the state from 1979-82 is until 1999. A three-year increment was used because the available licensure survey data from the West Virginia Department of Health was supplied for 1979 and 1982.
- The supply of WVA graduates and non-WVA graduates is assumed to be independent.
- It is assumed, on average, that students who graduate during a given three-year period start to practice within the next three-year period. We assume an average, three-year residency.
- It is assumed that the number of D.O.s practicing in WVA in 1979 is typical of any year.

Major limitations of the supply projection model include:

- The various assumptions made for each scenario affecting the number of West Virginia graduates remaining to practice in the state are incorporated into these projections.
- In an increasingly complex and rapidly changing health care field, the future supply of physicians is dependent on factors difficult to identify and harder still to quantify. These mathematical models are not equipped to allow for unforeseen adjustments in either the health care delivery system, the general population (market), or changes in the economy that affect the supply of physicians.
- The estimates of future physician supply are important for the general trends they suggest rather than their specific values.
- Consequences of policy changes made now will become evident in seven years at the earliest. The accuracy of the projections for the subsequent years becomes increasingly uncertain.

The key limitations to the projections from this model relate to the data base obtained from the state and to inherent risks in making long-term projections in a situation where multiple factors, not all of which can be accounted for in the model, affect outcomes. With regard to the first factor, state data for the most recent periods were used (1979 and 1982), because it was felt that practice changes had occurred in prior years that would not necessarily be carried through to future years. While these are the best available data, the use of a limited number of data points poses problems. For this model, it is assumed that the two years used are representative of the state's experience with regard to the movement and supply of physicians and that the rates of migration remain constant. If, in fact, these years are not representative or the rates of migration are in flux, the results could be an under or overestimation of physician supply of an

unknown magnitude. A further constraint of the data is that information for osteopaths was available in 1979 only and not in 1982 at the time the data were prepared for this study; the assumption is that practice patterns in this year are representative. With additional data over time, however, assumptions can be modified to reflect actual patterns experienced. Additional data points would also permit development of trend lines so that future experience could be predicted with greater degrees of confidence.

With regard to the second factor, projections of long-term trends in a field as complex as physician supply is a challenge. Numerous factors affect supply and migration rates including reimbursement policies, local, regional, and national economies, and the organization of health care delivery. Long-term projections, based on an environment at a given point in time, by their nature do not take these future events into account. However, the model is designed in such a way as to be able to incorporate new factors or new values for factors already included as information becomes available. Thus, the model can constantly be updated to reflect the best available information.

Overall, it is important to recognize that the significance of the model results lies not in the precise number, but in the general trends for physician supply that are projected. With boundaries of 20% above and below the actual figures estimated, the figures provide a reasonable approximation of future supply and give a general sense of whether undersupply or oversupply will be experienced.

VI. ANALYSIS

A. Log Diary Data

The log diary instrument, which measures how faculty spend their time, was used as a means of assigning costs to the various medical education programs. Hours were aggregated into four categories: medical teaching, resident and other teaching, research, and patient care. Salaries and other direct and indirect costs were allocated based on the resulting ratios. The log diary analysis of faculty activities was conducted to help predict the inputs required for different medical school outputs. However, this procedure is complicated by the fact that education, research, and patient care are interrelated, and faculty often produce simultaneous or joint outputs. For example, ward rounds, where care is provided by a team of teaching physicians, residents, and medical students, would be considered a joint activity: faculty teach while supervising or providing patient care, and students learn from observing and participating in that care. The problems posed by allocating joint activities are discussed later on in this section.

1. Collection Method

To obtain estimates of faculty time spent in various activities, full-time and available part-time faculty members at each school of medical education and the clinical campuses were asked to keep a daily record of their professional activities for a one-week period during the fall semester and again during the spring semester of 1981-82. The data collection instrument was a log diary using the Institute of Medicine's activity categories (32). Major activity categories include: teaching, teaching and patient care, preparation for teaching, curriculum development and evaluation, research, research and teaching, patient care, hospital/clinical administration, service, professional development, writing, personal, and other. As noted above, joint activities were categorized under both teaching and patient care, and teaching and research. In those categories where they interacted with students, faculty were requested to specify the types of student they were instructing (e.g., medical students, graduate students, residents). However, this category was not completed consistently by all faculty; thus, we were unable to use the diary data to disaggregate teaching activity by student type. To compensate for this omission, ratios from a similar log diary effort conducted by the Institute of Medicine (32a) were applied to our log diary data for the activity analysis and subsequent cost assignment. Prior to implementing the log diary instrument, it was pretested on a sample of University of Pennsylvania medical school faculty and critiqued by faculty subcommittees at each school in West Virginia. Based on suggestions made by the faculty subcommittees, several modifications to the instrument were made. These included clarifying definitions with additional examples of activities, adding more space for faculty to note more than one course taught per day, and marking each log diary confidential.

Faculty members received a packet of material containing a cover letter, an explanatory notes sheet, and seven log diary instruments and return envelopes identified by a confidential unique code number. Confidentiality of the data has been assured. A University of Pennsylvania research team member or representative served as the on-site data collection coordinator. Questionnaires were collected daily and follow-up phone calls were made by the collection coordinator to encour-

age a high response rate. (See Appendix H.1 for a sample log diary packet.) The log diary response rate from all schools was 91% for the fall and 84% for the spring, with a total response rate of 87%. This is an exceptionally high response rate for survey questionnaires. A breakdown of the responses by school appears on Table 5. (Note: volunteer faculty and residents were not represented in the survey; therefore, the analysis of teaching resources required for the education of medical students excludes these two groups.)

2. Statistical Analysis

Summary results of the log diary analysis are presented in this section. For some analyses the data were aggregated in order to increase the sample size and, hence, statistical validity. In other instances, the data were disaggregated into smaller subsets to capture structural differences that have a bearing on cost allocations. Prior to regrouping the data, statistical tests were performed to assure that the data sets being combined were statistically similar.

It is reasonable to expect that the average hours faculty members spent in various activities were similar in the fall and spring. Therefore, if testing bears out this expectation, these two data sets can be aggregated. Four series of comparisons were performed to test whether the fall and spring patterns of faculty hours were alike (refer to Table 6 for department classification scheme):

1. All faculty in fall versus all faculty in spring.

2. All basic science department faculty in fall versus all basic science department faculty in spring.

3. All clinical department faculty in fall versus all clinical department faculty in spring.

4. Faculty by department in the fall versus the spring, grouping activities into teaching, research, patient care, professional time, and personal time.

The T-test for differences between means from two samples and the Behrens-Fisher T-test were the statistical comparisons used to determine the existence of any significant differences; tests were run for each school separately. Overall, these tests show no significant variation in time allocation patterns during the fall and the spring. The means of the times spent during the fall and spring are not significantly different and therefore justify aggregating the two data sets in order to obtain summary statistics for the cost analysis, as well as the micro and financial models. (Tables 1-4.5 in Appendix H.2 contain the statistics to test equality of means between fall and spring log diary data.)

Alternatively, comparisons were made between the basic sciences departments and the clinical departments for the pooled fall-spring data set. As expected, the distribution of faculty time from basic science departments is significantly different from those of clinical departments. Since WVU, Charleston, and WVU, Wheeling, do not offer basic sciences courses, there were no tests performed for these two locations. Differences are most pronounced in patient care, research, and teaching with patient care and teaching with research. In general, basic sciences faculty had a larger number of research hours than patient care hours, while

Table 5

LOG DIARY RESPONSE RATE

SCHOOL	Potential Number of Respondents (n)	Number of Surveys Expected	Number of Surveys Received	Response Percentage
FALL:				
Marshall University	75	525	522	99%
West Virginia School of Osteopathic Medicine	33	231	231	100%
West Virginia University Medical Center	306	2142	1877	88%
Charleston	35	245	245	100%
Morgantown	266	1862	1597	86%
Wheeling	5	35	35	100%
FALL TOTAL	414	2898	2630	91%
SPRING:				
Marshall University	77	539	524	98%
West Virginia School of Osteopathic Medicine	32	224	224	100%
West Virginia University Medical Center	303	2121	1661	78%
Charleston	35	245	223	91%
Morgantown	263	1841	1403	76%
Wheeling	5	35	35	100%
SPRING TOTAL	412	2884	2409	84%
YEAR TOTAL	826	5782	5039	87%

Table 6

CLASSIFICATION OF DEPARTMENTS

No.	Department	Classification
01	Anatomy	1
02	Anesthesiology	0
03	Biochemistry	1
04	Behavioral Medicine & Psychiatry	0
05	Community Medicine	2
06	Family Practice	0
07	General Practice	0
08	Medicine	0
09	Microbiology	1
10	Neurology	0
11	Neurological Surgery	0
12	Ob/Gyn	0
13	Ophthalmology	0
14	Orthopedic Surgery	0
15	Osteopathic Practice & Principles	0
16	Otolaryngology	0
17	Pathology	1
18	Pediatrics	0
19	Pharmacology and Toxicology	1
20	Physiology	1
21	Radiology	0
22	Surgery	0
23	Urology	0
24	Administration	3
27	Conjoined Basic Science Courses	1

Key: 0 = Clinical Science
1 = Basic Science
2 = Community Medicine
3 = Administration

clinical faculty spent more time providing patient care than doing research. These findings, in agreement with intuitive beliefs, are another confidence check of the log diary data. (Tables 5-5.3 in Appendix H.2 contain T-statistics to test log diary data equality of means between basic and clinical sciences.)

Tables 7-8 present the average number of hours faculty spend in each of the eighteen log diary activity categories grouped by basic science departments, clinical science departments, community medicine, and administration. Faculty time spent in many of the activity categories are similar for the three schools. However, a school's stage of development and orientation may be revealed by reviewing specific differences across the different medical institutions. For basic science departments, teaching preparation and curriculum development make up a greater percentage of the faculty time for Marshall University and WVSOM (aproximately 20% and 10% respectively of their professional work week) than for WVU (approximately 12% and 4%). This is probably a function of the different ages of the three schools. In addition, WVU faculty spend more time conducting research, research and teaching, and writing than do faculty at the other two schools. (41% at WVU; 26% at MU, and 13% at WVSOM). This also may be a function of the age of the institutions, as well as their orientation. Also note that the high level of professional development at WVSOM may not be representative of an average week,because the spring log diary was conducted when many of their faculty were attending a professional meeting.

Overall, the clinical science departments (Table 8) reveal less variation activity by activity across schools. The most time-intensive activity category is joint teaching and patient care, which ranges from 26% of their professional work week at MU and WVSOM to 36% at WVU, Wheeling. WVSOM clinical faculty spend a greater percentage of their time in curriculum development and school administration (20%) than the other schools (average approximately 8%).

The last column of Tables 7 and 8 presents average-hours data from The Cost of Education in the Health Professions study conducted by the Institute of Medicine 1974 (32). Meaningful comparisons between the IOM and the West Virginia data sets are facilitated because the definitions of activities in the two studies are identical. Review of the tables indicates the hour figures from the IOM study and those derived in the current study are similar; the only significant difference is that faculty in the West Virginia schools of medical education spend less time in research than the faculties studied in the IOM study for both the basic and clinical sciences. This finding was expected since the IOM study covered some medical schools noted for their heavy emphasis on research. The similarity of the IOM hours figures and the West Virginia log diary hours figures add to the credibility of the data for purposes of extrapolation or estimation.

Tables 9 and 10 present the community medicine department and administration independently, because it would be inappropriate to include them in either the previously grouped basic or clinical science departments. For example, the community medicine department at Marshall behaves like a clinical department, where much faculty time is spent in providing patient care, while the community medicine department at WVU behaves like a basic science department that is involved primarily in research. This difference would skew the interpretation of the basic and clinical science average-hours data.

Table 7

MEAN NUMBER OF HOURS SPENT PER WEEK BY ACTIVITY

Basic Sciences

ACTIVITIES	MARSHALL	WVSOM	MORGANTOWN	IOM STUDY
Teaching	4.42	5.49	4.40	5
Teaching & Patient Care	1.20	1.95	1.30	1
Teaching Preparation	11.01	11.98	5.77	8
Curriculum	6.21	5.13	1.87	3
Research	10.00	5.81	13.68	16
Research & Teaching	2.90	0.73	3.36	4
Patient Care	1.83	0.46	3.48	--
Hospital Administration	1.94	0.03	0.86	--
School Administration	3.80	5.01	3.82	6
Service	2.28	3.27	1.34	3
Professional Development	5.40	13.63	6.19	5
Writing	1.25	0.84	3.56	2
Questionnaire	1.17	0.81	1.10	
Personal	84.86	85.79	68.88	
Autopsy	1.01	0.49	0.19	
On Call at Home	2.81	4.65	5.26	
On Call at Hospital	0.00	1.17	0.00	
Others	25.90	10.78	42.95	
NUMBER OF OBSERVATIONS FOR FALL & SPRING	55	41	164	

Table 8

MEAN NUMBER OF HOURS SPENT PER WEEK BY ACTIVITY

Clinical Sciences

ACTIVITIES	MARSHALL	WVSOM	WVU MORGAN-TOWN	WVU CHARLESTON	WVU WHEELING	IOM STUDY
Teaching	3.06	6.49	3.31	4.51	2.69	4
Teaching & Patient Care	16.95	15.18	16.43	14.44	22.08	11
Teaching Preparation	5.48	5.76	3.24	4.05	6.42	4
Curriculum	1.53	4.27	1.03	0.67	1.11	2
Research	4.79	0.15	3.14	2.24	0.00	7
Research & Teaching	0.85	0.00	1.32	0.60	0.50	1
Patient Care	9.26	7.73	6.88	6.59	10.11	6
Hospital Administration	3.10	0.98	2.75	3.02	7.50	2
School Administration	4.88	7.71	3.33	4.01	2.58	6
Service	1.70	0.80	1.93	3.07	0.50	3
Professional Development	9.55	8.17	7.56	5.00	6.97	5
Writing	3.49	0.74	2.68	1.69	1.28	1
Questionnaire	1.33	0.99	1.16	1.37	0.67	
Personal	62.26	71.48	62.06	61.16	61.17	
Autopsy	0.71	0.10	0.13	0.00	0.00	
On Call at Home	21.68	26.23	16.95	16.38	37.56	
On Call at Hospital	0.64	0.87	0.48	0.00	0.00	
Others	16.73	10.57	33.61	39.21	6.86	
NUMBER OF OBSERVATIONS FOR FALL AND SPRING	76	21	260	65	9	

Table 9

MEAN NUMBER OF HOURS SPENT PER WEEK BY ACTIVITY

Community Medicine

ACTIVITIES	MARSHALL	WVU
Teaching	3.89	3.57
Teaching & Patient Care	8.93	0.68
Teaching Preparation	4.32	5.93
Curriculum	8.25	3.75
Research	3.04	12.55
Research & Teaching	1.36	2.41
Patient Care	11.07	0.61
Hospital Administration	1.39	0.70
School Administration	11.39	4.11
Service	0.18	4.70
Professional Development	1.32	8.32
Writing	0.57	2.43
Questionnaire	0.71	2.75
Personal	78.61	84.68
Autopsy	0.00	0.00
On Call at Home	9.04	0.00
On Call at Hospital	1.14	0.00
Others	22.79	30.82
NUMBER OF OBSERVATIONS FOR FALL AND SPRING	7	14

Table 10

MEAN NUMBER OF HOURS SPENT PER WEEK BY ACTIVITY

Administration*

ACTIVITIES	MARSHALL	WVU	
		MORGANTOWN	CHARLESTON
Teaching	1.13	1.38	1.25
Teaching & Patient Care	0.00	0.47	6.13
Teaching Preparation	3.69	2.94	4.25
Curriculum	9.81	3.22	0.00
Research	3.13	0.78	0.63
Research & Teaching	0.56	2.31	0.13
Patient Care	0.00	2.91	0.00
Hospital Administration	1.19	1.94	3.88
School Administration	33.31	24.16	32.13
Service	7.81	5.59	0.50
Professional Development	3.25	10.72	13.88
Writing	0.00	6.94	0.50
Questionnaire	0.31	2.25	0.25
Personal	102.94	68.84	70.13
Autopsy	0.00	0.00	0.00
On Call at Home	0.00	0.00	1.00
On Call at Hospital	0.00	0.13	0.00
Others	0.88	33.44	33.38
NUMBER OF OBSERVATIONS FOR FALL AND SPRING	4	8	2

* Faculty were recorded in the administration department only when categorized as such by the schools. At WVSOM, the president was not asked to complete a log diary since he is not a member of the teaching faculty.

3. Aggregation of Log Diary Activities

For the purposes of analysis, the hours data must be aggregated into meaningful categories. In this study, fifteen of the eighteen activities were combined to define the hours faculty members spend: (1) teaching medical students, (2) teaching residents and other students, (3) doing research, and (4) providing patient care. This combination is not unique; such activities as administration and service could be handled in several different ways. Furthermore, the aggregation is affected by the existence of "jointness" in the outputs of medical education, because medical schools produce joint products with regard to medical student teaching, resident teaching, research, and patient care.

Traditional cost accounting assigns joint costs to individual products based on a number of allocation methods. These often include ratios of direct cost or of effort. Many members of the medical education community disagree with such attempts, arguing that in medical schools it is virtually impossible to assign costs to specific programs (27). However, if the costs of medical education are to be evaluated, joint activities must be accounted for. Eight alternative schemes to allocate total costs into the four categories listed above were entertained by the research team (see Appendix H.3). After thoughtful study, two allocation schemes similar to those used by the IOM study were adopted. The first accounts for what are termed "instructional" hours and costs, while the second calculates "educational" hours and costs. Tables 11 and 12 indicate how the activities are aggregated into these two schemes.

This report uses the words "instructional hours," "instructional costs," "educational hours," and "educational costs" in precise ways, whereas, teaching and training are two terms used to denote the meaning of instruction and education in common usage. "Instructional hours" are used to compute "instructional costs" and "educational hours" are used to compute "educational costs." "Instructional costs" are included in "educational costs" but other costs are also included in "educational costs." Specifically, the instructional hours scheme allots a percentage of joint teaching/patient care hours to patient care, with the remaining hours included in teaching, thus distributing costs between the two components of the joint product. This allocation is based on ratios determined by an expert panel for the 1974 IOM study. The educational hours scheme, on the other hand, elects to allocate all joint product costs to teaching. This difference implies that the costs of medical training derived from instructional hours will be less than the costs derived from educational hours.

The inclusion of joint research/teaching hours and joint teaching/patient care hours in instructional hours and in educational hours was done because of the generally held position (IOM and medical educators) that some research is essential for the teaching of medicine and that clinical faculty members must maintain clinical skills in order to provide quality medical education.

The distinction between instructional hours and educational hours hinges on the allocation of the time faculty members spend directly delivering patient care while simultaneously teaching. The argument for not including all "teaching and patient care" hours in instructional teaching hours is that the faculty member is actually delivering care to the patient at bedside while making rounds with students and residents. On the other hand, all "teaching and patient care" hours are included in educational teaching hours because the students and residents are being "educated" if not "instructed" while the faculty member is delivering care to the patient. In a sense, then, instructional hours may underestimate the

Table 11

AGGREGATION OF LOG DIARY ACTIVITIES
Scheme 1: Instructional Hours

Teaching

2 = Teaching
3** = Teaching and Patient Care (Students/Residents Present)
4 = Teaching Preparation, Current Term
5 = Curriculum Development and Evaluation for Future Terms
7 = Research and Teaching (Students/Residents Present)
10 = School and Other Administration
20 = 2nd Teaching
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Research

6 = Research (No Students/Residents Present)
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Patient Care

3** = Teaching and Patient Care (Students/Residents Present)
8 = Patient Care (No Students/Residents Present)
9 = Hospital/Clinical Administration
16 = Autopsy
18 = On Call At Hospital
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Personal

14 = Completing this Questionnaire
15 = Personal
17 = On Call At Home
19 = Illness, Vacation, Day Off, Other

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* Allocated to instruction, research, and patient care in proportion to the time allocated to these programs from other activities.
** Factor based on IOM study.

Table 12

AGGREGATION OF LOG DIARY ACTIVITIES
Scheme 2: Educational Hours

Teaching

2 = Teaching
3 = Teaching and Patient Care (Students/Residents Present)
4 = Teaching Preparation, Current Term
5 = Curriculum Development and Evaluation for Future Terms
7 = Research and Teaching (Students/Residents Present)
10 = School and Other Administration
20 = 2nd Teaching
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Research

6 = Research (No Students/Residents Present)
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Patient Care

8 = Patient Care (No Students/Residents Present)
9 = Hospital/Clinical Administration
16 = Autopsy
18 = On Call At Hospital
11* = Service
12* = Professional Development
13* = Writing/Reviewing Journal Articles/Textbooks

Personal

14 = Completing This Questionnaire
15 = Personal
17 = On Call At Home
19 = Illness, Vacation, Day Off, Other

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* Allocated to instruction, research, and patient care in proportion to the time allocated to these programs from other activities.
** Factor based on IOM study.

teaching process occuring at the patient's bedside. In addition, educational hours may overestimate the teaching process, because the costs associated with the physician's treatment of the patient are allocated as educational costs. Both the instructional and educational schemes allocate total costs to: 1) medical student teaching, 2) resident/other student teaching, 3) research, and 4) patient care. Total costs are equal in both schemes. The difference between the schemes is in how hours and/or costs are allocated among the four categories. When reviewing this analysis, it is important to remember that even though this report focuses on the costs and findings of teaching medical students, thecosts allocated to resident/other students, research and patient care still must be covered by the revenue sources of the school of medicine.

Construction of educational versus instructional hours was hampered by the inability of the study team to directly obtain estimates of the portion of this joint time that faculty members actually spend delivering patient care and the portion they spent teaching. To overcome this problem, the study uses estimates of these proportions determined by an expert panel for the IOM study (32).

Another more difficult issue is how to separate the amount of teaching that is given to the medical students and how much to the residents when both medical students and residents are present with the faculty member as research is being conducted or as patient care is being given. It could be argued that the teaching function would be necessary for either the medical students or residents alone. Accordingly, one hundred percent of the educational teaching cost could be attributed to medical education or residency training. Various observers have argued for different percentage ranges, e.g., 75:25, 50:50, or an allocation based on the number of medical students and residents present. Unfortunately, these student/resident categories were not properly recorded in the log diaries. Thus, for this analysis, an arbitrary 50:50 allocation to medical teaching and residency training was used.

Prior to calculating the costs of undergraduate medical student teaching--also referred to as first degree medical teaching--the time faculty members at each of the schools of medicine spend with first degree medical students must be segregated from time spent with residents, fellows, and nonmedical students such as basic science graduate students, nursing students, dental students, undergraduates, and continuing education students. Actual class hours provided by the schools were used to allocate faculty time to nonmedical courses taught by the faculty. Ratios from the 1976 IOM study (32a) were applied to our log diary data in order to separate the time faculty spent teaching medical students from residents and fellows (see Table 13).

Tables 14 - 23 summarize the average log diary hours per faculty per week by medical and nonmedical teaching hours, research, and patient care activities for the three schools. These hours are shown by department for both scheme 1, instructional hours, and scheme 2, educational hours. Professional development hours are already allocated proportionately in the table to teaching, research and patient care; they should not be summed with total teaching, research and patient care columns when calculating faculty member's average work week by department. Appendix H.4 contains the mean number and percentage of hours spent in group activities per week by department for schemes 1 and 2.

TABLE 13

RATIOS FOR THE ALLOCATION OF INSTRUCTIONAL
AND EDUCATIONAL HOURS FOR RESIDENTS AND MEDICAL STUDENTS*

DEPARTMENT	TEACHING (2,4,5,10,20)		JOINT TEACHING AND RESEARCH (7)		JOINT TEACHING/ PATIENT CARE (3)		MARGINAL JOINT TEACHING/PATIENT CARE HOURS INST.
	RESIDENTS	MEDICAL STUDENTS	RESIDENTS	MEDICAL STUDENTS	RESIDENTS	MEDICAL STUDENTS	
Anatomy	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Anesthesiology	.6500	.3500	1.0000	.0000	.8362	.1638	.2000
Biochemistry	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Beh.Med.& Psych.	.6719	.3281	.7500	.2500	.6935	.3065	.4000
Comm. Med.	.5000	.5000	.8750	.1250	.6863	.3137	.4300
Family Prac.	.5000	.5000	.8750	.1250	.6863	.3137	.4300
Gen'l. Prac.	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Medicine	.5000	.5000	.8750	.1250	.6863	.3137	.5000
Microbiology	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Neurology	.5000	.5000	.8750	.1250	.6863	.3137	.4300
Neurosurgery	.5333	.4667	.8333	.1667	.7177	.2823	.4300
OB/GYN	.5333	.4667	.8333	.1667	.7177	.2823	.6000
Ophthalmology	.5333	.4667	.8333	.1667	.7177	.2823	.4300
Orthopedic Surg.	.5333	.4667	.8333	.1667	.7177	.2823	.4300
O P & P†	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Otolaryngology	.5333	.4667	.8333	.1667	.7177	.2823	.4300
Pathology	.0000	1.0000	.0000	1.0000	.0000	1.0000	.5000
Pediatrics	.5000	.5000	.8750	.1250	.6863	.3137	.4500
Pharm. & Tox.	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Physiology	.0000	1.0000	.0000	1.0000	.0000	1.0000	.4300
Radiology	.6500	.3500	1.0000	.0000	.8362	.1638	.4000
Surgery	.5333	.4667	.8333	.1667	.7177	.2823	.4000
Urology	.5333	.4667	.8333	.1667	.7177	.2823	.4300

* The hours faculty teach nonmedical "other" students are accounted for independent of these ratios.

† Osteopathic Practice and Principles

Table 14

AVERAGE INSTRUCTIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

Marshall University School of Medicine

NO.	DEPARTMENT	----------TEACHING-------- Medical Students	Non-Med Students	TOTAL	RESEARCH	PATIENT CARE	PROF.* OTHER
1	Anatomy	35.51	1.03	36.54	3.30	3.03	3.60
3	Biochemistry	21.65	6.01	27.66	14.94	.00	6.45
4	Behavioral Medicine & Psychiatry	10.15	21.16	31.31	3.12	19.02	17.50
5	Community Medicine	14.88	19.42	34.30	3.15	19.40	2.07
6	Family Practice	11.98	16.57	28.55	.00	20.45	4.50
8	Medicine	11.57	16.28	27.85	12.20	24.63	12.06
9	Microbiology	26.87	7.70	34.57	23.90	3.92	13.59
12	OB/GYN	14.23	27.40	41.63	7.58	36.18	34.39
17	Pathology	30.83	.07	30.90	5.41	22.07	18.25
18	Pediatrics	15.63	20.01	35.64	1.48	25.11	16.61
19	Pharmacology & Toxicology	32.45	3.03	35.48	7.70	13.24	8.27
20	Physiology	36.49	4.95	41.44	19.48	.08	5.63
21	Radiology	6.58	16.31	22.89	.00	35.86	.75
22	Surgery	11.53	17.77	29.30	1.26	44.77	9.58

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 15

AVERAGE EDUCATIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

Marshall University School of Medicine

NO.	DEPARTMENT	----------TEACHING------- Medical Students	Non-Med Students	TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
1	Anatomy	35.87	1.03	36.90	3.30	2.67	3.60
3	Biochemistry	21.65	6.01	27.66	14.94	.00	6.45
4	Behavioral Medicine & Psychiatry	11.18	23.50	34.68	3.12	15.65	17.50
5	Community Medicine	16.54	23.05	39.59	3.15	14.12	2.07
6	Family Practice	17.10	27.77	44.87	.00	4.13	4.50
8	Medicine	14.18	22.00	36.18	12.20	16.30	12.06
9	Microbiology	26.87	7.70	34.57	23.90	3.92	13.59
12	OB/GYN	18.90	39.28	58.18	7.58	19.63	34.39
17	Pathology	33.26	.07	33.33	5.41	19.64	18.25
18	Pediatrics	20.02	29.62	49.64	1.48	11.10	16.61
19	Pharmacology & Toxicology	34.42	3.03	37.45	7.70	11.27	8.27
20	Physiology	36.57	4.95	41.52	19.48	.00	5.63
21	Radiology	8.47	25.97	34.44	.00	24.31	.75
22	Surgery	16.19	29.63	45.82	1.26	28.24	9.58

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 16

AVERAGE INSTRUCTIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia School of Osteopathic Medicine

NO.	DEPARTMENT	-------TEACHING--------- Medical Students	Non-Med. Students	Total	RESEARCH	PATIENT CARE	PROF.* DEVEL.
1	Anatomy	38.71	.00	38.71	23.23	.25	26.27
3	Biochemistry	50.18	.00	50.18	.91	.00	20.54
7	General Practice	31.15	.00	31.15	.34	24.81	6.65
9	Microbiology	42.95	.13	43.08	10.35	6.42	22.55
10	Neurology	24.78	.00	24.78	.49	19.85	5.00
15	Osteopathic Practice and Principles	43.87	.16	44.03	.00	18.13	17.42
17	Pathology	33.40	.00	33.40	.00	20.27	8.71
18	Pediatrics	43.96	4.97	48.93	.00	28.82	8.33
19	Pharmacology and Toxicology	46.52	.43	95.88	.30	.00	8.19
20	Physiology	46.50	.19	46.69	6.45	.86	11.34
21	Radiology	22.39	.00	22.39	.00	26.61	9.50

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 17

AVERAGE EDUCATIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia School of Osteopathic Medicine

NO.	DEPARTMENT	--------TEACHING-------- Medical Students	Non-Med. Students	TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
1	Anatomy	38.96	.00	38.96	23.23	.00	26.27
3	Biochemistry	50.18	.00	50.18	.91	.00	20.54
7	General Practice	43.20	.00	43.20	.34	12.76	6.65
9	Microbiology	42.95	.13	43.08	10.35	6.42	22.55
10	Neurology	28.19	.00	28.19	.49	16.45	5.00
15	Osteopathic Practice and Principles	54.37	.16	54.53	.00	7.64	17.42
17	Pathology	40.09	.00	40.09	.00	13.58	8.71
18	Pediatrics	56.07	4.97	61.04	.00	16.71	8.33
19	Pharmacology and Toxicology	46.52	.43	46.95	.30	.00	8.19
20	Physiology	47.36	.19	47.55	6.45	.00	11.34
21	Radiology	43.88	.00	43.88	.00	5.12	9.50

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 18

AVERAGE INSTRUCTIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia University School of Medicine
Morgantown

NO.	DEPARTMENT	TEACHING			RESEARCH	PATIENT CARE	PROF.* DEV.
		Medical Students	Non-Med. Students	TOTAL			
1	Anatomy	22.20	3.57	25.77	18.68	.91	10.87
2	Anesthesiology	4.78	14.33	19.11	2.62	30.28	10.94
3	Biochemistry	12.83	8.95	21.78	23.92	.77	10.66
4	Behavioral Medicine & Psychiatry	5.43	11.72	17.15	3.02	22.65	10.06
5	Community Medicine	10.76	18.33	29.09	18.21	2.45	15.45
8	Medicine	11.38	16.56	27.94	5.28	24.72	11.38
9	Microbiology	21.97	8.57	30.54	20.58	.77	7.36
10	Neurology	12.07	18.91	30.98	3.67	29.19	21.13
11	Neurological Surgery	12.10	19.57	31.67	8.60	29.40	29.17
12	OB/GYN	12.25	20.08	32.33	6.77	23.06	11.88
13	Ophthalmology	7.68	13.57	21.25	10.01	18.11	12.50
14	Orthopedic Surgery	12.15	21.88	34.03	4.55	25.69	10.93
16	Otolaryngology	11.23	17.85	29.08	1.01	19.60	12.71
17	Pathology	18.94	3.09	22.03	2.58	29.49	13.24
18	Pediatrics	10.62	15.50	26.12	2.41	24.07	11.60
19	Pharmacology & Toxicology	27.34	2.59	29.93	22.14	.81	14.04
20	Physiology	24.11	2.43	26.54	22.98	.41	9.89
21	Radiology	6.06	13.48	19.54	3.21	24.52	8.44
22	Surgery	9.22	17.03	26.25	3.09	30.30	13.46
23	Urology	10.06	22.67	32.73	3.77	16.10	13.29

* Professional development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 19

AVERAGE EDUCATIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia University School of Medicine
Morgantown

NO.	DEPARTMENT	TEACHING			RESEARCH	PATIENT CARE	PROF.* DEV.
		Medical Students	Non-Med. Students	TOTAL			
1	Anatomy	22.54	3.57	26.11	18.68	.57	10.87
2	Anesthesiology	8.42	32.92	41.34	2.62	8.05	10.94
3	Biochemistry	13.26	8.95	22.21	23.92	.33	10.66
4	Behavioral Medicine & Psychiatry	7.23	15.78	23.01	3.02	16.80	10.06
5	Community Medicine	10.93	18.72	29.65	18.21	1.89	15.45
8	Medicine	14.57	23.55	38.12	5.28	14.53	11.38
9	Microbiology	22.29	8.57	30.86	20.58	.46	7.36
10	Neurology	17.54	30.88	48.42	3.67	11.74	21.13
11	Neurological Surgery	17.08	32.23	49.31	8.60	11.75	29.17
12	OB/GYN	14.73	26.40	41.13	6.77	14.27	11.88
13	Ophthalmology	11.51	23.33	34.84	10.01	4.52	12.50
14	Orthopedic Surgery	17.00	34.20	51.20	4.55	8.52	10.93
16	Otolaryngology	14.40	25.92	40.32	1.01	8.35	12.71
17	Pathology	21.74	3.09	24.83	2.58	26.70	13.24
18	Pediatrics	14.51	24.00	38.51	2.41	11.69	11.60
19	Pharmacology & Toxicology	27.66	2.59	30.25	22.14	.48	14.04
20	Physiology	24.53	2.43	26.96	22.98	.00	9.89
21	Radiology	6.95	18.03	24.98	3.21	19.08	8.44
22	Surgery	14.86	31.38	46.24	3.09	10.30	13.46
23	Urology	13.46	31.31	44.77	3.77	4.06	13.29

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 20

AVERAGE INSTRUCTIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia University School of Medicine
Charleston

NO.	DEPARTMENT	---------TEACHING---------- Medical Students	Students	TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
4	Behavioral Medicine & Psychiatry	6.95	14.70	21.65	1.69	22.68	9.83
6	Family Practice	10.85	15.37	26.22	.00	20.57	6.38
8	Medicine	14.26	18.94	33.20	4.62	17.38	10.98
12	OB/GYN	13.80	25.40	39.20	.00	27.30	17.75
18	Pediatrics	7.65	11.25	18.90	2.16	25.65	11.54
22	Surgery	11.03	17.57	28.60	10.17	23.89	4.92

* Professional Development has been allocated proportionately to teaching, research and patient care and is included in the numbers under those categories.

Table 21

AVERAGE EDUCATIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia University School of Medicine
Charleston

NO.	DEPARTMENT	---------TEACHING---------- Medical Students	Non-Med. Students	TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
4	Behavioral Medicine & Psychiatry	9.22	19.84	29.06	1.69	15.27	9.83
6	Family Practice	15.77	26.15	41.92	.00	4.87	6.38
8	Medicine	17.55	26.05	43.60	4.62	7.02	10.98
12	OB/GYN	17.04	33.66	50.70	.00	15.80	17.75
18	Pediatrics	10.50	17.48	27.98	2.16	16.55	11.54
22	Surgery	15.88	29.92	45.80	10.17	6.69	4.92

* Professional Development has been allocated proportionately to teaching, research, and patient care and is included in the numbers under those categories.

Table 22

AVERAGE INSTRUCTIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

West Virginia University Medical Center
Wheeling

NO.	DEPARTMENT	TEACHING: Medical Students	TEACHING: Non-Med. Students	TEACHING: TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
8	Medicine	8.84	13.55	22.39	.00	31.78	6.79
12	OB/GYN	20.84	32.75	53.59	.00	34.66	15.63

Table 23

AVERAGE EDUCATIONAL HOURS SPENT IN GROUPED ACTIVITIES PER FACULTY PER WEEK

NO.	DEPARTMENT	TEACHING: Medical Students	TEACHING: Students	TEACHING: TOTAL	RESEARCH	PATIENT CARE	PROF.* DEV.
8	Medicine	12.34	21.22	33.56	.00	20.62	6.79
12	OB/GYN	25.09	43.56	68.65	.00	19.59	15.63

* Professional Development has been allocated proportionately to teaching, research and patient care and is included in the numbers under those categories.

B. Cost Analysis

As observed earlier, a primary objective of this study is to determine the costs of educating a physician at each of the West Virginia schools of medical education. It should be recognized though, that three very distinct institutions are being considered, and that different outputs are produced at the schools. West Virginia University School of Medicine (WVU) is a mature, established school with substantial full-time faculty and a university teaching hospital. Marshall University School of Medicine (MU) is still evolving and utilizes affiliated community, VA, and state hospitals for clinical rotations. The West Virginia School of Osteopathic Medicine (WVSOM), also evolving, is essentially a basic sciences school, with some ambulatory teaching, and with hospital linkages across the country for clinical instruction. Projections regarding MU and WVSOM were based primarily on 1981-82 data. Minor adjustments in the number of enrolled students were made at WVU and WVSOM; however, more significant ones had to be made at Marshall. In this latter case, additional salary data through 1983 were supplied by MU so that the cost associated with the increase in class size to 48 students could be accounted for. Changes in nonfaculty personal service cost and current expenses were also estimated. No additional judgments on how these maturing schools' programs (and subsequent costs) might change were made. Thus, projections will not be precise, especially in these evolving schools.

The cost analysis seeks to determine the costs of various components of medical education in West Virginia. In this section five categories of costs are presented:

1. medical student instructional costs;
2. medical student educational costs;
3. total costs for the schools of medical education;
4. allocated educational total costs for medical students and residents/others;
5. state costs.

Within a medical school, a portion of costs can be identified as resulting from activities that directly involve the teaching of medical students; these include course and curriculum development, clinical teaching in other than a patient care setting, a portion of teaching associated with patient care, and all teaching associated with research activities. These costs that can be directly attributed to the teaching of medical students are called **instructional costs.** These instructional costs, however, do not provide a full picture of the costs of teaching medical students, in large part because clinical practice is an important component of education. This is true in terms of both student exposure to patients and maintenance of faculty clinical skills. Thus, medical student educational **costs** are defined to include instructional costs and the remainder of the joint patient care/teaching activity. Both medical student instructional and educational costs include a share of the school's indirect operational costs as well. The medical school environment also involves other large sets of supportive activities which are vital to quality education. These include resident/other teaching, biomedical research and patient care (exclusive of patient care conducted jointly with teaching). **Total costs** are defined to include these costs in addition to medical student educational costs. **Allocated educational total costs** allocate total costs to two categories of students: medical students and residents/other students. They are calculated by taking the educational costs for medical students and the educational costs for residents/other students and allocating all of

the remaining total costs proportionately to these two costs based on the ratio of the sum of their direct and indirect expenses. Hence, the allocated educational total costs for medical students include educational costs of medical students plus a portion of research and a portion of patient care costs.

Medical schools have a variety of sources of revenue to offset these total costs: endowment and grant income, federal support, tuition revenue, patient revenues, and state support. **State costs** represent the state funds used to cover the medical school costs not supported by other revenue sources. These funds include those that are directly appropriated to the school, those that are specially mandated (e.g., soft drink tax), and those incurred by other state agencies.

In computing instructional and educational costs, methodologies developed by researchers in the IOM study were utilized as described below:

Medical Student Instructional Costs:

- teaching, course preparation and curriculum development for medical students;
- joint teaching and research for medical students;
- a portion of joint teaching and patient care attributable to instructional needs of medical students;
- a proportionate distribution of professional development and scholarly activities;
- school and administrative activities attributable to medical students;
- a proportionate assignment of indirect costs based primarily on the ratio of medical student instructional direct expenses to the other related direct expenses including resident/other, patient care and research (see cost reports in Appendix I for specific indirect allocation).

For instructional costs, the above formula is identical to that used by IOM, with the exception that all faculty time spent in school and administrative activities are charged to instruction, whereas in the IOM study, these costs are distributed across instruction, research, and patient care. These faculty costs are primarily instructional costs or are needed for the instructional programs.

Medical Student Educational Costs:

- instructional costs as defined above;
- balance of joint teaching and patient care for medical students not attributable to instruction;
- proportionate assignment of indirect costs based primarily on the ratio of medical student educational direct expenses to other related direct expenses (see Appendix I for specific indirect allocation methods).

The above formula differs from the IOM approach in one other way. The IOM study assigns a portion of pure research to educational costs (clinical sciences research up to 30% and basic sciences research up to 67% of medical teaching hours) on the rationale that these activities provide the scientific and clinical environment necessary to create expected professional skills and values in students, maintain faculty skill and competence in teaching, and attract and retain competent faculty in a competitive market. (Pure research here refers to research conducted when no students were present.) In contrast, this study includes only

those research costs attributable to the medical school share of joint teaching and research activities. It does not include a portion of the pure research costs. The rationale for this modification is that, while the importance of the research function is noted, this factor is taken care of by inclusion of joint research and teaching activities. Because the West Virginia schools of medicine are not as research intensive as most of those schools in the IOM study, the assignment of other research activity would inflate medical student direct educational costs. Hence, it is excluded here, but accounted for in total costs and allocated educational total costs below.

Total costs:

- medical student educational costs, as defined above;
- resident/other educational costs;
- patient care costs;
- research costs;
- all other costs of medical school operation, (e.g. equipment, utilities).

Total costs essentially reflect all expenses incurred by a medical school in its operation.

Allocated Educational Total Costs:

- total costs allocated to medical student education and to resident/other student education based on the ratio of total medical educational costs to total resident/other educational costs.

Table 24 provides a detailed description of the makeup of the direct costs included in the medical student instructional and educational costs, total costs, and medical student and resident/other total allocated costs categories. It indicates the medical students' shares of costs associated with the eighteen log diary activities. As previously mentioned, the IOM 1976 ratios were used to disaggregate medical student and resident/other teaching activities; separate sets of ratios were used for teaching, joint patient care and teaching, and joint research and teaching (see Table 13). A fifty/fifty decision rule was used to separate out the time faculty spent with medical students and residents when both were present during the activity.

In summary, the distinctions among these cost categories are important for they represent different ways of regarding the cost of education. One could view the costs in a narrow sense and consider only those costs directly involving medical student contact. However, in considering only these **medical student instructional costs,** costs of other supportive programs necessary to maintain a quality medical education effort are not accounted for. Part of this support network is included under **medical student educational costs,** which includes instructional costs and all of joint teaching and patient care attributable to medical students. This inclusion is made because patient care is an integral part of medical training. **Total costs** more fully expand the notion of educational costs by including all other activities in which medical school faculty are involved, the teaching of residents and other students, research, and patient care conducted independently of students. However, it is unclear that all of these costs, especially those of resident training, should be attributed to the total cost of medical student education. In response to this problem, **allocated educational total**

Table 24
DESCRIPTION OF SELECTED COST CATEGORIES BY ACTIVITY

LOG DIARY ACTIVITY		MEDICAL STUDENT INSTRUCTIONAL COSTS	MEDICAL STUDENT EDUCATIONAL COSTS	TOTAL COSTS	ALLOCATED EDUCATIONAL TOTAL COSTS	
					MEDICAL STUDENTS	RESIDENTS/ OTHERS
Teaching [2,4,5,10, 11-13[a]]	Medical Students	100%	100%	100%	100%	0%
	Resident/Others	0%	0%	100%	0%	100%
	Both of above	50%	50%	100%	50%	50%
Teaching and Patient Care** [3, 11-13[a]]	Medical Students	X%**	100%	100%	100%	0%
	Resident/Others	0%	0%	100%	0%	100%
	Both of above	X% of 50%**	50%	100%	50%	50%
Research [6, 11-13[a]]		0%	0%	100%	y%†	1-y%
Research and Teaching [7, 11-13[a]]	Medical Students	100%	100%	100%	y%†	1-y%
	Resident/Others	0%	0%	100%	y%†	1-y%
	Both of above	50%	50%	100%	y%†	1-y%
Patient Care [8,9,11-13[a], 16, 18]		0%	0%	100%	y%†	1-y%
Personal [14,15,17,19]		0%	0%	0%	0%	0%

a. Categories 11-13 are proportionately allocated teaching, teaching and patient care, research, research and teaching, patient care.

* The amount of time faculty spent with each type of student was based on IOM, 1976 ratios applied to log diary data.

** Y% is based on IOM, 1974 factor.

† Based on the ratio of the medical students' direct and indirect expenses to the sum of medical student and resident/other direct and indirect expenses.

costs allocate total costs to medical student training and resident/other student training. These costs are attributed to medical students versus resident/other students based on the ratio of their educational costs. Finally, **state costs** are the state's share of the costs of: (1) the medical student teaching program at the schools and (2) all of the other programs (resident/other teaching, patient care in the absence of students, and/or research in the absence of students) at the medical school.

In addition to the problems of the overlap in products and services related to research, teaching, and patient care, there are several other difficulties in capturing the costs of running academic health centers. These include the problems of multiple and interrelated products and nonreimbursable costs:

- Multiple and Interrelated Products: Medicine is not taught by faculty only; the processes of training the various types of students are interrelated as well. Residents, although still in training, also teach students. Ideally, the time residents teach medical students could be gathered and costed. This cost would then be a cost of instructing medical students. At present, this cost is borne by the hospitals' residency programs. Similarly, the faculty costs of educating residents are borne by the medical schools.

- Non-reimbursable Costs: Some resources cannot be defined in terms of reimbursable costs. Volunteer faculty (attending non-faculty physicians), whose services represent a substantial investment of time, contribute in important ways to the educational experience.

Although the volunteer faculty spend valuable time teaching medical students, they also receive nonpaid, services for their patients from these students and from the residents. For a total cost picture for volunteer faculty, these times and benefits would have to be costed. It was not possible to do this in this study, so it was assumed that these volunteer faculty received equivalent value either economic or intrinsic, for the teaching they performed or else they would not do it.

Costs of using other resources such as veterans' and other community hospitals and staff are also not taken into account for reasons similar to the costs and benefits of volunteer faculty. It should be noted that non-reimbursable costs affect the three schools differently. For example, MU, WVSOM, and WVU, Charleston, rely heavily on volunteer faculty, whereas WVU, Morgantown, does not. Thus, in relation to Morgantown, costs may be underestimated at MU, WVSOM, and WVU, Charleston. Finally, depreciation of physical plant was not accounted for because it is separately budgeted in the state university/medical school budgets. Also, for the short run (several years), these costs are sunk costs until a need to rebuild the physical plant is encountered.

1. Methodology

The cost analysis is based on generally accepted cost accounting principles. The direct and indirect costs of the individual medical schools were collected for fiscal year 1981-82. The direct and indirect costs of the teaching hospitals were not used for the study except for faculty salaries, some of which went to patient care. Full faculty salaries including practice plan salaries and benefits were

collected. These resulting costs, then, were separated into fixed and variable cost categories.

The sources of funding for each medical school (i.e., federal grants, state appropriations) were also collected in order to derive, insofar as possible, the costs allocated to each source (e.g., cost of the medical school to the state).

a. Method of Collection

All the cost data used in this study were extracted from individual school financial statements and ledger account balances supplied by the financial coordinator of each school. Since the major portion of educational costs is faculty time, the log diary was used to determine how faculty spend their day. As noted in Section VI.A., activities were classified into four categories, medical teaching, resident/other teaching, research and patient care, and costs were allocated singly or as joint activities based on log diary and IOM data. Analysis of the West Virginia log diary data and that of the IOM's 1974 study indicate that they are highly comparable. In addition, the similarity of the fall and spring log diary data further substantiate the log diary's validity.

The resulting cost data in this study have been reviewed by the financial coordinators of each school and the staff of the Board of Regents. (Appendix I contains the detailed summary of expenditures and sources of financing for the individual medical schools.)

b. Definitions

Definitions of terms used in the analysis follow.

Activities: Medical teaching, resident/other student teaching, research, and patient care are considered activities of the schools of medical education for the purpose of this study. All other activities have been allocated to one of these categories.

Direct Expenses: Direct expenses are defined as all financial expenses, labor or material that are physically traceable to an activity in an economically feasible manner. Source documents for direct expenses were the academic departmental expenditure sheets and computer printouts, research project accounts, and other ledger account balances. Examples are faculty salaries and costs of course material.

Indirect Expenses: All expenses other than direct expenses. For example, expenditures such as electricity and library costs are considered indirect expenses because of the difficulty or economic impossibility of tracing such expenses directly to a specific activity by physical observation. The source documents for indirect expenses were departmental expenditure printouts.

Fixed Costs: Costs that remain constant over a reasonable range of the volume of students.

Variable Costs: Those costs reasonably proportional to the volume of students or to the volume of faculty.

c. Allocations and Adjustments

Adjustments were made to each school's financial statement according to project-generated data in order to facilitate the objectives of the study. For example, faculty salaries were allocated to various activities on the basis of log diary data as opposed to departmental assignment based on the schools' effort reports.

Direct Expenses of Academic Departments: The direct expenses of faculty salaries were allocated to medical students teaching, residents and other "nonmedical" student teaching, research, and patient care using the time averages computed from the faculty log diaries. Resident hours were constructed based on ratios stemming from the 1976 IOM study (32a). Faculty salaries attributable to a joint activity were allocated in the same way that joint activity hours were allocated. Thus, there is faculty salary allocation for instruction costs and for educational costs. All other direct expenses were extracted from departmental accounts and financial statements provided by the schools. In cases where fringe benefits were included in current expenses, they were removed and added into fringe benefit accounts. In addition, equipment allocations were disregarded. Direct teaching costs exclusive of faculty salaries were allocated to medical student teaching and resident/other teaching based on the ratio of medical student teaching to resident/other student teaching hours.

Indirect Expenses: Indirect expenses were allocated to medical student training, resident/other training, research, and patient care based on accepted accounting methods of allocation. The methods of allocation included but were not restricted to the following:

- o Dollar value of direct expenses of activities. This method was used where there appeared to be a reasonable relationship between the dollar value of direct expenses and the allocable indirect expenses.

- o Faculty time. This method was used in cases where the indirect expenditure tended to vary with the faculty time on each activity.

- o Square feet. This method was used where the indirect expenditure varied depending on the area used by academic departments.

In most cases indirect costs differ for instructional and educational cost schemes.

2. Analysis

A summary of costs and sources of financing per school for 1981-82 is presented in Tables 25a and 25b (Scheme 1 - Instructional Costs and Scheme 2 - Educational Costs respectively). Offsetting the total costs are research grants, VA grant, endowment earnings, patient fees, etc. The Veterans Administration appropriation to Marshall University which equaled $1,828,887* in 1981/82 was discontinued after 1982/83. It is a cost the state is incurring this year (1983/84) and will continue to carry in the future. It is presented as such in

* Excludes $4,978 from dean's office allocation--see MU cost note 5, Appendix I.

Table 25a

SUMMARY OF INSTRUCTIONAL COSTS AND SOURCES OF FINANCING
(in thousands of dollars)
1981-82

Scheme 1: INSTRUCTIONAL COSTS

EXPENDITURES	MU	WVSOM	WVU	TOTAL
DIRECT EXPENSES				
Medical Teaching	$ 1,776	$ 1,409	$ 5,306	$ 8,491
Resident/Other Teaching	1,408	14	8,480	9,902
Research	847	117	6,105	7,069
Patient Care	1,544	714	7,732	9,990
Total	$ 5,575	$ 2,254	$27,623	$35,452
INDIRECT EXPENSES				
Medical Teaching	$ 702	$ 1,327	$ 851	$ 2,880
Resident/Other Teaching	514	9	1,048	1,571
Research	349	174	713	1,236
Patient Care	538	415	966	1,919
Total	$2,103	$ 1,925	$ 3,578	$ 7,606
DIRECT & INDIRECT EXPENSES				
Medical Teaching	$2,478	$ 2,736	$ 6,157	$11,371
Resident/Other Teaching	1,922	23	9,528	11,473
Research	1,196	291	6,818	8,305
Patient Care	2,082	1,129	8,698	11,909
Total	$7,678	$ 4,179	$31,201	$43,058
Funded by:				
1. State Funds	$3,437	$ 3,432	$14,990	$21,859
2. Federal Grants, Local Grants, Contracts and VA Grants	2,959	142	4,106	7,207
3. Practice Plan and Other Clinical Income	865	221	9,376	10,462
4. Financial Aid to Students	21	147	90	258
5. Private and Other Funds	338	67	2,430	2,835
6. Tuition and fees	58	170	209	437
Total	$7,678	$ 4,179	$31,201	$43,058

Table 25b

SUMMARY OF EDUCATIONAL COSTS AND SOURCES OF FINANCING
(in thousands of dollars)
1981-82

Scheme 2: EDUCATIONAL COSTS

EXPENDITURES	MU	WVSOM	WVU	TOTAL
DIRECT EXPENSES				
Medical Teaching	$ 1,961	$ 1,604	$ 6,349	$ 9,914
Resident/Other Teaching	1,784	14	11,110	12,908
Research	847	117	6,104	7,068
Patient Care	983	519	4,060	5,562
Total	$5,575	$ 2,254	$27,623	$35,452
INDIRECT EXPENSES				
Medical Teaching	$ 760	$ 1,386	$ 981	$ 3,127
Resident/Other Teaching	644	8	1,397	2,049
Research	349	174	693	1,216
Patient Care	350	357	507	1,214
Total	$2,103	$ 1,925	$ 3,578	$ 7,606
DIRECT & INDIRECT EXPENSES				
Medical Teaching	$2,720	$ 2,990	$ 7,330	$13,041
Resident/Other Teaching	2,428	22	12,507	14,957
Research	1,196	291	6,797	8,284
Patient Care	1,333	876	4,567	6,776
Total	$7,678	$ 4,179	$31,201	$43,058
Funded by:				
1. State Funds	$3,437	$ 3,432	$14,990	$21,859
2. Federal Grants, Local Grants, Contracts and VA Grants	2,959	142	4,106	7,207
3. Practice Plan and Other Clinical Income	865	221	9,376	10,462
4. Financial Aid to Students	21	147	90	258
5. Private and Other Funds	338	67	2,430	2,835
6. Tuition and fees	58	170	209	437
Total	$7,678	$ 4,179	$31,201	$43,058

the ten-year projection of revenue sources for Marshall but is not represented in this base-year (1981/82) analysis.

Five levels of costs, as previously defined, are of interest.

1. Medical student instructional costs
2. Medical student educational costs
3. Total costs for the schools of medical education
4. Allocated educational total costs for medical students and for resident/other students
5. State costs

These cost categories focus on different facets of medical school costs. The first four levels of costs for the three West Virginia schools of medical education are presented in Table 26. State costs are documented and discussed separately below. WVU, the most mature of the institutions, has the highest total cost of $31.2 million; Marshall, a young, four-year program, has total costs of $7.7 million; WVSOM, primarily a two-year, on-site program, has total costs of $4.2 million (rounded to nearest tenth of a million). Comparison of total costs, however, only begins the analysis. Higher total costs do not necessarily imply less efficient teaching of medical students. It is necessary to examine both the inputs and outputs to make such an evaluation. The more important costs analysis involve the other cost categories and the changing scenarios discussed in later sections.

Table 26
WEST VIRGINIA COSTS OF MEDICAL EDUCATION*
1981-82

	Medical Student Instructional Costs	Medical Student Educational Costs	Total Costs	Allocated Educational Total Costs	
				Medical Students	Resident/ Other Students
MU	$ 2,478,012	$ 2,720,912	$ 7,677,758	$ 4,057,012	$ 3,620,746
WVSOM	2,736,127	2,989,807	4,179,051	4,148,124	30,927
WVU	6,157,329	7,330,314	31,201,352	12,872,089	18,329,263
Total	$11,371,468	$13,041,033	$43,058,161	$21,077,225	$21,980,936

WVU is also highest in all of the other cost categories. Due to its small residency program, Marshall has lower instructional and educational costs than does WVSOM. However, it has higher allocated educational total costs than WVSOM, because it has a larger program of research and patient care.

Medical student teaching costs per student for 1981-82 are presented in Table 27. For each school, these figures represent the total instructional, educational and allocated educational total costs divided by the number of medical students at

* Data for this table are derived from cost notes; see Appendix I.

the school (MU=133 students, WVSOM=236 students, WVU=343 students). As discussed previously, these different cost categories stem from different viewpoints about how joint costs are assigned to the different activities and outputs of a medical school. Both the instructional and educational costs per student categories are based on the premise that there are four equally valued intermediate and final outputs of a medical school--medical students, residents and other students, research, and patient care. Hence total costs, are assigned to each of these categories. Attention to allocated educational total costs, on the other hand, heightens the importance of the first two outputs, viz., the students and residents. In this case, it is assumed that the costs of research and patient care are costs of medical student and resident/other teaching. Thus, all total costs are allocated to these two categories alone.

Table 27
COSTS PER MEDICAL STUDENT IN WEST VIRGINIA
1981-1982

	Instructional Costs Per Medical Student	Educational Costs Per Medical Student	Allocated Educational Total Costs Per Med. Student
MU	$18,632	$20,458	$30,504
WVSOM	$11,594	$12,669	$17,577
WVU	$17,951	$21,371	$37,528

Notice, no attempt is made to divide total costs by the number of medical students, because the total costs involve the teaching of residents and other students as well. (If the reader wishes to know these figures, the data in Table 26 and the student figures above are sufficient for their calculation.) Similarly, total costs are not divided by the total number of students who take courses at the school. Since data were not available to weight student participation at the schools, someone who only took one course would have to be treated identically to another who was enrolled full time; thus, each would bear an equal but obviously disproportionate share of the costs.

Data in Table 27 indicate that WVSOM has significantly lower average per student educational costs than do MU or WVU and that these costs for the latter two schools are roughly equivalent. While WVSOM continues to have lower allocated educational total costs, differences begin to appear between MU and WVU figures with the latter roughly 8% greater than the former. This effect may be attributable to the fact that WVU has a larger portion of full-time faculty than does MU and uses fewer voluntary faculty to teach its students.

Two caveats should be recognized when these figures are evaluated. First, WVSOM costs are divided by 236 students. This figure is appropriate because it represents the number of physicians the school produces in four years, and hence, is equivalent to the numbers used at MU and WVU. However, the low WVSOM per student figures are partly the result of a cost advantage this school has over MU and WVU. That is, while 236 students were enrolled at WVSOM in 1981-82, the third and fourth year classes (approximately 120 students) received most of their clinical

training at hospitals away from the campus. The costs of educating these students were mostly borne by these hospitals and volunteer faculty rather than the school; thus, few of the school's $2,736,127 instructional and $2,989,807 educational costs were actually incurred by these students. (An upper bound overestimate of per student cost for the students, then, would be twice the listed figures. Note that any effort to compare this estimate with the averages at MU and WVU will be confounded by the inclusion of an imputed value for the volunteer faculty costs in this WVSOM estimate and the exclusion of these costs at the other schools.) Second, due to its size compared to the rest of its university, Marshall School of Medicine has much higher per student instructional and educational indirect costs than does WVU. Indirect instructional/educational per student costs at MU equal $5,275 and $5,711 respectively, while at WVU they are $2,481 and $2,860. It should be kept in mind that some of this difference is an artifact of the allocation procedure which is based on direct costs (see Appendix I.: cost notes of the two schools).

Table 28 reports total state revenues received by the three medical schools in 1981-1982. The simple division of the state allocation by the number of medical students shows that the state allocation to each school exceeds the instructional and educational costs after tuition of the medical students has been excluded. This excess can be thought of as the state's contribution to resident and other teaching as well as research and patient care provided at the school. By this argument, it is assumed that primacy is given to the use of state funds for medical student training; that is, the state funds are assumed to pay for the difference between medical student teaching costs and student tuition. State funds should be assumed to pay the difference between medical student teaching costs and any school revenue, not just tuition, that stems from these teaching activities. For example, faculty may receive research funds for their joint teaching/research activities. These are considered a teaching rather than a research cost. Thus, the state dollar figures may tend to overstate the state's share of medical teaching costs. A basic premise of this approach is that the remainder of the state's allocation supports other activities at the schools. Indeed, one could argue that a medical school's research and patient care activity should be self supporting and as shown in Table 22, grant income and practice plan income go to this purpose. To the extent that they are not covered or to the extent that the costs of training residents/other students are substantive, these excess state dollars should be considered as the costs of training residents/other students.

Another way of viewing the state's contribution to medical education is to allocate state dollars to the two categories of students: medical students and residents/other students. In this allocation, primacy is given to the use of state funds for both medical student training and resident/other training. State funds are allocated based on the same ratio of direct and indirect medical student educational costs to the sum of medical student and resident/other direct and indirect expenses used to calculate allocated educational total costs. In 1981-82 allocated state expenditures for medical students is $1.8 million at MU, 3.4 million at WVSOM, and 6.2 million at WVU.

Table 28
STATE EXPENDITURES 1981-82

School	State Revenues	State Expenditure	----------COSTS PER MEDICAL STUDENT---------- Med. Stud. Instruc. Costs Less Tuition	Med. Stud. Educ. Costs Less Tuition	Alloc. State Expenditure for Med. Students
MU	$ 3,436,572*	$ 25,839*	$18,196	$20,023	$13,654*
WVSOM	3,432,230	14,543	10,875	11,950	14,436
WVU	14,990,532	43,704	17,343	20,762	18,030

* Does not include the Veterans Administration Grant, $1,828,887 (excludes $4,978 from dean's office allocation; see MU cost note 5, Appendix I), which was discontinued in 1982-1983. If this amount is included as a state expenditure, the state expenditure per medical student would be $39,590, and the allocated state expenditure per medical student would be $20,920.

Because state revenues received by WVU are over 400 percent higher than those received by the other schools and their costs are less than 300% higher, state dollars per medical student are at least 28 percent higher at WVU than they are at MU and WVSOM. To see this in more detail consider Table 29. At MU the state appropriation and VA grant totaled $5,265,459 in 1981/82. The "instructional costs" after tuition of medical students was $2,420,090. Consequently, the state and the VA grant contributed $2,845,369 to the three categories, Resident/Other Student Teaching, Research, and Patient Care. If "educational costs" are used as the measure for evaluating the cost of medical school teaching, then the state and the VA grant contributed $2,602,469 to the other three categories. Finally, if one wishes to say all research and patient care is done to maintain faculty knowledge, skill and experience for teaching, which is the case shown by the "Allocated Educational Total Costs for Medical Students" figures, then the state and the VA grant are contributing $1,266,369 to the teaching of residents/other students.

At WVSOM, similar statements can be made. Namely, after subtracting "instructional costs" and "educational costs," the state is contributing $865,696 and $612,016 respectively to the teaching of interns/residents/other students, to research, and to patient care. Interestingly, since very few dollars go into the Intern/Residents/Other Students category at WVSOM, in the costing scheme "allocated educational total costs for medical students," the state funds do not cover these expenditures. The non-covered difference is $546,301 and is made up from the other funding sources.

At WVU, the situation directly parallels MU, but absolute dollar amounts are significantly larger due to the large residency and research programs involved. After accounting for "instructional costs" and "educational costs," the state is contributing $9,042,003 and $7,869,018 respectively to the other three categories: Resident/Other Students, Research, and Patient Care. After assigning the entire $12,663,289 for "Allocated Educational Total Costs for Medical Students" minus tuition to the state appropriation, the state is still contributing $3,327,243 toward the cost of Residents/Other Students.

An additional caution must be provided about the per student costs in Tables 27 and 28. These data represent average per student costs, not marginal costs. Average costs are calculated by dividing total students costs by the number of students. If all of these costs are fixed--that is, they do not vary with the number of students--changes in the number of students would change the average cost per student, although total costs would remain fixed. Similarly, if a portion of these costs is fixed and a portion varies, only the variable costs will be affected if the number of students changes. Non-technically, marginal costs represent the dollar change that would occur should a single student be added to or subtracted from the school. These costs need not be constant over the total range of students. In economics it is often assumed that the marginal cost of production is increasing; that is, each additional unit costs more to make than the previous one. The reader should be aware that there is no way to determine marginal cost from the average cost figures that are presented in the tables. Thus, these data provide no foundation for the evaluation of cost changes that accompany changes in the number of students.

Table 29
STATE ALLOCATION
MEDICAL STUDENTS-RESIDENTS/OTHERS
1981-82

	INSTRUCTIONAL			EDUCATIONAL			Medical Students Allocated Educational TOTAL COSTS		
	MU	WVSOM	WVU	MU	WVSOM	WVU	MU	WVSOM	WVU
State Allocation	$3,437	$3,432	$14,990	$3,437	$3,432	$14,990	$3,437	$3,432	$14,990
VA Grant*	1,829	NA†	NA†	1,829	NA†	NA†	1,829	NA†	NA†
Total State & VA*	5,266	NA†	NA†	5,266	NA†	NA†	5,266	NA†	NA†
Less Med. Student Teaching Cost After Tuition.	-2,420	-2,567	-5,949	-2,663	-2,820	-7,122	-3,999	-3,979	-12,663
State and VA* Contribution to Resident/Other Student Research and/or Patient Care	$2,846	$ 865	$9,041	$2,603	$ 612	$7,868	$1,267	($ 547)	$ 2,327

*VA = Marshall University only.
†NA - Not Applicable.

3. Critique of Methodology

While the methodology is based on accepted cost accounting principles, it has limitations. Some often are inherent, others have to do with lack of needed information from the faculty log diary. The limitations include:

- Inability to measure and impute a value to volunteer faculty time, even though this contribution to the educational program may be substantial. Costs, therefore, may be underestimated.

- Inability to account for the teaching of medical students by residents. Researchers were denied the opportunity to conduct a log diary on residents since they are hospital employees and not under the control of the medical school. The IOM 1974 study estimates that residents spend ten percent of their time teaching medical students; this cost of medical education was not included in the analysis. Costs, therefore, may be underestimated.

- Inability to use log diary to account for the amount of faculty time spent with residents because log diaries were not completely filled in. IOM 1976 ratios were applied to the log diary data in an effort to eradicate this omission; however, a nonestimable bias may have entered the analysis at this stage.

- Joint allocation decisions. Any allocation scheme has arbitrary qualities; indeed, economists argue that there exists no basis for allocating "joint production" costs for any endeavor. On the other hand, accountants allocate such costs on a regular basis with accepted principles. While it is theoretically difficult (or impossible) to determine the amounts of research and patient care essential to education, the study team agrees with the IOM researchers that high-quality medical training cannot be conducted without some research and patient care activities in conjunction with students. Second, the group believes that if the faculty felt it was necessary to have students in attendance for the amount of joint teaching and research and joint teaching and patient care, then these total amounts were deemed necessary for medical education and should be considered a cost of education. When residents and undergraduates were taught simultaneously, the time was allocated equally between the two groups. It was impossible to weight the split since actual number of students in these "joint/joint" activities were unavailable. Third, the practical value of these cost data allocations surpasses the theoretical arguments against any specific allocation scheme.

- Decisions to allocate indirect costs on the basis of faculty time, number of students, space utilized, etc. In all managerial endeavors to determine the costs of products and services, the allocation of indirect costs requires judgments. Again, there is no set way to determine the "optimal" or "correct" allocation, and the study team used judgments once again in accordance with generally accepted accounting principles. The allocations used were then transmitted to the schools for their comments and critiques before final use in the models.

- Decisions were made to allocate the faculty salary costs to activities in proportion to their time spent on these activities. By using an average faculty salary cost per hour, an hour of time carries the same value, whether spent in teaching, research, or patient care. Again, it is probably theoretically impossible to say whether the "value" of one activity is greater than another; hence the decision to give equal value to each hour in each activity.

C. Manpower Analysis

In order for the Board of Regents to formulate informed manpower policy, a comparison of the projected supply of physicians practicing in West Virginia for each scenario was made with established health care requirement estimates. These comparisons attempt to assess how the specified policies affect manpower resources in relationship to the health care requirements for West Virginia. A primary data collection effort was not elected for this phase of the study; rather, the model that was developed and the analyses were based on established secondary sources.

The Graduate Medical Education National Advisory Committee (GMENAC) national physician requirement ratios by specialty (24) were applied to the West Virginia population projections to identify the number of physicians these ratios would suggest are needed in West Virginia. The practicing physicians' projection process (described earlier in the report), projects the supply of physicians practicing in West Virginia through the year 2000 for each scenario option (see Section V for a description of the process).

1. GMENAC

In 1976, the Graduate Medical Education Advisory Committee (GMENAC) was charged by the Secretary of DHEW to analyze the manpower needs for physicians and to develop strategies related to the present and future supply requirements of physicians. The subsequent four-year research effort involved development of various models for forecasting physician supply and need for the U.S. population (24).

In its development of physician requirements, GMENAC employed panels of experts (including practicing physicians) to determine need on a natural basis for health care services. These panels reviewed data on current and estimated future prevalence of disease conditions and, based on normative practice standards, gave judgments as to the kinds of medical care required to treat the condition and the amount and level of physician involvement required. These analyses were conducted for a number of medical specialty areas. Physician time requirements were then matched against productivity estimates for physicians to develop estimates of the number of physicians needed in each specialty addressed. Figure 11 summarizes the basic requirement model. GMENAC's population-to-health manpower ratios per specialty were translated into ratios for the six aggregate specialty groupings used in this study (See Appendix J). These six ratios were then applied to the West Virginia population projections supplied by the West Virginia Department of Health for 1980, 1990, and 2000. Table 30 presents the number of physicians by specialty group necessary to meet GMENAC's requirements applied to the population of West Virginia.

The GMENAC ratios are not tailored specifically to West Virginia, but they do represent a benchmark figure from which further investigations can be undertaken. Several constraints should be considered when applying national standards to a

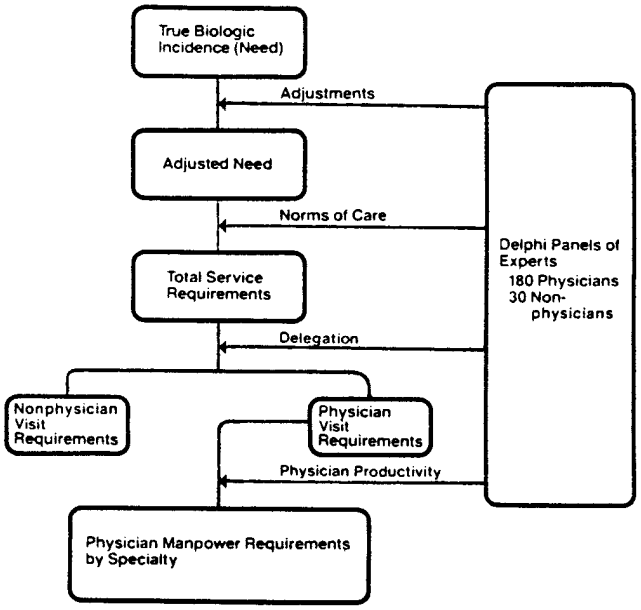

Figure 11: Physician Requirements Model

DATA:

- The practice content of physicians within each specialty and subspecialty.
- The trend data on the incidence and prevalence rates of diseases treated by each specialty and subspecialty.
- The estimates from various surveys on the amounts of ambulatory care or surgical care required to care for each disease or condition.
- The recommendations from various experts on the levels of preventive and well person care that should be consumed by various age groups of the population.
- The estimates of productivity of physicians in each specialty and subspecialty, such as the number of ambulatory care visits and the deliveries or operations performed per year for the average practitioner in each specialty.
- The roles of nonphysician providers, both in terms of substitutability and complementarity for physicians in each specialty and subspecialty.
- The various estimates of requirements for physicians in each specialty and subspecialty for teaching, research, administration, or other functions apart from direct patient care.

Source: Summary Report of The Graduate Medical Education National Advisory Committee, Volume 1, pp. 63 and 65.

Table 30

NUMBER OF PHYSICIANS REQUIRED TO MEET THE HEALTH CARE NEEDS
IN WEST VIRGINIA BY SPECIALTY GROUPING BASED ON GMENAC NATIONAL RATIOS
AND APPLIED TO WEST VIRGINIA POPULATION PROJECTIONS
(1980, 1990, 2000)

SPECIALTY GROUPING	GMENAC STANDARD 1 Physician per X Population	Number of Physicians Required in WVA Based on GMENAC Benchmark Ratios		
		1980 (1,949,644)†	1990 (2,172,515)‡	2000 (2,403,054)‡
Primary Care				
1. Internal Medicine	3,466	563	627	693
2. Family/General Practice	2,897	673	750	829
3. Pediatrics	8,050	242	270	299
TOTAL		1,478	1,647	1,821
Non-Primary Care				
4. Direct Patient Care: Non-consultants	1,562	1,248	1,391	1,538
5. Direct Patient Care: Consultants	2,563	761	848	938
6. Indirect Patient Care Specialties	6,468	301	336	372
TOTAL		2,310	2,575	2,848
TOTAL PRIMARY AND NON-PRIMARY CARE		3,788	4,222	4,669

†250a.

‡West Virginia Department of Health population projections.

specific state. First, these figures are based on national levels of disease prevalence and incidence. Because of population characteristics such as age or occupational history, individual states may not experience the same rates of disease prevalence and incidence. A state with an older population, for example, may have higher levels of chronic disease and thus require a different mix of specialties than the nation overall. In addition, GMENAC figures are based on normative standards of types of conditions that physicians in particular specialties should be caring for. In areas where a full range of specialties is unavailable, physicians' practices will undoubtedly be broader than these normative standards dictate. Thus, in this case overestimates of physicians may result from reliance on GMENAC standards. Further, West Virginia is characterized by many small communities, the populations of which many are often too small to be efficiently served by a single physician. Application of GMENAC standards in these cases may result in underestimates of physician requirements for West Virginia.

2. Application of GMENAC Standards to Projected Primary and Non-Primary Care Specialty Groups

Due to the possibility of substantial error, the comparison between requirements and the projected physician supply is made using three broad categories defined as:

SHORTAGE: is defined as GMENAC requirements exceeding supply by more than 20%
SURPLUS: is defined as supply exceeding GMENAC requirements by more than 20%
BALANCE: is defined as supply varying less than 20% of GMENAC requirements.

Using these definitions, GMENAC requirements, and five supply projections based on various retention rate schemes, summary of current and projected West Virginia physician manpower and physician requirements is presented in Table 31. While there is a shortage of physician manpower in 1980, there will be a balance between physician manpower requirements and supply in 1990. Furthermore, in the year 2000, there will be an expected surplus in the total number of physicians, an expected surplus of primary care physicians, and an expected balance of non-primary care specialists for all schemes. These statements regarding the status quo projection hold true for all other scenarios. In essence, the system's output for each of the scenarios is not substantially different from the status quo through the years for which projections were made.

D. Scenarios

Based on 1981-82 data gathered for this study, the weighted average annual medical instruction cost per student in West Virginia for 1981-82 is $15,971 ($11,594 at WVSOM, $17,951 at WVU, and $18,032 at MU), whereas the weighted average annual medical education cost per student in West Virginia for 1981-82 is $18,316 ($12,669 at WVSOM, $20,458 at MU and $21,371 at WVU). Annual state expenditures at the schools of medical education, which are $3,432,230 (WVSOM), $3,436,572* (MU) and $14,990,532 (WVU). In considering what financial experience might be expected over the next decade, assumptions concerning economic trends were used to develop a financial profile from 1981-1982 through 1991-1992. Costs and the output of physicians were estimated.

* Excludes Veterans Administration funds that have been discontinued after 1982-83.

Table 31

QMENAC BENCHMARK PHYSICIAN REQUIREMENTS COMPARED TO PHYSICIAN SUPPLY PROJECTIONS USING FIVE VARIED RETENTION RATES

	1980	ACTUAL 1982	1990	1991 PROJECTED NUMBER OF PHYSICIANS PRACTICING IN WVA BY RETENTION RATE SCHEMES					2000	2000 PROJECTED NUMBER OF PHYSICIANS PRACTICING IN WVA BY RETENTION RATE SCHEMES				
	QMENAC BENCHMARK		QMENAC BENCHMARK	A	B	C	D	E	QMENAC BENCHMARK	A	B	C	D	E
Primary Care Sp. Groups 1 & 2 & 3	1478	895	1647	1755	1763	1770	1772	1778	1821	2471	2490	2509	2575	2528
Non-Primary Care Specialty Groups 4 & 5 & 6	2310	1250	2575	2348	2357	2367	2371	2378	2848	3221	3247	3274	3281	3300
Total	3788	2145	4222	4103	4120	4137	4144	4156	4669	5692	5737	5783	5796	5828

Retention Rate Schemes

Percentage rate that medical graduates tend to remain in or return to West Virginia to practice:

A. MU and WVSOM: 10% less than WVU.
B. MU and WVSOM: Same as WVU.
C. MU and WVSOM: 10% greater than WVU.
D. MU: 10% greater than WVU.
   WVSOM: 20% greater than WVU.
E. MU and WVSOM: 20% greater than WVU.

This extrapolation of the present, modified by specific assumptions, provides a visualization of a potential future that can assist in the formulation of strategies to realize goals and objectives. The resultant synopsis of hypothetical events is our scenario of the status quo. As noted earlier, such scenarios are constructed for the purposes of focusing attention on causal processes and decisions points (131a).

In this project, several alternative hypothetical futures were formulated. They were selected from among policy options suggested in various forums in West Virginia.

Selected options were synthesized into the following scenarios to illustrate the future consequences of the several individual courses of possible action:

1. Status Quo
2. Increase Tuition
3. Increase Tuition with Revolving Loan Program
   a. Without Forgiveness
   b. With Forgiveness
4. Reduce Enrollment

Each scenario is organized thusly:

1. Description of scenario
2. Specification of Assumptions Used
3. Financial Analysis
4. System's Output Analysis
5. Implications of Scenario

The reader is invited to study the assumptions utilized in each scenario. These can be modified in the policy planning process. New scenarios can be posited. Obviously, changes in the assumptions will yield changes in the outputs and implications of each scenario.

The status quo scenario is a most likely projection if no other changes occur. The other scenarios should be contrasted to estimate differential impact. Variations and combinations of aspects of the other scenarios can be pursued as part of a continuing planning and policy formulation process by the West Virginia Board of Regents.

Scenario 1
STATUS QUO

I. Description

Policies of the West Virginia Board of Regents and the State Legislature have implications for the present and the future allocation of the state's resources. The status quo scenario examines budgetary requirements of and physician output by the West Virginia system of medical education over the next decade (1982-1992). Assuming status quo medical education policies, it is projected that close to eight hundred and fifty additional West Virginia-trained physicians will be practicing in the state by the end of this decade at a cost to the state of approximately $331 million.*

II. Assumptions

To project the current dimension of the cost of medical education over the decade ahead, a number of assumptions were used concerning the factors that influence the output and retention of physicians by specialty and practice, as well as the rates of growth in expenditure and funding. The assumptions were based on trend data and professional judgment. When empirical data are lacking, informed judgment is used to postulate numerical values necessary to run the models. In addition, the models have been developed to permit the user (the Board of Regents or the individual medical institution) to alter these values and rerun the models with other specified values for this and other scenarios.

The status quo scenario, like the others, displays the consequences of certain factors or changes for the state's medical education system. These are known as "what if" questions. In this way, the implications of alternative policies can be tested as part of the state's and/or individual institution's process of formulation and analysis. The particular assumptions used in this scenario are described below.

1. Retention History

Patient care and research notwithstanding, one of the objectives of each school of medical education in West Virginia is to prepare physicians to serve the citizens of the state. Using the records of the West Virginia Licensure Board on the number and origins of practicing physicians in the state, all the scenarios attempt to forecast how many physicians will be practicing in the state through the year 2000.

Accurate data are available on the state's 1974-1977 retention history for West Virginia University graduates and 1978-80 retention history for West Virginia School of Osteopathic Medicine graduates who set up practice after a one-year internship. This experience is projected forward without revision either up or down. While it is preferable to use school-specific retention rates, WVSOM and MU are too new to have residency and post-residency practice

* Refer to the ten-year projections: sum state funds for each school from 1982/83-1991/92, then sum the three school state funds.

pattern data. So, for MU and WVSOM graduates who enter three-to-five year residency programs, adjusted WVU data are used. Five adjusted sets of WVU retention rates were examined in order to estimate appropriate rates for MU and WVSOM. They ranged from setting both schools' retention rates at 10% less than WVU's experience, to setting both their rates at 20% greater than WVU's experience. After reviewing the results of using different rates and taking into account the primary care philosophy and placement activities of the two schools, differential rates were selected for each school. For graduates of Marshall University, the WVU experience plus ten percent (10%) was used to reflect the primary care and rural community linkages of the program. The WVU experience plus twenty percent (20%) was used for WVSOM because of the primary care priority and the very limited pursuit of residency training outside of West Virginia. It is worth iterating that all schemes have consistent results in terms of whether or not undersupply, balance, or oversupply will be experienced when applied to a boundary of 20% above or below the GMENAC benchmark figures.

2. Aggregation of Log Diary Activity

The log diary attempted to measure the portion of faculty time spent on teaching in contrast, for instance, to research and patient care. Time was recorded across eighteen discrete categories. Categories were aggregated into instructional and educational hours, schemes 1 and 2 respectively, and their resultant costs were projected for the coming decade (see Section V).

It was assumed that the proportion of faculty time allocated to teaching would remain unchanged over the decade ahead. This assumption is based on the comparison of the West Virginia medical schools' log diary mean hours spent in specific activities with those of the 1974 IOM study. With few exceptions, the means of these studies are equivalent (see Section VI. A).

3. Urban/Rural Definition

Because one of the priority health needs in West Virginia is for more primary care physicians in rural areas, the definition of urban and rural areas became essential to this analysis. The U.S. Bureau of the Census defines rural as a population of 2500 or fewer. As discussed in Section V.C of the text, members of the Board of Regents and the Chancellor's Office felt this definition was not appropriate for West Virginia. Examination of population densities throughout the state suggested the following definition of urban/rural areas, providing levels more closely describing the urban/rural mix of the state:

Urban: any city with a population of 10,000 or greater or comprising an urban strip.

Rural: any city with less than a 10,000 population.

This assumption yields fifteen urban areas in West Virginia, which range from Vienna, St. Albans, and Martinsburg to Parkersburg, Wheeling, Huntington and Charleston, in addition to smaller areas that comprise part of an urban strip. Using this criterion, seventy-nine percent of the West Virginia population resides in rural areas.

4. Specialty Groupings

As noted previously, approximately fifty specialties and sub-specialties of medical practice were identified. For purposes of analysis and forecasting service needs, it was necessary to reduce these categories into a smaller number. These were aggregated into six categories of medical practice and further grouped into primary care and specialty services as follows:

Primary Care

1. General internal medicine
2. Family practice/General practice
3. Pediatrics

Specialty Services

4. Direct patient care: Non-consultant
5. Direct patient care: Consultant
6. Indirect patient care

Forecasts are particularly concerned with the implications of the status quo and other scenarios on the distribution of primary care physicians and specialty services to urban and rural communities.

5. Interchangeability of Faculty

Those scenarios that modify the programs of individual schools of medical education also require assumptions concerning the interchangeability of faculty. Throughout the application of the models, it is assumed that faculty within a department are interchangeable. This will be true to a greater or lesser degree among departments depending on size, scope, and depth of faculty. Obviously, the application of specific scenarios in institutional planning and management would require precise adjustments in refining their implications.

6. Average Faculty Salaries per Department

A related assumption pertains to faculty salaries per department. Average faculty salaries, rather than ranges, are used in the calculations. The above caveat concerning application also applies here when explicit changes involving specific faculty are made in institutional planning.

7. Constant Number of Residency Positions

Finally, it is assumed that the number of residency positions by specialty remains the same. Changes in residency opportunities and selection would modify the physician output by specialty and, conceivably, urban/rural location.

Ten-Year Assumptions (1982 - 1992)

Forecasting the costs of medical education over the next decade requires a number of assumptions that have a critical impact on future estimated financial activity. As with assumptions in other cases, the assumptions here are based on expert judgment, past trends, and/or possible or probable policy deci-

sions. Any or all assumptions may be altered depending on additional data or interests of users. The specific assumptions used in the status quo and other scenarios are itemized below:

1. Base-year expenditures will increase at six percent (6%) compounded annual interest rate.

2. The portion of each school's Medical Practice Plan, appropriated to the schools, will increase at six percent (6%) compounded annually.

3. Federal and local grants and contracts will increase at three percent (3%) compounded annually. It was felt that in a restrictive fiscal environment, federal grants and contracts would increase at one half the rate of inflation. (See Appendix I, Cost Note Summary Sheets, for complete definition of this category.)

4. Private funds will increase at three percent (3%) compounded annually. Private funds refer to private foundation grants, gifts and endowments.

5. Financial aid will increase at three percent (3%) compounded annually. Financial aid refers to all grants without a service committment from federal, state, and school sources.

6. Tuition will increase at twenty percent (20%) compounded annually. (Tables 39-41 at the end of this Scenario present the 10-year projection of tuition and fees per school.) This assumption was provided by the West Virginia Board of Regents. Note: tuition has been included as a source of revenue; however, it is unclear how much of these funds support capital expenditures. These latter costs of capital goods have been excluded from the calculation of costs of medical education and the revenues covering these expenditures likewise should be excluded. Thus the estimate of state funds supporting the medical schools may be understated.

7. Federal capitation dollars will be zero from 1982 forward.

8. For Marshall University:

   a. The $1,828,887 Veterans Administration funds will be discontinued after 1982-83.
   b. Forty-eight students will be enrolled per class from 1982-1983 forward.
   c. Other VA funds totalling $992,670 in 1983-84 were added to support the increased faculty size necessary to accommodate enlarged student enrollment.

9. The state will provide the balance of funding.

These assumptions are subject to revision by the West Virginia Board of Regents or the administrators of the schools. They are fundamental to all scenarios.

III. Financial Analysis

Total direct and indirect costs for the state's schools of medical education are projected to increase from approximately $43 million in 1982/83 to $76 million in 1991/1992.* These costs include medical student teaching costs, as well as resident/other student teaching, patient care and research costs not attributed to the medical teaching program. This 77 percent increase would require, at present patterns of funding, that state appropriations almost double from $23 million to $42 million (see Figure 12). The costs of medical student instruction, defined in Section VI, would rise from $12 million to $21 million. Medical student educational costs, also defined in Section VI, would rise from $14 million to $24 million. Tables 32-34 present detailed cost projections and estimated sources of revenue for each of the schools of medical education over the next ten years. Each school's costs are allocated by the instructional cost scheme (Table a) and by the educational cost scheme (Table b), so that two tables are presented for each school. Each of these tables breaks down direct expenses, indirect expenses and the sum of direct andindirect expenses (total costs) into the four cost categories: medical teaching, resident/other teaching, research, and patient care. The itemized medical student instructional, medical student educational and state costs per school, and the overall system costs for each over the next ten years is presented in Table 35. Medical student instructional costs for WVSOM would increase from $2.7 million in 1981/1982 to $4.9 million in 1991/1992. Their educational costs would increase from $3.0 million in 1981/82 to $5.3 million in 1991/92. Comparable figures for Marshall University are $2.6 million for medical student instruction in 1981/82 to $5.2 million in 1991/1992 and $2.8 million in 1981/82 to $5.7 million in 1991/1992 for their educational costs. At WVU, medical student instructional costs would grow from $6.2 million (1981/1982) to $11.2 million (1991/1992) and their educational costs would grow from $7.4 million in 1981/1982 to $13.2 million in 1991/1992.

State expenditures over time are not increased at a set inflation rate. It is assumed that the state will cover the difference between the total direct and indirect expenses of the medical school and the sum of all other revenue sources. In reality, these funds are used at the school's discretion to cover the various medical school programs not covered by other revenue. Table 36presents the state's contribution to each of the schools over the decade ahead. At WVSOM, state funds would increase from $3.4 million in 1981-82 to $4.7 million in 1991-92. The state's share to Marshall increases at a more rapid rate from $3.4 million in 1981-82 to $10.1 million in 1991-92. WVU receives approximately 64% of the state funds to medical schools. In 1981-82, WVU received $15 million, with a projected increase to $26.9 million by 1991-92 (See Figure 12).

One of the initial questions addressed by the study has been, "How much does it cost to educate a physician?" Table 36 presents the instructional costs and educational costs per student for each year over the decade based on the log diary analysis and the assumptions stated for the status quo scenario. The data are presented for each school. The range of projected instructional costs per student from 1981-82 to 1991-92 would be:

* These increases over time result primarily from the application and compounding of the assumed six percent (6%) inflation rate.

TABLE 32a

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

PROJECTION OF SCHEME 1 - INSTRUCTIONAL COSTS

DIRECT EXPENSES*	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83**	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	1,867,193	6%	1,979,225	2,486,560	2,635,754	2,793,899	2,961,533	3,139,225	3,327,578	3,527,233	3,738,867	3,963,199
Resident/Other Teaching	1,323,050	6%	1,402,433	1,812,232	1,920,966	2,036,224	2,158,397	2,287,901	2,425,175	2,570,686	2,724,927	2,888,423
Research	858,906	6%	910,441	1,239,596	1,313,972	1,392,811	1,476,379	1,564,962	1,658,860	1,758,391	1,863,895	1,975,728
Patient Care	1,640,061	6%	1,738,465	2,286,376	2,423,559	2,568,972	2,723,111	2,886,497	3,059,687	3,243,268	3,437,864	3,644,136
Total	5,689,211		6,030,563	7,824,765	8,294,251	8,791,906	9,319,420	9,878,585	10,471,301	11,099,579	11,765,553	12,471,486
INDIRECT EXPENSES												
Medical Teaching	701,542	6%	743,634	778,312	825,010	874,511	926,982	982,601	1,041,557	1,104,050	1,170,293	1,240,511
Resident/Other Teaching	513,982	6%	544,821	584,291	619,349	656,510	695,900	737,654	781,913	828,828	878,558	931,271
Research	349,096	6%	370,042	413,390	438,194	464,486	492,355	521,896	553,210	586,402	621,586	658,882
Patient Care	538,246	6%	570,541	625,591	661,007	700,667	742,707	787,270	834,506	884,576	937,651	993,910
Total	2,102,866		2,229,037	2,399,585	2,543,560	2,696,174	2,857,944	3,029,421	3,211,186	3,403,857	3,608,088	3,824,574
DIRECT & INDIRECT EXPENSES												
Medical Teaching	2,568,735	6%	2,722,859	3,264,872	3,460,764	3,668,410	3,888,515	4,121,826	4,369,135	4,631,283	4,909,160	5,203,710
Resident/Other Teaching	1,837,032	6%	1,947,254	2,396,523	2,540,315	2,692,734	2,854,298	3,025,556	3,207,089	3,399,514	3,603,485	3,819,694
Research	1,208,002	6%	1,280,482	1,652,987	1,752,166	1,857,296	1,968,734	2,086,858	2,212,069	2,344,794	2,485,481	2,634,610
Patient Care	2,178,307	6%	2,309,006	2,909,968	3,084,566	3,269,640	3,465,818	3,673,767	3,894,193	4,127,845	4,375,515	4,638,046
Total	7,792,076		8,259,601	10,224,350	10,837,811	11,488,079	12,177,364	12,908,006	13,682,486	14,503,436	15,373,642	16,296,060
PROJECTION OF REVENUES												
State Funds	**3,436,572[a]**		**3,948,891**	**6,593,473**	**6,974,905**	**7,364,086**	**7,789,982**	**8,231,445**	**8,687,208**	**9,155,481**	**9,633,830**	**10,119,035**
Federal Capitation Grant	60,348	-	0	0	0	0	0	0	0	0	0	0
Federal Other Funds	1,068,862	3%	1,100,928	1,133,956	1,167,974	1,203,014	1,239,104	1,276,277	1,314,565	1,354,002	1,394,622	1,436,461
Veterans Admin. Grant	1,829,592	-	1,829,592	992,6709	1,052,230	1,115,364	1,182,285	1,253,223	1,328,416	1,408,121	1,492,608	1,582,165
Private Funds[b]	94,549	3%	97,385	100,307	103,316	106,416	109,608	112,896	116,283	119,772	123,365	127,066
Tuition-Medical School[c]	57,922[d]	20%	70,464[e]	70,464	89,626	114,463	137,355	164,826	197,792	237,350	284,820	341,784
Tuition-State[c]			135,400[e]	175,536	222,998	285,051	342,061	410,473	492,568	591,082	709,298	851,157
Financial Aid	20,733	3%	21,355	21,996	22,656	23,335	24,035	24,756	25,499	26,264	27,052	27,863
Medical Practice Plan	865,403	6%	917,327	972,367	1,030,709	1,092,551	1,158,104	1,227,591	1,301,246	1,379,321	1,462,080	1,549,805
Marshall U. Foundation[f]	145,587	6%	154,322	163,582	173,396	183,800	194,828	206,518	218,909	232,044	245,966	260,724
Total	7,579,568		8,259,601	10,224,350	10,837,811	11,488,079	12,177,364	12,908,006	13,682,486	14,503,436	15,373,642	16,296,060

* These expenses do not include $106,536 in additional resident/other direct costs (see note 9).

** Based on 1982-83 entering class of 48 students.

a. $2,950,660 state appropriation plus additional general tax-supported state funds.

b. $50,869 excluded. (See Note 9.)

c. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted to account for increases in student enrollment through the year 1985-86 to accommodate a class size of 48. In addition, tuition may double-count financial aid dollars for 1982-83 on.

d. Excludes equipment and carryovers to the next year; includes carryovers from the previous year.

e. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.

f. Family and Community Health Grant ($55,667) excluded. (See Note 9.)

g. While the $1,829,592 VA funds were discontinued in 1982-83, other VA funds were received in 1983-84 in the amount of $992,670 to support the increased faculty size necessary to accommodate the enlarged student enrollment.

NOTE: Totals may differ due to rounding error.

TABLE 32b

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

PROJECTION OF SCHEME 2 - EDUCATIONAL COSTS

DIRECT EXPENSES*	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83**	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	2,051,226	6%	2,174,299	2,737,130	2,901,358	3,075,439	3,259,966	3,455,563	3,662,897	3,882,671	4,115,631	4,362,569
Resident/Other Teaching	1,724,845	6%	1,828,336	2,355,386	2,496,710	2,646,512	2,805,303	2,973,621	3,152,038	3,341,161	3,541,630	3,754,128
Research	858,906	6%	910,441	1,239,596	1,313,972	1,392,811	1,476,379	1,564,962	1,658,860	1,758,391	1,863,895	1,975,728
Patient Care	1,054,234	6%	1,117,488	1,492,652	1,582,211	1,677,144	1,777,773	1,884,439	1,997,505	2,117,356	2,244,397	2,379,061
Total	5,689,211		6,030,563	7,824,765	8,294,251	8,791,906	9,319,420	9,878,585	10,471,301	11,099,579	11,765,553	12,471,486
INDIRECT EXPENSES												
Medical Teaching	759,565	6%	805,139	844,053	894,696	948,378	1,005,280	1,065,597	1,129,533	1,197,305	1,269,143	1,345,292
Resident/Other Teaching	644,397	6%	683,061	730,859	774,711	821,193	870,465	922,693	978,054	1,036,738	1,098,942	1,164,878
Research	349,096	6%	370,042	413,390	438,194	464,486	492,355	521,896	553,210	586,402	621,586	658,882
Patient Care	349,807	6%	370,795	411,283	435,960	462,117	489,844	519,235	550,389	583,412	618,417	655,522
Total	2,102,866		2,229,037	2,399,585	2,543,560	2,696,174	2,857,944	3,029,421	3,211,186	3,403,857	3,608,088	3,824,574
DIRECT & INDIRECT EXPENSES												
Medical Teaching	2,810,791	6%	2,979,439	3,581,183	3,796,054	4,023,817	4,265,246	4,521,161	4,792,430	5,079,976	5,384,775	5,707,861
Resident/Other Teaching	2,369,242	6%	2,511,397	3,086,245	3,271,420	3,467,705	3,675,768	3,896,314	4,130,093	4,377,898	4,640,572	4,919,006
Research	1,208,002	6%	1,280,482	1,652,987	1,752,166	1,857,296	1,968,734	2,086,858	2,212,069	2,344,794	2,485,481	2,634,610
Patient Care	1,404,041	6%	1,488,283	1,903,935	2,018,171	2,139,261	2,267,617	2,403,674	2,547,894	2,700,768	2,862,814	3,034,583
Total	7,792,076		8,259,601	10,224,350	10,837,811	11,488,079	12,177,364	12,908,006	13,682,486	14,503,436	15,373,642	16,296,060
PROJECTION OF REVENUES												
State Funds	**3,436,572[a]**		**3,948,891**	**6,593,473**	**6,974,905**	**7,364,086**	**7,789,982**	**8,231,445**	**8,687,208**	**9,155,481**	**9,633,830**	**10,119,035**
Federal Capitation Grant	60,348	-	0	0	0	0	0	0	0	0	0	0
Federal Other Funds	1,068,862	3%	1,100,928	1,133,956	1,167,974	1,203,014	1,239,104	1,276,277	1,314,565	1,354,002	1,394,622	1,436,461
Veterans Admin. Grant	1,829,592	-	1,829,592	992,6709	1,052,230	1,115,364	1,182,285	1,253,223	1,328,416	1,408,121	1,492,608	1,582,165
Private Funds[b]	94,549	3%	97,385	100,307	103,316	106,416	109,608	112,896	116,283	119,772	123,365	127,066
Tuition-Medical School[c]	57,922[d]	20%	70,464[e]	70,464	89,626	114,463	137,355	164,826	197,792	237,350	284,820	341,784
Tuition-State[c]			135,400[e]	175,536	222,998	285,051	342,061	410,473	492,568	591,082	709,298	851,157
Financial Aid	20,733	3%	21,355	21,996	22,656	23,335	24,035	24,756	25,499	26,264	27,052	27,863
Medical Practice Plan	865,403	6%	917,327	972,367	1,030,709	1,092,551	1,158,104	1,227,591	1,301,246	1,379,321	1,462,080	1,549,805
Marshall U. Foundation[f]	145,587	6%	154,322	163,582	173,396	183,800	194,828	206,518	218,909	232,044	245,966	260,724
Total	7,579,568		8,259,601	10,224,350	10,837,811	11,488,079	12,177,364	12,908,006	13,682,486	14,503,436	15,373,642	16,296,060

* These expenses do not include $106,536 in additional resident/other direct costs (see note 9).

** Based on 1982-83 entering class of 48 students.

a. $2,950,660 state appropriation plus additional general tax-supported state funds.

b. $50,869 excluded. (See Note 9.)

c. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted to account for increases in student enrollment through the year 1985-86 to accommodate a class size of 48. In addition, tuition may double-count financial aid dollars for 1982-83 on.

d. Excludes equipment and carryovers to the next year; includes carryovers from the previous year.

e. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.

f. Family and Community Health Grant ($55,667) excluded. (See Note 9.)

g. While the $1,829,592 VA funds were discontinued in 1982-83, other VA funds were received in 1983-84 in the amount of $992,670 to support the increased faculty size necessary to accommodate the enlarged student enrollment.

NOTE: Totals may differ due to rounding error.

TABLE 33a

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE
TEN-YEAR PROJECTION OF INSTRUCTIONAL COSTS AND SOURCES OF FINANCING

PROJECTION OF SCHEME 1 - INSTRUCTIONAL COSTS

DIRECT EXPENSES	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	1,403,190	6%	1,487,381	1,576,624	1,671,221	1,771,494	1,877,784	1,990,451	2,109,879	2,236,471	2,370,659	2,512,899
Resident/Other Teaching	15,064	6%	15,968	16,926	17,941	19,018	20,159	21,368	22,650	24,009	25,450	26,977
Research	116,777	6%	123,784	131,211	139,084	147,429	156,275	165,651	175,590	186,125	197,293	209,131
Patient Care	713,657	6%	756,477	801,865	849,977	900,976	955,035	1,012,337	1,073,077	1,137,461	1,205,709	1,278,052
Total	2,248,688		2,383,609	2,526,626	2,678,223	2,838,917	3,009,252	3,189,807	3,381,195	3,584,067	3,799,111	4,027,058
INDIRECT EXPENSES												
Medical Teaching	1,327,020	6%	1,406,642	1,491,040	1,580,503	1,675,333	1,775,853	1,882,404	1,995,348	2,115,069	2,241,973	2,376,491
Resident/Other Teaching	8,359	6%	8,861	9,392	9,956	10,553	11,186	11,857	12,569	13,323	14,122	14,970
Research	174,284	6%	184,741	195,825	207,575	220,029	233,231	247,225	262,058	277,782	294,449	312,116
Patient Care	415,200	6%	440,112	466,519	494,510	524,180	555,631	588,969	624,307	661,765	701,471	743,560
Total	1,924,863		2,040,355	2,162,776	2,292,543	2,430,095	2,575,901	2,730,455	2,894,282	3,067,939	3,252,016	3,447,136
DIRECT & INDIRECT EXPENSES												
Medical Teaching	2,730,210	6%	2,894,023	3,067,664	3,251,724	3,446,827	3,653,637	3,872,855	4,105,226	4,351,540	4,612,632	4,889,390
Resident/Other Teaching	23,423	6%	24,828	26,318	27,897	29,571	31,345	33,226	35,219	37,332	39,572	41,947
Research	291,061	6%	308,525	327,036	346,658	367,458	389,505	412,876	437,648	463,907	491,742	521,246
Patient Care	1,128,857	6%	1,196,589	1,268,384	1,344,487	1,425,156	1,510,666	1,601,305	1,697,384	1,799,227	1,907,180	2,021,611
Total	4,173,551		4,423,964	4,689,402	4,970,766	5,269,012	5,585,153	5,920,262	6,275,478	6,652,006	7,051,127	7,474,194
PROJECTION OF REVENUES												
State Funds	**3,432,230[a]**		**3,493,686**	**3,656,247**	**3,819,475**	**3,982,028**	**4,140,066**	**4,290,437**	**4,429,221**	**4,551,571**	**4,651,519**	**4,721,739**
Federal Capitation Grant	142,503	-	0	0	0	0	0	0	0	0	0	0
Practice Plan Income	114,721	6%	121,604	128,901	136,635	144,833	153,523	162,734	172,498	182,848	193,819	205,448
Other Clinical Income	106,158	6%	112,527	119,279	126,436	134,022	142,063	150,587	159,622	169,200	179,352	190,113
Special Operating Income	157,393	6%	166,837	176,847	187,458	198,705	210,627	223,265	236,661	250,861	265,912	281,867
Financial Aid	146,903	3%	151,310	155,849	160,525	165,341	170,301	175,410	180,672	186,092	191,675	197,425
Tuition-Medical School[b]	169,593	20%	98,400[c]	118,848	143,078	171,694	206,033	247,239	296,687	356,025	427,230	512,676
Tuition-State[b]			256,300[c]	309,432	372,442	446,930	536,316	643,579	772,295	926,754	1,112,105	1,334,526
Gifts	22,621	3%	23,300	23,999	24,719	25,460	26,224	27,011	27,821	28,656	29,515	30,401
Total	4,292,122		4,423,964	4,689,402	4,970,766	5,269,012	5,585,153	5,920,262	6,275,478	6,652,006	7,051,127	7,474,194

a. $3,076,329 state appropriation plus additional general tax support state funds.
b. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted for variance in class size. In addition, tuition may double-count financial aid dollars for years 1982-83 on.
c. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.

NOTE: Totals may differ due to rounding error.

TABLE 33b

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE
TEN-YEAR PROJECTION OF INSTRUCTIONAL COSTS AND SOURCES OF FINANCING

PROJECTION OF SCHEME 2 - EDUCATIONAL COSTS

DIRECT EXPENSES	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	1,598,469	6%	1,694,377	1,796,040	1,903,803	2,018,031	2,139,113	2,267,459	2,403,507	2,547,717	2,700,580	2,862,615
Resident/Other Teaching	14,595	6%	15,471	16,399	17,383	18,426	19,531	20,703	21,945	23,262	24,658	26,137
Research	116,777	6%	123,784	131,211	139,084	147,429	156,275	165,651	175,590	186,125	197,293	209,131
Patient Care	518,846	6%	549,977	582,976	617,954	655,032	694,333	735,993	780,153	826,962	876,580	929,175
Total	2,248,688		2,383,609	2,526,626	2,678,223	2,838,917	3,009,252	3,189,807	3,381,195	3,584,067	3,799,111	4,027,058
INDIRECT EXPENSES												
Medical Teaching	1,385,890	6%	1,469,043	1,557,185	1,650,617	1,749,654	1,854,633	1,965,911	2,083,865	2,208,897	2,341,431	2,481,917
Resident/Other Teaching	7,646	6%	8,105	8,591	9,107	9,653	10,232	10,846	11,497	12,187	12,918	13,693
Research	174,200	6%	184,652	195,731	207,475	219,924	233,119	247,106	261,933	277,649	294,308	311,966
Patient Care	357,127	6%	378,555	401,268	425,344	450,865	477,917	506,592	536,987	569,206	603,359	639,560
Total	1,924,863		2,040,355	2,162,776	2,292,543	2,430,095	2,575,901	2,730,455	2,894,282	3,067,939	3,252,016	3,447,136
DIRECT & INDIRECT EXPENSES												
Medical Teaching	2,984,359	6%	3,163,420	3,353,226	3,554,419	3,767,684	3,993,745	4,233,370	4,487,372	4,756,615	5,042,011	5,344,532
Resident/Other Teaching	22,241	6%	23,576	24,990	26,490	28,079	29,764	31,549	33,442	35,449	37,576	39,830
Research	290,978	6%	308,436	326,943	346,559	367,353	389,394	412,757	437,523	463,774	491,601	521,097
Patient Care	875,973	6%	928,532	984,244	1,043,298	1,105,896	1,172,250	1,242,585	1,317,140	1,396,168	1,479,939	1,568,735
Total (Direct & Indirect)	4,173,551		4,423,964	4,689,402	4,970,766	5,269,012	5,585,153	5,920,262	6,275,478	6,652,006	7,051,127	7,474,194
PROJECTION OF REVENUES												
State Funds	**3,432,230[a]**		**3,493,686**	**3,656,247**	**3,819,475**	**3,982,028**	**4,140,066**	**4,290,437**	**4,429,221**	**4,551,571**	**4,651,519**	**4,721,739**
Federal Capitation Grant	142,503	-	0	0	0	0	0	0	0	0	0	0
Practice Plan Income	114,721	6%	121,604	128,901	136,635	144,833	153,523	162,734	172,498	182,848	193,819	205,448
Other Clinical Income	106,158	6%	112,527	119,279	126,436	134,022	142,063	150,587	159,622	169,200	179,352	190,113
Special Operating Income	157,393	6%	166,837	176,847	187,458	198,705	210,627	223,265	236,661	250,861	265,912	281,867
Financial Aid	146,903	3%	151,310	155,849	160,525	165,341	170,301	175,410	180,672	186,092	191,675	197,425
Tuition-Medical School[b]	169,593	20%	98,400[c]	118,848	143,078	171,694	206,033	247,239	296,687	356,025	427,230	512,676
Tuition-State[b]			256,300[c]	309,432	372,442	446,930	536,316	643,579	772,295	926,754	1,112,105	1,334,526
Gifts	22,621	3%	23,300	23,999	24,719	25,460	26,224	27,011	27,821	28,656	29,515	30,401
Total	4,292,122		4,423,964	4,689,402	4,970,766	5,269,012	5,585,153	5,920,262	6,275,478	6,652,006	7,051,127	7,474,194

a. $3,076,329 state appropriation plus additional general tax support state funds.
b. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted for variance in class size. In addition, tuition may double-count financial aid dollars for years 1982-83 on.
c. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.

NOTE: Totals may differ due to rounding error.

TABLE 34a

WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE
Morgantown, Charleston, and Wheeling
TEN-YEAR PROJECTION OF INSTRUCTIONAL COSTS AND SOURCES OF FINANCING

PROJECTION OF SCHEME 1 - INSTRUCTIONAL COSTS

DIRECT EXPENSES	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	5,392,666	6%	5,716,226	6,059,199	6,422,751	6,808,116	7,216,603	7,649,600	8,108,576	8,595,090	9,110,796	9,657,443
Resident/Other Teaching	6,078,129	6%	6,442,816	6,829,385	7,239,148	7,673,497	8,133,907	8,621,941	9,139,258	9,687,613	10,268,870	10,885,002
Research	6,133,397	6%	6,501,401	6,891,485	7,304,974	7,743,272	8,207,869	8,700,341	9,222,361	9,775,703	10,362,245	10,983,980
Patient Care	7,729,068	6%	8,192,812	8,684,381	9,205,444	9,757,770	10,343,236	10,963,831	11,621,661	12,318,960	13,058,098	13,841,584
Total	25,333,259		26,853,255	28,464,450	30,172,317	31,982,656	33,901,616	35,935,713	38,091,855	40,377,367	42,800,009	45,368,009
INDIRECT EXPENSES												
Medical Teaching	850,939	6%	901,995	956,115	1,013,482	1,074,291	1,138,748	1,207,073	1,279,497	1,356,267	1,437,643	1,523,902
Resident/Other Teaching	1,047,889	6%	1,110,762	1,177,408	1,248,052	1,322,935	1,402,312	1,486,450	1,575,637	1,670,176	1,770,386	1,876,609
Research	713,205	6%	755,998	801,358	849,439	900,405	954,430	1,011,696	1,072,397	1,136,741	1,204,946	1,277,242
Patient Care	966,138	6%	1,024,106	1,085,553	1,150,686	1,219,727	1,292,911	1,370,485	1,452,715	1,539,877	1,632,270	1,730,206
Total	3,578,171		3,792,861	4,020,433	4,261,659	4,517,359	4,788,400	5,075,704	5,380,246	5,703,061	6,045,245	6,407,960
DIRECT & INDIRECT EXPENSES												
Medical Teaching	6,243,605	6%	6,618,221	7,015,314	7,436,233	7,882,407	8,355,352	8,856,673	9,388,073	9,951,357	10,548,439	11,181,345
Resident/Other Teaching	7,126,017	6%	7,553,578	8,006,793	8,487,201	8,996,433	9,536,219	10,108,392	10,714,895	11,357,789	12,039,256	12,761,612
Research	6,846,602	6%	7,257,399	7,692,842	8,154,413	8,643,678	9,162,298	9,712,036	10,294,759	10,912,444	11,567,191	12,261,222
Patient Care	8,695,206	6%	9,216,919	9,769,934	10,356,130	10,977,497	11,636,147	12,334,316	13,074,375	13,858,838	14,690,368	15,571,790
Total	28,911,431		30,646,116	32,484,883	34,433,976	36,500,015	38,690,016	41,011,417	43,472,102	46,080,428	48,845,254	51,775,969
PROJECTION OF REVENUES												
State Funds[a]	**14,990,532**		**15,860,691**	**16,872,864**	**17,942,204**	**19,067,752**	**20,247,251**	**21,480,521**	**22,766,664**	**24,103,885**	**25,489,264**	**26,918,845**
Grants and Contracts	4,105,926	3%	4,229,104	4,355,977	4,486,656	4,621,256	4,759,894	4,902,690	5,049,771	5,201,264	5,357,302	5,518,021
Practice Plan Income[a]	9,375,602	6%	9,938,138	10,534,426	11,166,492	11,836,482	12,546,670	13,299,471	14,097,439	14,943,285	15,839,882	16,790,275
Financial Aid	90,259	3%	92,967	95,756	98,628	101,587	104,635	107,774	111,007	114,337	117,768	121,301
Tuition-Medical School[b]	208,800	20%	354,400[c]	432,576	521,741	626,089	751,307	901,568	1,081,882	1,298,258	1,557,910	1,869,492
Tuition-State[b]			75,100[c]	91,824	110,707	132,849	159,418	191,302	229,562	275,475	330,570	396,684
Other	90,299	6%	95,717	101,460	107,548	114,000	120,840	128,091	135,776	143,923	152,558	161,712
Total	28,861,418		30,646,116	32,484,883	34,433,976	36,500,015	38,690,016	41,011,417	43,472,102	46,080,428	48,845,254	51,775,969

a. See WVU, Note 13
b. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted for variance in class size. In addition, tuition may double-count financial aid dollars for years 1982-83 on.
c. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.
NOTE: Totals may differ due to rounding error.

TABLE 34b

WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE
Morgantown, Charleston, and Wheeling
TEN-YEAR PROJECTION OF EDUCATIONAL COSTS AND SOURCES OF FINANCING

PROJECTION OF SCHEME 2 - EDUCATIONAL COSTS

DIRECT EXPENSES	BASE YEAR 1981-82	% Incr. Compounded per Year	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Medical Teaching	6,410,836	6%	6,795,486	7,203,215	7,635,408	8,093,532	8,579,144	9,093,893	9,639,526	10,217,898	10,830,972	11,480,830
Resident/Other Teaching	8,726,226	6%	9,249,799	9,804,787	10,393,075	11,016,659	11,677,659	12,378,318	13,121,017	13,908,278	14,742,775	15,627,342
Research	6,133,398	6%	6,501,402	6,891,486	7,304,975	7,743,274	8,207,870	8,700,342	9,222,363	9,775,705	10,362,247	10,983,982
Patient Care	4,062,800	6%	4,306,568	4,564,962	4,838,860	5,129,191	5,436,943	5,763,159	6,108,949	6,475,486	6,864,015	7,275,856
Total	25,333,259		26,853,255	28,464,450	30,172,317	31,982,656	33,901,616	35,935,713	38,091,855	40,377,367	42,800,009	45,368,009
INDIRECT EXPENSES												
Medical Teaching	980,966	6%	1,039,824	1,102,214	1,168,346	1,238,447	1,312,754	1,391,519	1,475,011	1,563,511	1,657,322	1,756,761
Resident/Other Teaching	1,396,853	6%	1,480,664	1,569,504	1,663,674	1,763,494	1,869,304	1,981,462	2,100,350	2,226,371	2,359,953	2,501,551
Research	692,833	6%	734,403	778,467	825,175	874,686	927,167	982,797	1,041,765	1,104,271	1,170,527	1,240,759
Patient Care	507,519	6%	537,970	570,248	604,463	640,731	679,175	719,925	763,121	808,908	857,443	908,889
Total	3,578,171		3,792,861	4,020,433	4,261,659	4,517,359	4,788,400	5,075,704	5,380,246	5,703,061	6,045,245	6,407,960
DIRECT & INDIRECT EXPENSES												
Medical Teaching	7,391,802	6%	7,835,310	8,305,429	8,803,754	9,331,980	9,891,898	10,485,412	11,114,537	11,781,409	12,488,294	13,237,591
Resident/Other Teaching	10,123,079	6%	10,730,463	11,374,291	12,056,749	12,780,154	13,546,963	14,359,781	15,221,367	16,134,649	17,102,728	18,128,892
Research	6,826,231	6%	7,235,805	7,669,953	8,130,150	8,617,959	9,135,037	9,683,139	10,264,128	10,879,975	11,532,774	12,224,740
Patient Care	4,570,319	6%	4,844,538	5,135,210	5,443,323	5,769,922	6,116,118	6,483,085	6,872,070	7,284,394	7,721,458	8,184,745
Total	28,911,431		30,646,116	32,484,883	34,433,976	36,500,015	38,690,016	41,011,417	43,472,102	46,080,428	48,845,254	51,775,969
PROJECTION OF REVENUES												
State Funds[a]	**14,990,532**		**15,860,691**	**16,872,864**	**17,942,204**	**19,067,752**	**20,247,251**	**21,480,521**	**22,766,664**	**24,103,885**	**25,489,264**	**26,918,845**
Grants and Contracts	4,105,926	3%	4,229,104	4,355,977	4,486,656	4,621,256	4,759,894	4,902,690	5,049,771	5,201,264	5,357,302	5,518,021
Practice Plan Income[a]	9,375,602	6%	9,938,138	10,534,426	11,166,492	11,836,482	12,546,670	13,299,471	14,097,439	14,943,285	15,839,882	16,790,275
Financial Aid	90,259	3%	92,967	95,756	98,628	101,587	104,635	107,774	111,007	114,337	117,768	121,301
Tuition-Medical School[b]	208,800	20%	354,400[c]	432,576	521,741	626,089	751,307	901,568	1,081,882	1,298,258	1,557,910	1,869,492
Tuition-State[b]			75,100[c]	91,824	110,707	132,849	159,418	191,302	229,562	275,475	330,570	396,684
Other	90,299	6%	95,717	101,460	107,548	114,000	120,840	128,091	135,776	143,923	152,558	161,712
Total	28,861,418		30,646,116	32,484,883	34,433,976	36,500,015	38,690,016	41,011,417	43,472,102	46,080,428	48,845,254	51,775,969

a. See WVU, Note 13
b. Tuition dollars have been disaggregated into portions that go to the medical school and those that go to the state and have been adjusted for variance in class size. In addition, tuition may double-count financial aid dollars for years 1982-83 on.
c. May overstate revenue because these fees may include equipment purchases that are excluded in the model. Any shortfall would have to be met by an increase in state funding.
NOTE: Totals may differ due to rounding error.

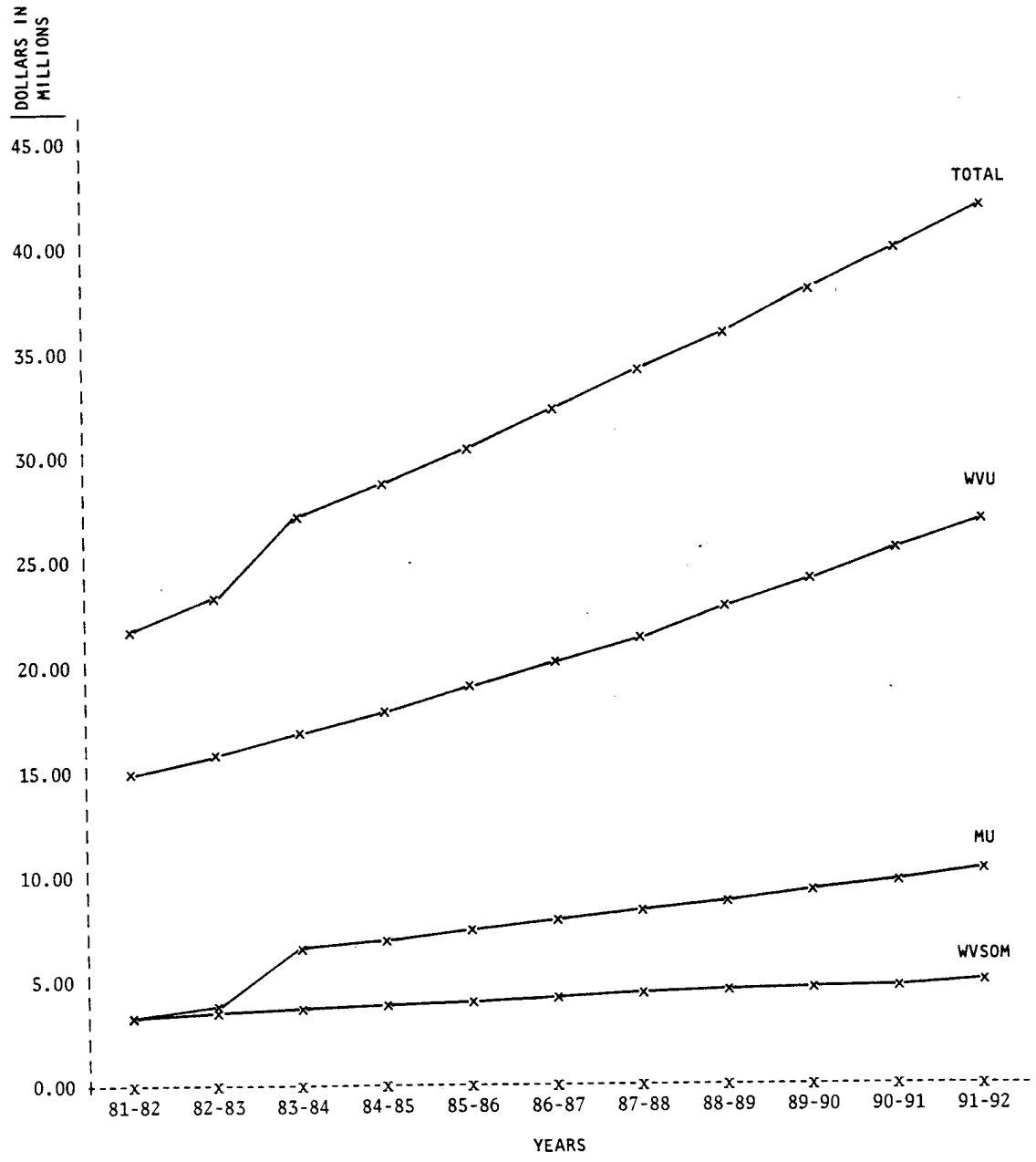

Figure 12: Ten-Year Projection of West Virginia State Appropriations for Medical Education

Table 35

Ten-Year Projection of the Costs of Medical Education Per School

Medical Student Instructional Costs

Year	Total	MU	WVSOM	WVU
81-82	11,542,550	2,568,735	2,730,210	6,243,605
82-83	12,235,103	2,722,859	2,894,023	6,618,221
83-84	13,347,850	3,264,872	3,067,664	7,015,314
84-85	14,148,721	3,460,764	3,251,724	7,436,233
85-86	14,997,644	3,668,410	3,446,827	7,882,407
86-87	15,897,504	3,888,515	3,653,637	8,355,352
87-88	16,851,354	4,121,826	3,872,855	8,856,673
88-89	17,862,434	4,369,135	4,105,226	9,388,073
89-90	18,934,180	4,631,283	4,351,540	9,951,357
90-91	20,070,231	4,909,160	4,612,632	10,548,439
91-92	21,274,445	5,203,710	4,889,390	11,181,345

Medical Student Educational Costs

Year	Total	MU	WVSOM	WVU
81-82	13,186,952	2,810,791	2,984,359	7,391,802
82-83	13,978,169	2,979,439	3,163,420	7,835,310
83-84	15,239,838	3,581,183	3,353,226	8,305,429
84-85	16,154,227	3,796,054	3,554,419	8,803,754
85-86	17,123,481	4,023,817	3,767,684	9,331,980
86-87	18,150,889	4,265,246	3,993,745	9,891,898
87-88	19,239,943	4,521,161	4,233,370	10,485,412
88-89	20,394,339	4,792,430	4,487,372	11,114,537
89-90	21,618,000	5,079,976	4,756,615	11,781,409
90-91	22,915,080	5,384,775	5,042,011	12,488,294
91-92	24,289,984	5,707,861	5,344,532	13,237,591

State Expenditures

Year	Total	MU	WVSOM	WVU
81-82	21,859,334	3,436,572	3,432,230	14,990,532
82-83	23,303,268	3,948,891	3,493,686	15,860,691
83-84	27,122,584	6,593,473	3,656,247	16,872,864
84-85	28,736,584	6,974,905	3,819,475	17,942,204
85-86	30,413,866	7,364,086	3,982,028	19,067,752
86-87	32,177,299	7,789,982	4,140,066	20,247,251
87-88	34,002,403	8,231,445	4,290,437	21,480,521
88-89	35,883,093	8,687,208	4,429,221	22,766,664
89-90	37,810,937	9,155,481	4,551,571	24,103,885
90-91	39,774,613	9,633,830	4,651,519	25,489,264
91-92	41,759,619	10,119,035	4,721,739	26,918,845

Table 36
TEN YEAR PROJECTION PER STUDENT COSTS

Instructional Costs Per Student

Year	MARSHALL UNIVERSITY		WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE		WEST VIRGINIA UNIVERSITY	
	Num. of Stud.	Per Stud. Costs	Num. of Stud.	Per Stud. Costs	Num. of Stud.	Per Stud. Costs
81-82	133	19,314	236	11,569	343	18,203
82-83	158	17,233*	237	12,211	345	19,183
83-84	170	19,205	239	12,835	350	20,044
84-85	181	19,120	240	13,549	352	21,126
85-86	192	19,106	240	14,362	352	22,393
86-87	192	20,253	240	15,223	352	23,737
87-88	192	21,468	240	16,137	352	25,161
88-89	192	22,756	240	17,105	352	26,671
89-90	192	24,121	240	18,131	352	28,271
90-91	192	25,569	240	19,219	352	29,967
91-92	192	27,103	240	20,372	352	31,765

Educational Costs Per Student

Year	MARSHALL UNIVERSITY		WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE		WEST VIRGINIA UNIVERSITY	
	Num. of Stud.	Per Stud. Costs	Num. of Stud.	Per Stud. Costs	Num. of Stud.	Per. Stud. Costs
81-82	133	21,134	236	12,646	343	21,550
82-83	158	18,857*	237	13,348	345	22,711
83-84	170	21,066	239	14,030	350	23,730
84-85	181	20,973	240	14,810	352	25,011
85-86	192	22,215	240	15,699	352	26,511
86-87	192	23,548	240	16,641	352	28,102
87-88	192	24,961	240	17,639	352	29,788
88-89	192	26,458	240	18,697	352	31,575
89-90	192	28,046	240	19,819	352	33,470
90-91	192	28,046	240	21,008	352	35,478
91-92	192	29,728	240	22,269	352	37,607

* Cost adjustments for the increased class size of 48 students is incomplete for 1982-83. This figure underrepresents per student costs.

	1981-82	1991-92
WVSOM	11,569	20,372
Marshall	19,314	27,103
WVU	18,203	31,765

The range of projected educational costs per student from 1981-82 to 1991-92 would be:

	1981-82	1991-92
WVSOM	12,646	22,269
Marshall	21,134	29,728
WVU	21,550	37,607

IV. System Outputs

Investments in medical education yield a number of benefits to the citizens of West Virginia. However, the primary purpose of state appropriations for medical education is to prepare physicians to serve the people of the state. Therefore, the status quo and other scenarios have sought to predict the output of the system in terms of the numbers and type of physicians that can be expected to practice in urban and rural settings. These projections are based on past experience and the assumptions specified earlier. The projected number in each of the following categories is shown for each school:

Primary Care/Urban
Primary Care/Rural
Specialty/Urban
Specialty/Rural

Two status quo macro model outputs are presented in this section. The first presents the status quo based on historical data which reflects past policies. This run estimates that on average, 87 of the 198 physicians graduated each year in the state will practice in West Virginia. (See Table 37a.) The second accounts for WVSOM's current policy of enrolling contract students. This run estimates that on average 83 of the physicians graduated each year will practice in West Virginia. (See Table 37b.) The difference between the two runs is minimal. The number of practicing physicians in West Virginia is reduced by less than one percent when contract students are taken into account (5,752 practicing physicians if contract students are accounted for, 5,796 if they are not). Note: All other macro model runs are based on the historical data and prior policies. These practicing physicians are assumed to follow the attrition rates as in the past, from which projections of physician supply over time can be made.

It is important to realize that it may take a student from five to as many as ten years following matriculation in medical school before he/she can practice medicine, so that an investment in medical education may not be felt until that time. Accordingly, state appropriations in 1991-92 could realize the benefits in the twenty-first century.

Table 37a

MACRO MODEL OUTPUT: STATUS QUO SCENARIO

Number of WVA Graduates Practicing in West Virginia
Per Class by Specialty Group and Practice Location

MU Graduates*
Class of 48 Students

SPECIALTY GROUP	BASE YEAR		
	Urban	Rural	Total
Primary Care Specialty Group 1,2,3	6	4	10
Non-Primary Care Specialty Group 4,5,6	13		13
TOTAL	19	4	23

*Assuming MU retention rate is 10% greater than WVU's.

WVSOM Graduates**
Class of 60 Students

Primary Care Specialty Group 1,2,3	8	12	20
Non-Primary Care Specialty Group 4,5,6	5		5
TOTAL	13	12	25

**Assuming WVSOM's retention rate is 20% greater than WVU's.

WVU Graduates
Class of 88 Students

Primary Care Specialty Group 1,2,3	10	7	17
Non-Primary Care Specialty Group 4,5,6	21	1	22
TOTAL	31	8	39

TOTAL NUMBER OF WVA GRADUATES

Primary Care Specialty Group 1,2,3	24	23	47
Non-Primary Care Specialty Group 3,4,5	39	1	40
TOTAL	63	24	87

Table 37b

MACRO MODEL OUTPUT: STATUS QUO SCENARIO ADJUSTING FOR CONTRACT STUDENTS

Number of WVA Graduates on Average Practicing in West Virginia
Per Class by Specialty Group and Practice Location

MU Graduates*
Class of 48 Students

SPECIALTY GROUP	BASE YEAR		
	Urban	Rural	Total
Primary Care Specialty Group 1,2,3	6	4	10
Non-Primary Care Specialty Group 4,5,6	13		13
TOTAL	19	4	23

*Assuming MU retention rate is 10% greater than WVU's.

WVSOM Graduates**
Class of 49 Students†

Primary Care Specialty Group 1,2,3	7	10	17
Non-Primary Care Specialty Group 4,5,6	4		4
TOTAL	11	10	21

**Assuming WVSOM's retention rate is 20% greater than WVU's.
† Excluding contract students (on Average, 11 per year)

WVU Graduates
Class of 88 Students

Primary Care Specialty Group 1,2,3	10	7	17
Non-Primary Care Specialty Group 4,5,6	21	1	22
TOTAL	31	8	39

TOTAL NUMBER OF WVA GRADUATES ON AVERAGE

Primary Care Specialty Group 1,2,3	23	22	44
Non-Primary Care Specialty Group 3,4,5	38	1	39
TOTAL	61	22	83

In 1982 there were 2,532 physicians in West Virginia (387 West Virginia medical school graduates and 2,145 from out of state). The projected total for the year 2000 based on historical data is 5,796 (1,749 West Virginia and 4,047 elsewhere) or one physician per 415 people. Stated another way, West Virginia would have 241 physicians per 100,000 population. The projected total for the year 2000 accounting for contract students is 5,752 (1705 West Virginia and 4,047 elsewhere) or one physician per 418 people or 239 physicians per 100,000 population. As noted in the manpower analysis, this total contrasts with a GMENAC-based estimate of physician requirements in West Virginia for the year 2000 of 4,669 to serve a population of 2.4 million, or one physician per 515 people.

The projection of total physicians in West Virginia by geographic and specialty distribution is shown in Table 38a and 38b. These data do not reflect geographical or specialty need. An overall surplus of physicians in the state could be associated with critical geographic or specialty maldistribution. Such has been the experience in other states.

V. Implications

A. Medical Education: The state medical education system comprises a university medical center and major clinical campus (Morgantown and Charleston, respectively), a Veterans Administration model school of medicine (Huntington), and an osteopathic school of medicine (Lewisburg), each able to pursue its own goals and objectives. Numerous high-quality undergraduate and graduate medical education opportunities for the region and population are provided. The system is currently producing graduates at a rate more than adequate to meet the state's physician manpower needs between the year 1990 and the year 2000. A stable, virtually tuition independent applicant pool is available because of strong economic support from the state's taxpayers.

B. Health Care Delivery: The schools of medical education in West Virginia support a comprehensive delivery system with access to a wide range of quality primary, secondary, and tertiary care. The state has made a substantial economic and political commitment to medical education as a means for providing the state with physicians. Projections based on GMENAC ratios (see Table 31) imply that while there will not be a manpower shortage by 1990, there could be a maldistribution. The projections for the year 2000 indicate an excess of physicians. In the interest of satisfying the population's health care needs, it is necessary that physician's practice be distributed appropriately, both geographically and by specialty. It is possible to have more physicians in the state than are warranted, yet have population groups that are underserved.

C. Economic: The state legislature has indicated that resources are no longer available to sustain the current situation into the future. The major issue is how to reallocate existing resources among the schools, increase public expenditures, or increase revenues from other sources to meet the increasing costs. Regionally, the individual schools of medical education stimulate the economy by providing employment and job security, which in turn stimulate the economy through increased purchasing power and cash flow for other goods and services. For students attending medical schools in West Virginia, educational costs are low; the state currently absorbs most of the

Table 38a

Status Quo Scenario

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	630	307	116	1,533
2000	589	703	317	140	1,749

Non-West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	510	1,028	385	222	2,145
1985	546	1,158	469	276	2,449
1988	583	1,293	554	340	2,770
1991	615	1,429	640	410	3,094
1994	643	1,563	726	482	3,414
1997	674	1,693	815	553	3,735
2000	702	1,811	907	627	4,047

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,323	1,122	669	5,268
2000	1,291	2,514	1,224	767	5,796

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 38b

Status Quo Scenario
Adjusting for WVSOM Contract Students

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates**

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	155	48	800
1991	298	462	207	68	1,035
1994	382	547	254	91	1,274
1997	475	627	282	115	1,499
2000	583	697	286	139	1,705

Non-West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	510	1,028	385	222	2,145
1985	546	1,158	469	276	2,449
1988	583	1,293	554	340	2,770
1991	615	1,429	640	410	3,094
1994	643	1,563	726	482	3,414
1997	674	1,693	815	553	3,735
2000	702	1,811	907	627	4,047

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	709	388	3,570
1991	913	1,891	847	478	4,129
1994	1,025	2,110	980	573	4,688
1997	1,149	2,320	1,097	668	5,234
2000	1,285	2,508	1,193	766	5,752

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

** WVSOM was run with 49 students per year and with adjusted origin percentages.

institutional costs for education, thereby keeping tuition low. Students also have the potential for high future earnings and purchasing power, and for those who remain in West Virginia to practice, they will become some of the state's major taxpayers of the future.

D. Social: The medical schools contribute diversity in terms of education and socio-economic status to the social stratification of the State of West Virginia . Each school offers stability and continuity for its community; as a highly structured social system, it contributes energy, direction, and support to its surrounding social environment. The faculty enjoy recognition, status, and peer involvement characteristic of professional settings. The level of prestige enjoyed is high, and the identity with their institution is generally quite significant. It should be expected that local efforts will be made to preserve this rank and privelige. For students, the social dimension of their medical education and the particular program in which they are enrolled is one of career opportunity and social mobility. Under the status quo scenario, the situation is a relatively stable one for the future. The general population perceives medical education as a social good. However, increasing pressures on the State budget may affect this perception.

E. Psychological: At the state and regional levels, the reputation of the medical schools creates a feeling of pride; this is likely to be greater at the regional level where the identification is stronger. The individual institutions appear to be cohesive units with strong identities, a feature which contributes to their performance but can inhibit efforts to change programs. Likewise, faculty can be resistant to change in what they consider to be already excellent programs. The scenario for change must allay these concerns and convince faculty of the serious consequences of no change. The appeal of the status quo for medical students is its stability--in the schools' curricula, in educational opportunities, and in existing faculty role models. Status quo also assures that no added adjustments are required in an already demanding and stressful medical education program. For the population, there is security in having access to highly respected medical resources.

F. Political: It is politically viable to maintain the status quo in medical education for West Virginia. The geographic distribution of the three schools of medical education and the Charleston clinical campus yields a statewide political balance that should continue to provide both educational opportunities and health care services to the state. This distribution also creates a strong regional base for the medical establishment. However, since each school requires significant resources and must aggressively seek to secure its own support, medical centers come into conflict with one another for legislative appropriation of state revenues, creating pressures that are destined to become increasingly acute as each center seeks to grow in the face of other political priorities; e.g., highways, primary and secondary education, higher education, community development and social programs. Each school understandably views the status quo as a preservation of strong coalitions and carefully nutured political influence; it is also their foundation for continued growth and development. Also, the state medical associations may create pressure to restrict the number of graduates as the number of practitioners saturate the market. Intensified present and potential conflicts can be expected in the near and long-term future as the state legislature weighs priorities.

The West Virginia population presents the ultimate source of political accountability. For several reasons, it seems willing to share a large tax burden for its state's medical education costs. The questions to be addressed are whether the state can increase the cost effectiveness of its dollars, find an alternative means of increasing public funds, or new sources of revenue for medical education.

VI. Conclusion

A careful reading of the status quo reveals a system of medical education in West Virginia destined to be the subject of increasing fiscal stress in the face of a potential surplus of physicians. Budgetary requirements to perpetuate the status quo over the next ten years may require substantial resource allocation trade-off decisions by the state legislature from other sectors of the state's responsibilities. The only viable alternative would appear to be innovations within the system *per se*. These are examined in subsequent scenarios.

Table 39

Marshall University

STATUS QUO:
TUITION AND FEES
TEN-YEAR PROJECTION

	Actual 1981-82 Year 1	Actual 82-83 Year 2	Projected 20% Increase							
			83-84 Year 3	84-85 Year 4	85-86 Year 5	86-87 Year 6	87-88 Year 7	88-89 Year 8	89-90 Year 9	90-91 Year 10
Total Tuition & Fees for WVA Resident	$ 725.30	$1329	$1595	$1914	$2297	$2756	$3307	$3968	$4762	$5714
Dollars to Medical School	320	320	384	461	553	664	796	956	1147	1376
Dollars to State	210	780	936	1123	1348	1617	1941	2329	2795	3354
Total Tuition & Fees for Non-Residents	1805.30	3329	3995	4794	5753	6903	8284	9940	11928	14314
Dollars to Medical School	600	800	960	1152	1382	1659	1991	2389	2867	3440
Dollars to State	1010	2300	2760	3312	3974	4769	5723	6868	8241	9890

Table 40

WVSOM

STATUS QUO:
TUITION AND FEES
TEN-YEAR PROJECTION

	Actual 1981-82 Year 1	Actual 82-83 Year 2	Projected 20% Increase							
			83-84 Year 3	84-85 Year 4	85-86 Year 5	86-87 Year 6	87-88 Year 7	88-89 Year 8	89-90 Year 9	90-91 Year 10
Total Tuition & Fees for WVA Resident	$650	$1312	$1574	$1889	$2267	$2721	$3265	$3918	$4701	$5641
Dollars to Medical School	258	320	384	461	553	664	796	956	1147	1376
Dollars to State	180	780	936	1123	1348	1617	1941	2329	2795	3354
Total Tuition & Fees for Non-Residents	1710	3312	3974	4769	5723	6868	8241	9890	11,868	14,241
Dollars to Medical School	548	800	960	1152	1382	1659	1991	2389	2867	3440
Dollars to State	950	2300	2760	3312	3974	4769	5723	6868	8241	9890

Table 41

WVU

STATUS QUO:
TUITION AND FEES
TEN-YEAR PROJECTION

	Actual 1981-82 Year 1	Actual 82-83 Year 2	Projected 20% Increase							
			83-84 Year 3	84-85 Year 4	85-86 Year 5	86-87 Year 6	87-88 Year 7	88-89 Year 8	89-90 Year 9	90-91 Year 10
Total Tuition & Fees for WVA Resident	$ 782	$1460	$1752	$2102	$2523	$3027	$3633	$4360	$5231	$6278
Dollars to Medical School	354	920	1104	1325	1590	1908	2289	2747	3297	3956
Dollars to State	130	180	216	259	311	373	448	537	645	774
Total Tuition & Fees for Non-Residents	1968	3460	4152	4982	5979	7175	8610	10,332	12,398	14,877
Dollars to Medical School	770	2400	2880	3456	4147	4977	5972	7166	8600	10,320
Dollars to State	900	700	840	1008	1210	1452	1742	2090	2508	3010

Scenario 2

MAINTAIN STATUS QUO
AND INCREASE TUITION

I. Description

A study several years ago found that West Virginia ranked second only to Texas in public per capita support of medical education, while the tuitions were extremely low in comparison to other medical schools in the nation. (See Table 48a at the end of this scenario.) This scenario suggests ways to reduce the State of West Virginia's contribution to medical education costs at the three schools by increasing tuition levels beginning in 1983-84. To guide the Board of Regents and the Legislature in assessing such a policy, the implications of increasing tuition levels are calculated. Two methods of achieving a 10% and 20% reduction of state funds are presented: the aggregate method and the individual method. The **aggregate method** proposes to increase tuition to offset 10% and 20% of the state's share of the combined state costs for all three medical schools, where the students at all schools pay the same amount of increase. The **individual method** suggests that each medical school increase tuition to offset 10% and 20% of its unique share of the state's costs of medical education. This second method would result in significantly different tuition levels at each school, since each school's costs vary significantly.

II. Assumptions

To run Scenario 2, most status quo assumptions are maintained even after the tuition increase is initiated in 1983-1984. (These assumptions are based on trend data, professional judgment, and rational expectations of the research team and staff of the West Virginia Board of Regents and may be challenged and refined in order to rerun the models and revise the scenario accordingly. They are used to ascertain the impact such values would have on model outputs and could be altered to see what magnitude of change in value is necessary to produce a significant change in output.) In addition, the following assumptions regarding student enrollment, applicants from rural and less affluent families, and the choice of specialty practice have been made because a tuition increase may adversely affect these factors. Enrollment size will not change and no students will drop out of medical school as a result of any tuition increase.

Beginning with the freshman class of 1983/84, there will be a slight increase in students from urban areas and a slight decrease in students from rural areas. Specifically, by increasing tuition to reduce the state fund by 10%, students with an urban background will increase by 5%. The underlying assumption is that the poorer rural applicants to medical school will be discouraged from applying. Another assumption is that as tuition increases, there will be a decrease in primary care specialty choices and an increase in the more lucrative non-primary care specialty choices. Specifically, an increase in tuition that reduces the state fund by 10% will decrease primary care specialty choice by 10% and, respectively, a 20% reduction will decrease primary care specialty choice by 15%. The change in specialty choice will be phased in for juniors through freshman due to the amount of tuition increase incurred.

A summary table of the specific assumptions follows.

Table 42
INCREASE TUITION SCENARIO ASSUMPTIONS

Reduction of State Tax Burden	Enrollment	Student Origin ≥10,000	Dropout	Change in Specialty Choice	Phase-in of Change in Specialty Choice
10%	No change	up 2%	0	* down 10%	Seniors, no change Juniors, * down 5% Sophs., * down 5% Fresh., * down 10%
20%	No change	up 5%	0	* down 15%	Seniors, no change Juniors, * down 5% Sophs., * down 10% Fresh., * down 15%

* There will be a decrease in the number of students seeking specialty training in the primary care specialties (internal medicine, family/general practice, and pediatrics)

III. Financial Analysis

The cost savings to the state for this scenario are derived solely from shifting the financial burden from the state to individual students. Tuition is increased in order to reduce the state fund by 10% and 20% respectively. The **aggregate method** distributes the tuition increases equally to students across schools, whereas the **individual method** distributes differential tuition increases which reflect a 10% and 20% savings in each school's state appropriation.

Table 43 presents the savings to the state and tuition increase per student using the **aggregate method** for 1981-82 to 1991-92. The 10% reduction in state funds saves West Virginia $2.71 million in 1983/84 to $4.18 million in 1991-92. The tuition increase per student for a 10% reduction in the state funds ranges from $3,573 in 1983-84 to $5,326 in 1991-92. The 20% reduction in state funds saves West Virginia $5.42 million in 1983/84 to $8.35 million in 1991-92. In order to reduce the state fund by 20%, the per student tuition increase ranges from $7,147 in 1983-84 to $10,653 in 1991-92. Total savings to the state over the eleven-year period for 10% equals $30.77 million and $61.53 million for a 20% reduction.

Tables 44, 45, and 46 present the state savings and individual tuition increases per school for the **individual method.** West Virginia University students would bear the largest tuition increase, Marshall the next largest, and WVSOM the smallest increase. For a 10% reduction in state funds, the tuition increase for West Virginia University ranges from $4,821 in 1983-84 to $7,647 in 1991-92, for Marshall University from $3,879 in 1983-84 to $5,270 in

Table 43

MAINTAIN STATUS QUO, INCREASE TUITION TO REDUCE STATE TAX BURDEN BY 10% and 20%
AGGREGATE METHOD
ALL SCHOOLS

YEAR	STATE FUNDING*	REDUCED STATE FUNDING* 10%	20%	TOTAL TUITION INCREASE* 10%	20%	TOTAL NUMBER OF STUDENTS	TUITION INCREASE PER STUDENT 10%	20%
81-82	21.86	.00	.00	.00	.00	712	0	0
82-83	23.30	.00	.00	.00	.00	740	0	0
83-84	27.12	24.41	21.70	2.71	5.42	759	3,573	7,147
84-85	28.74	25.86	22.99	2.87	5.75	773	3,718	7,435
85-86	30.41	27.37	24.33	3.04	6.08	784	3,879	7,759
86-87	32.18	28.96	25.74	3.22	6.44	784	4,104	8,208
87-88	34.00	30.60	27.20	3.40	6.80	784	4,337	8,674
88-89	35.88	32.29	28.71	3.59	7.18	784	4,577	9,154
89-90	37.81	34.03	30.25	3.78	7.56	784	4,823	9,646
90-91	39.77	35.80	31.82	3.98	7.95	784	5,073	10,147
91-92	41.76	37.58	33.41	4.18	8.35	784	5,326	10,653

* In Millions of Dollars

Table 44

MAINTAIN STATUS QUO, INCREASE TUITION TO REDUCE STATE TAX BURDEN BY 10% and 20%
INDIVIDUAL METHOD
MARSHALL UNIVERSITY

YEAR	STATE FUNDING*	REDUCED STATE FUNDING*		TOTAL TUITION INCREASE*		TOTAL NUMBER OF STUDENTS	TUITION INCREASE PER STUDENT	
		10%	20%	10%	20%		10%	20%
81-82	3.44	.00	.00	.00	.00	133	0	0
82-83	3.95	.00	.00	.00	.00	158	0	0
83-84	6.59	5.93	5.27	.66	1.32	170	3,879	7,757
84-85	6.97	6.28	5.58	.70	1.39	181	3,854	7,707
85-86	7.36	6.63	5.89	.74	1.47	192	3,835	7,671
86-87	7.79	7.01	6.23	.78	1.56	192	4,057	8,115
87-88	8.23	7.41	6.59	.82	1.65	192	4,287	8,574
88-89	8.69	7.82	6.95	.87	1.74	192	4,525	9,049
89-90	9.16	8.24	7.32	.92	1.83	192	4,768	9,537
90-91	9.63	8.67	7.71	.96	1.93	192	5,018	10,035
91-92	10.12	9.11	8.10	1.01	2.02	192	5,270	10,541

* In Millions of Dollars

Table 45

MAINTAIN STATUS QUO, INCREASE TUITION TO REDUCE STATE TAX BURDEN BY 10% and 20%
INDIVIDUAL METHOD
WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE

YEAR	STATE FUNDING*	REDUCED STATE FUNDING* 10%	20%	TOTAL TUITION INCREASE* 10%	20%	TOTAL NUMBER OF STUDENTS	TUITION INCREASE PER STUDENT 10%	20%
81-82	3.43	.00	.00	.00	.00	236	0	0
82-83	3.49	.00	.00	.00	.00	237	0	0
83-84	3.66	3.29	2.92	.37	.73	239	1,530	3,060
84-85	3.82	3.44	3.06	.38	.76	240	1,591	3,183
85-86	3.98	3.58	3.19	.40	.80	240	1,659	3,318
86-87	4.14	3.73	3.31	.41	.83	240	1,725	3,450
87-88	4.29	3.86	3.43	.43	.86	240	1,788	3,575
88-89	4.43	3.99	3.54	.44	.89	240	1,846	3,691
89-90	4.55	4.10	3.64	.46	.91	240	1,896	3,793
90-91	4.65	4.19	3.72	.47	.93	240	1,938	3,876
91-92	4.72	4.25	3.78	.47	.94	240	1,967	3,935

* In Millions of Dollars

Table 46

MAINTAIN STATUS QUO, INCREASE TUITION TO REDUCE STATE TAX BURDEN BY 10% and 20%
INDIVIDUAL METHOD
WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE

YEAR	STATE* FUNDING	REDUCED STATE* FUNDING 10%	20%	TOTAL TUITION* INCREASE 10%	20%	TOTAL NUMBER OF STUDENTS	TUITION INCREASE PER STUDENT 10%	20%
81-82	14.99	.00	.00	.00	.00	343	0	0
82-83	15.86	.00	.00	.00	.00	345	0	0
83-84	16.87	15.19	13.50	1.69	3.37	350	4,821	9,642
84-85	17.94	16.15	14.35	1.79	3.59	352	5,097	10,194
85-86	19.07	17.16	15.25	1.91	3.81	352	5,417	10,834
86-87	20.25	18.22	16.20	2.02	4.05	352	5,752	11,504
87-88	21.48	19.33	17.18	2.15	4.30	352	6,102	12,205
88-89	22.77	20.49	18.21	2.28	4.55	352	6,468	12 936
89-90	24.10	21.69	19.28	2.41	4.82	352	6,848	13,695
90-91	25.49	22.94	20.39	2.55	5.10	352	7,241	14,483
91-92	26.92	24.23	21.53	2.69	5.38	352	7,647	15,295

* In Millions of Dollars

1991-92, and for WVSOM from $1,530 to $1,967. For a 20% reduction in state funds WVU's tuition increases ranges from 9,642 in 1983-84 to $15,295 in 1991-92, MU's tuition increases range from $7,757 in 1983-84 to $10,541 in 1991-92 and WVSOM's range from $3,060 in 1983-84 to $3,935 in 1991-92. The transfer of 20% of the state cost for WVU to tuition increases demonstrates the extraordinary implication of a seemingly small percentage change. This scenario has a principal value in provoking the search for other strategies.

IV. System's Output

Since the mix (urban/rural) of incoming students and specialty choice selection is only altered slightly, the impact of these policies on the system's output is almost negligible. The projections of the number of physicians practicing in urban/rural West Virginia for a 10% and 20% reduction of state funds are given in Tables 47 and 48. Basically, the status quo manpower analysis remains unchanged for this scenario.

V. Implications

A. Medical Education: The implications of a tuition increase for medical education resemble those of status quo, with the added observation that the applicant pool will be tuition dependent. However, a tuition increase to reduce the state funds by 20% using the aggregate method may be too drastic an increase to implement without providing additional financial assistance.

This scenario increases the financial barriers to medical training for state residents. As tuition increases, the students' urban/rural background mix may shift (fewer rural and more urban) based on one's ability to pay, and specialty choice may be affected as students' concern for financial security increases.

The aggregate method pools costs across the three schools rather than exposing the extreme differentials in costs using the individual method.

B. Health Care Delivery: Concern for greater financial security may cause new medical graduates to specialize further. In addition, some studies have indicated that accepting fewer medical students from rural areas tends to reduce the number of physicians more likely to set up a rural practice--an action counter to the goals of West Virginia's Board of Regents. This scenario does not attempt further to increase access to medical care in underserved areas, nor does it actively attempt to attract physicians to underserved areas; in fact, it may reduce the numbers interested in practicing in rural underserved areas.

C. Economic: There are immediate and long-term potential savings of millions of dollars of public funds. For students and families, however, out-of-pocket expenses will be higher. If, as they are able to shift this cost to patients and third-party payers, this scenario may translate into higher health care costs to the population over time. Some tuitions calculated exceed tuition levels of schools contiguous to West Virginia and would be virtually prohibitive to all but the most affluent students.

D. Social: As medical education is affected by a change in the student urban/rural mix, so, too, can one expect possible social implications from fewer low-income applicants. However, for the most part, the implications are similar to the status quo.

E. Psychological: The financial anxieties for medical students may increase.

F. Political: Middle and low-income constituents will bring pressure to bear on their state representatives for better access to medical education.

Table 47

Increase Tuition by 10% of State Fund

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	296	466	216	73	1,051
1994	377	560	263	103	1,303
1997	468	647	294	135	1,544
2000	572	726	299	167	1,764

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	911	1,895	856	483	4,145
1994	1,020	2,123	989	585	4,717
1997	1,142	2,340	1,109	688	5,279
2000	1,274	2,537	1,206	794	5,811

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	-4	3	-2	4	1
1994	-8	10	-8	12	6
1997	-12	17	-13	19	11
2000	-17	23	-18	27	15

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 48

Increase Tuition by 20% of State Fund

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	295	469	214	75	1,053
1994	374	569	258	108	1,309
1997	463	662	285	144	1,554
2000	566	746	286	181	1,779

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	910	1,898	854	485	4,147
1994	1,017	2,132	984	590	4,723
1997	1,137	2,355	1,100	697	5,289
2000	1,268	2,557	1,193	808	5,826

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	-5	6	-4	6	3
1994	-11	19	-13	17	12
1997	-17	32	-22	28	21
2000	-23	43	-31	41	30

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 48a

TUITION AND FEES*
ALLOPATHIC AND OSTEOPATHIC MEDICAL SCHOOLS
TO INCLUDE STATES CONTIGUOUS TO WEST VIRGINIA

	RESIDENT	NON-RESIDENT
ALABAMA		
a. University of Alabama in Birmingham School of Medicine	$3,786	$11,568
b. University of South Alabama College of Medicine	3,941	7,541
ARKANSAS		
a. University of Arkansas College of Medicine	2,725	5,375
FLORIDA		
a. University of Florida College of Medicine	2,133	4,859
b. University of South Florida College of Medicine	1,580	3,784
GEORGIA		
a. Medical College of Georgia School of Medicine	2,052	4,104
KENTUCKY		
a. University of Kentucky College of Medicine	2,404	4,790
b. University of Louisville School of Medicine	2,435	4,819
LOUISIANA		
a. Louisiana State College School of Medicine, New Orleans	2,070	6,820
b. Louisiana University School of Medicine, Shreveport	2,070	6,820
MARYLAND		
a. University of Maryland School of Medicine	2,011	3,707
MISSISSIPPI		
a. University of Mississippi School of Medicine	3,111	9,111
NORTH CAROLINA		
a. East Carolina University School of Medicine	1,268	3,086
b. University of North Carolina at Chapel Hill School of Medicine	1,243	3,061
OHIO		
a. University of Cincinnati College of Medicine	5,166	7,986
b. Medical College of Ohio at Toledo	4,575	6,225
c. Northeastern Ohio Universities College of Medicine	3,510	6,660
d. Ohio State University College of Medicine	3,627	7,827
e. Wright State University School of Medicine	3,990	7,980
f. Ohio University Osteopathic School	4,050	5,841
PENNSYLVANIA		
a. Pennsylvania State University College of Medicine	6,681	10,437
b. University of Pittsburgh School of Medicine	9,664	14,464
c. Temple University School of Medicine	8,780	12,070
SOUTH CAROLINA		
a. Medical University of South Carolina College of Medicine	1,850	4,000
b. University of South Carolina School of Medicine	2,030	4,010
TENNESSEE		
a. University of Tennessee College of Medicine	3,492	5,772
TEXAS		
a. Texas A & M University College of Medicine	859	1,459
b. Texas Tech University Health Sciences Center School of Medicine	400	1,000
c. University of Texas Southwestern Medical School at Dallas	300	900
d. University of Texas Medical School at Galveston	400	1,200
e. University of Texas Medical School at Houston	400	1,200
f. University of Texas Medical School at San Antonio	300	900
VIRGINIA		
a. Virginia Commonwealth University Medical College of Virginia	4,074	7,224
b. University of Virginia School of Medicine	3,946	8,146
WEST VIRGINIA		
a. Marshall University School of Medicine	1,330	3,330
b. West Virginia University School of Medicine	1,460	3,460
c. West Virginia School of Osteopathic Medicine	1,312	3,312

*Source: January, 1983, telephone interview conducted by the West Virginia Board of Regents.

Scenario 3

INCREASE TUITION AND ESTABLISH A STATE REVOLVING LOAN FUND WITH AND WITHOUT FORGIVENESS

I. Description

As the federal government's role in subsidizing medical education initiatives faces increased scrutiny, states are assuming a greater role in resolving problems of medical underservice. In fact, over the past decade, states are shifting from an emphasis on expanding medical education programs to one of developing programs that assure adequate statewide distribution of physician manpower. As of December, 1981, twenty-seven states in the nation had financial incentive programs for medical students set in place, which consisted of loan programs with and/or without service obligations (204).

In this scenario, the State of West Virginia addresses two primary policy issues: rising state costs of medical education, and geographic and specialty maldistribution. The first component, as in scenario two, increases tuition at the three West Virginia schools of medical education in three separate runs in order to reduce the annual state appropriations for medical education by 10%, 20% and 30%. The second component of the scenario establishes a revolving loan tuition fund for allopathic and osteopathic students that reduces financial barriers to medical training for state residents. In the long term, the revolving loan fund would transfer a portion of the costs of medical education from the taxpayer to the practicing physician. In the short term, the savings to the state would be minimal depending on the size of loans, administrative costs and the amortization schedule. Further, the legislature could establish policies that would forgive some or all of a loan if the student specializes in a priority specialty or sets up practice in a rural community or an urban underserved area. The fund with forgiveness options could thus be used as a strategy to address one of the major concerns of the state legislature; i.e., the distribution of physicians in rural communities or priority specialties. Thus, this scenario attempts to present a method for offsetting the impact of tuition increases and for possibly influencing physicians to practice in underserved areas.

II. Assumptions

It is assumed that the tuition increase and tuition loan program will be initiated in 1983/84. Tuition will be increased to recover ten percent, twenty percent and thirty percent of the current level of state funds using both the aggregate and individual methods of calculating tuition increases. As noted in Scenario 2, the aggregate method sums the costs for all three schools and then applies the average increase in tuition per student to all schools to offset the reduction in the state funding level. Alternatively, the individual method differentially increases the tuition at each school to offset its share of the state appropriations.

Class enrollment remains the same at all schools. It is assumed that because loans are made available, the urban/rural mix of entrants remains the same and no dropouts result from tuition increases. The revolving loan fund is

such that loans for tuition increase are available only to state residents. This scenario postulates that students need not demonstrate need; students who apply for a loan will receive one for the total amount of the tuition increase. It is assumed that the percentage of the student body requesting loans is dependent on the total amount of tuition increase accrued over the four years of undergraduate education. (See Table 49 below for specific percentages of the class receiving loan.) The tuition loan program is run with and without forgiveness options. It is assumed that the specialty choices will be affected by tuition increases. Without a forgiveness option, non-primary care specialty choices will increase slightly as the total four-year tuition increase incurred is greater than $36,000. The values specified are "what if" values, deemed reasonable by the research team. They are used to examine the potential outcomes of the models. With forgiveness, priority specialty choice and location will be affected based on the following options:

a) 75% of a student's loans will be forgiven for practicing in a West Virginia rural setting in a primary care specialty (specialty group 1, 2, 3).

b) 50% of a student's loans will be forgiven for practicing in a West Virginia rural setting in a non-primary care specialty (group 4, 5, 6).

c) 50% of a student's loans will be forgiven for practicing in a West Virginia urban setting in a primary care specialty (group 1, 2, 3).

d) 0% of a student's loans will be forgiven for practicing in a West Virginia urban setting in a non-primary care specialty (group 4, 5, 6).

(See Table 49 for specific specialty choice changes.) Once again, the selected values represent postulated values to permit the examination of the outputs under these assumptions. These values can be altered. Loans will be repaid over a period of ten years at 10% interest compounded annually. Principal and interest payments of equal installments begin following the conclusion of post-graduate training. It is assumed that the state will be able to collect 80% of loans from students who practice out of state and 100% of unforgiven loans from students who practice within West Virginia after they begin practicing medicine. This assumption is based on the fact that for students who practice out of state, it is unlikely that all students will return their loan. The 80% collection rate represents an estimate of 20% in bad debts. For those who practice in West Virginia, however, it is likely that all loans will be collected, since all physicians must be licensed and thus are more traceable. This analysis has not considered the administrative cost of a loan program which could be treated as an annual, relatively fixed cost. At this time no study has been undertaken to determine the specific location of underserved communities.

III. Financial Analysis

For this scenario, the major cost savings to the state are derived from increasing student tuitions offset by the costs of the loan program. In effect, the desired state fund savings and the number of enrolled students deter-

Table 49

LOAN PROGRAM ASSUMPTIONS FOR PERCENTAGE OF CLASS RECEIVING LOAN AND EFFECT ON SPECIALTY CHOICE

Four Year Cumulative Tuition Increase ($)	% of Class Receiving Loan	Effect on Specialty Choice w/out Forgiveness (% Increase)	Effect on Specialty Choice with Forgiveness (% Increase)			
			(a) 75% Rural	(b) 50% Rural	(c) 50% Urban	(d) 0% Urban
< 6,000	20%	0	0	0	0	0
<12,000	30%	0	0	0	0	0
<18,000	40%	0	0	0	0	0
<24,000	50%	0	3%	0	0	0
<30,000	60%	0	5%	3%	3%	0
<36,000	70%	0	5%	4%	4%	0
<42,000	80%	3% ★	6%	5%	5%	0
<48,000	90%	3% ★	7%	6%	6%	0
⩾48,000	95%	5% ★	10%	7%	7%	0

(a) 75% of loans will be forgiven for practicing in a West Virginia rural setting in a primary care specialty (specialty group 1,2,3).

(b) 50% of loans will be forgiven for practicing in a West Virginia rural setting in a non-primary care specialty (group 4,5,6).

(c) 50% of loans will be forgiven for practicing in a West Virginia urban setting in a primary care specialty (group 1,2,3).

(d) 0% of loans will be forgiven for practicing in a West Virginia urban setting in a non-primary care specialty (group 4,5,6).

★ Non-primary care specialty groups (4,5,6).

mines the tuition increase per student. The tuition costs per student accrued over four years determines the number of students requiring loans which then determines the amount of state funds needed for the loan program. The long-term costs of the loan program, excluding opportunity costs, are merely the 20% assumed bad debt from those students practicing out of the state and the amount forgiven when the forgiveness options are available. However, there is a cash flow lag since the loan is repaid over a ten-year period, with repayment beginning following the end of the student's post-graduate training (a minimum of three years after graduation).

Figure 13 depicts the interaction of variables involved in the loan cash flow model. The diamond blocks represent three major decision points which greatly affect the final output of the scenario: 1) the amount of state fund savings desired, 2) the percent of students requiring loans, and 3) the specific terms of the loan regarding interest level, payback, forgiveness and bad debt variables.

The financial analysis, using the assumptions specified in Section II will be presented below. The analysis entails three segments: a) tuition increases, b) cash flow, and c) state fund savings.

a) Tuition Increases

Tuition is increased in order to reduce the state general revenue fund appropriation to finance medical education by 10%, 20% and 30% respectively using both the aggregate and individual methods. Table 50 presents the annual tuition increases per method and percentage of state fund reduction. The tuition increase per student using the aggregate method ranges from $3,573 in 1983/84 for a 10% reduction in state funds to $10,720 in 1983/84 for a 30% reduction. Using the individual method, West Virginia University bears the largest tuition increase, Marshall the next largest, and WVSOM the smallest increase. West Virginia University's tuition increase in 1983/84 ranges from $4,821 for a 10% reduction in state funds to $14,462 for a 30% reduction in state funds. Marshall University's tuition increase in 1983/84 ranges from $3,879 for a 10% reduction to $11,636 increase for a 30% reduction. West Virginia School of Osteopathic Medicine's tuition increase in 1983/84 ranges from $1,530 for a 10% reduction to $14,589 for a 30% reduction.

b) Cash Flow

Cash flow of the loan program is analyzed with and without forgiveness options. Tables 51 & 52 present the loan program cash flow and savings from the status quo state appropriations over the ten-year period from 1983/84 through 1992/93 using both the aggregate and individual method to compute tuition increase. For example, see Table 51: a 10% reduction using the aggregate method in 1992/93 reduces the gross state fund cost for education by about $4.33 million. However, $1.93 million will be loaned out; $.36 million from previous years will be returned in this year. Therefore, the net cash loan flow is $1.93 minus $.36 million or $1.57 million. The net state fund savings for that year is equal to $4.83 million minus $1.57 million or $2.76 million. In general, the savings for each option decrease for about five years and then increase for the next five years as the difference between the loan given out and the amount of loan repaid becomes a smaller percentage of the status quo state fund reduction. Savings will increase over time as the amount of the loan repaid becomes more substantial.

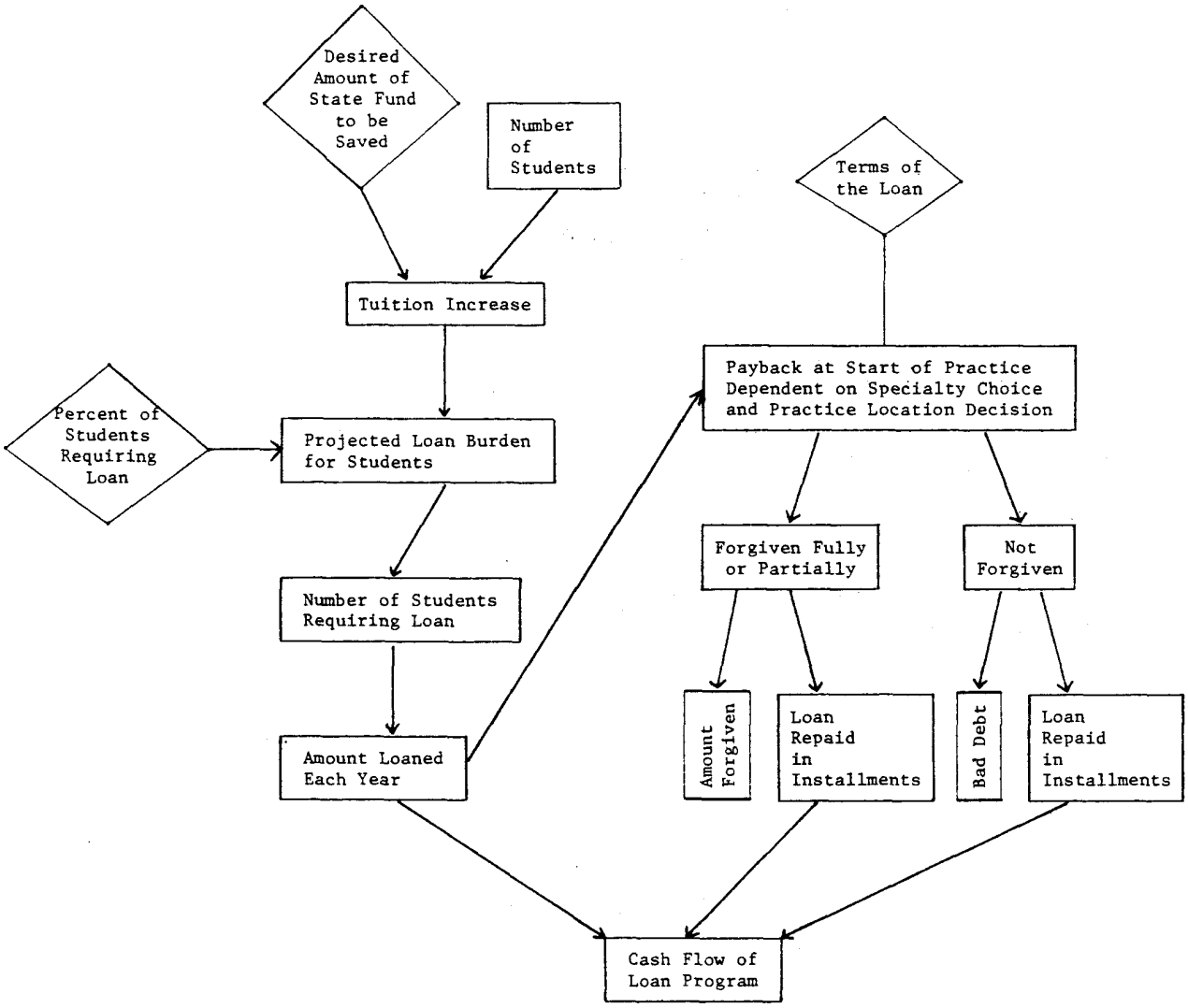

Figure 13: The Loan Cash Flow Model

Table 50

TUITION INCREASES PER STUDENT

YEAR	AGGREGATE METHOD			INDIVIDUAL METHOD								
				WVU			MARSHALL			WVSOM		
	% State Fund Reduced			% State Fund Reduced			% State Fund Reduced			% State Fund Reduced		
	10%	20%	30%	10%	20%	30%	10%	20%	30%	10%	20%	30%
83-84	3,573	7,147	10,720	4,821	9,642	14,462	3,879	7,757	11,636	1,530	3,060	4,589
84-85	3,718	7,435	11,153	5,097	10,194	15,292	3,854	7,707	11,561	1,591	3,183	4,774
85-86	3,879	7,759	11,638	5,417	10,834	16,251	3,835	7,671	11,506	1,659	3,318	4,978
86-87	4,104	8,208	12,313	5,752	11,504	17,256	4,057	8,115	12,172	1,725	3,450	5,175
87-88	4,337	8,674	13,011	6,102	12,205	18,307	4,287	8,574	12,862	1,788	3,575	5,363
88-89	4,577	9,154	13,731	6,468	12,936	19,403	4,525	9,049	13,574	1,846	3,691	5,537
89-90	4,823	9,646	14,468	6,848	13,695	20,543	4,768	9,537	14,305	1,896	3,793	5,689
90-91	5,073	10,147	15,220	7,241	14,483	21,724	5,018	10,035	15,053	1,938	3,876	5,814
91-92	5,326	10,653	15,979	7,647	15,295	22,942	5,270	10,541	15,811	1,967	3,935	5,902

Table 51

CASH FLOW OF LOAN WITH FORGIVENESS

PERCENT SAVINGS OF STATE FUND	YEAR	AMOUNT SAVED FROM FUND	AGGREGATE METHOD TO COMPUTE TUITION INCREASE				INDIVIDUAL METHOD TO COMPUTE TUITION INCREASE			
			LOAN GIVEN OUT	AMOUNT RETURNED	NET CASH FLOW	NET SAVINGS	LOAN GIVEN OUT	AMOUNT RETURNED	NET CASH FLOW	NET SAVINGS
10%	83/84	2,712,258	483,924	0	- 483,924	2,228,334	496,276	0	- 496,276	2,215,982
	84/85	2,873,658	769,755	0	- 769,755	2,103,903	758,274	0	- 758,274	2,115,384
	85/86	3,041,387	815,402	1,894	- 813,508	2,227,879	979,797	811	- 978,986	2,062,401
	86/87	3,217,730	1,150,240	7,615	-1,142,625	2,075,105	1,332,765	2,419	-1,330,346	1,887,384
	87/88	3,400,240	1,215,482	15,953	-1,199,529	2,200,711	1,410,242	4,775	-1,405,466	1,994,774
	88/89	3,588,309	1,282,711	41,558	-1,241,153	2,347,156	1,490,430	21,873	-1,468,557	2,119,752
	89/90	3,781,094	1,351,625	88,011	-1,263,614	2,517,480	1,796,265	62,953	-1,733,312	2,047,782
	90/91	3,977,461	1,777,276	152,608	-1,624,667	2,352,794	1,985,224	138,668	-1,846,557	2,130,904
	91/92	4,175,926	1,865,957	257,122	-1,608,835	2,567,091	2,089,344	264,033	-1,825,311	2,350,615
	92/93	4,329,877	1,934,748	363,012	-1,571,736	2,758,141	2,184,043	385,019	-1,799,024	2,530,853
20%	83/84	5,424,517	1,451,772	0	-1,451,772	3,972,745	1,430,181	0	-1,430,181	3,994,336
	84/85	5,747,317	2,052,680	0	-2,052,680	3,694,637	2,374,776	0	-2,374,776	3,372,541
	85/86	6,082,773	2,718,007	5,681	-2,712,325	3,370,448	3,362,410	1,621	-3,360,789	2,721,984
	86/87	6,435,460	4,025,840	20,882	-4,004,958	2,430,502	4,675,416	6,520	-4,668,895	1,766,565
	87/88	6,800,481	4,254,186	48,854	-4,205,332	2,595,149	4,949,277	13,656	-4,935,621	1,864,860
	88/89	7,176,619	4,489,488	132,856	-4,356,631	2,819,988	5,233,109	62,663	-5,170,446	2,006,173
	89/90	7,562,188	4,730,688	268,130	-4,462,558	3,099,630	5,749,264	190,228	-5,559,036	2,003,152
	90/91	7,954,923	5,687,283	487,365	-5,199,918	2,755,005	6,245,823	448,187	-5,797,637	2,157,286
	91/92	8,351,852	5,971,063	854,356	-5,116,707	3,235,145	6,575,459	889,914	-5,685,546	2,666,306
	92/93	8,659,753	6,191,193	1,218,543	-4,972,651	3,687,102	6,881,129	1,316,263	-5,564,866	3,094,887
30%	83/84	8,136,775	2,177,658	0	-2,177,658	5,959,117	2,614,000	0	-2,614,000	5,522,775
	84/85	8,620,975	3,848,775	0	-3,848,775	4,772,200	4,259,174	0	-4,259,174	4,361,801
	85/86	9,124,160	5,707,814	8,522	-5,699,292	3,424,868	6,618,138	2,432	-6,615,706	2,508,454
	86/87	9,653,190	7,764,120	36,993	-7,727,127	1,926,063	7,837,529	9,780	-7,827,749	1,825,441
	87/88	10,200,721	8,660,308	95,791	-8,564,517	1,636,204	8,411,382	24,349	-8,387,033	1,813,688
	88/89	10,764,928	9,139,314	243,308	-8,896,006	1,868,922	8,890,771	115,516	-8,775,255	1,989,673
	89/90	11,343,281	9,630,330	504,887	-9,125,443	2,217,838	9,385,048	345,923	-9,039,125	2,304,156
	90/91	11,932,384	10,130,472	963,255	-9,167,217	2,765,167	9,892,063	854,156	-9,037,907	2,894,477
	91/92	12,527,778	10,635,955	1,673,674	-8,962,281	3,565,497	10,408,927	1,585,223	-8,823,705	3,704,073
	92/93	12,989,630	11,028,063	2,397,878	-8,630,186	4,359,444	10,878,301	2,302,145	-8,576,156	4,413,474

Table 52

CASH FLOW OF LOAN WITHOUT FORGIVENESS

PERCENT SAVINGS OF STATE FUND	YEAR	AMOUNT SAVED FROM FUND	AGGREGATE METHOD TO COMPUTE TUITION INCREASE				INDIVIDUAL METHOD TO COMPUTE TUITION INCREASE			
			LOAN GIVEN OUT	AMOUNT RETURNED	NET CASH FLOW	NET SAVINGS	LOAN GIVEN OUT	AMOUNT RETURNED	NET CASH FLOW	NET SAVINGS
10%	83/84	2,712,258	483,924	0	- 483,924	2,228,334	496,276	0	- 496,276	2,215,982
	84/85	2,873,658	769,755	0	- 769,755	2,103,903	758,274	0	- 758,274	2,115,384
	85/86	3,041,387	815,402	2,857	- 812,545	2,228,842	979,797	1,223	- 978,574	2,062,813
	86/87	3,217,730	1,150,240	11,490	-1,138,750	2,078,980	1,332,765	3,650	-1,329,116	1,888,614
	87/88	3,400,240	1,215,482	24,069	-1,191,413	2,208,827	1,410,242	7,205	-1,403,037	1,997,203
	88/89	3,588,309	1,282,711	59,267	-1,223,444	2,364,865	1,490,430	28,980	-1,461,450	2,126,859
	89/90	3,781,094	1,351,625	118,982	-1,232,643	2,548,451	1,796,265	78,982	-1,717,283	2,063,811
	90/91	3,977,461	1,777,276	200,097	-1,577,179	2,400,282	1,985,224	169,765	-1,815,459	2,162,002
	91/92	4,175,926	1,865,957	328,431	-1,537,526	2,638,400	2,089,344	319,323	-1,770,021	2,405,905
	92/93	4,329,877	1,934,748	460,196	-1,474,552	2,855,325	2,184,043	463,622	-1,720,422	2,609,455
20%	83/84	5,424,517	1,451,772	0	-1,451,772	3,972,745	1,430,181	0	-1,430,181	3,994,336
	84/85	5,747,317	2,052,680	0	-2,052,680	3,694,637	2,374,776	0	-2,374,776	3,372,541
	85/86	6,082,773	2,718,007	8,571	-2,709,435	3,373,338	3,362,410	2,446	-3,359,964	2,722,809
	86/87	6,435,460	4,025,840	31,505	-3,994,335	2,441,125	4,675,416	9,838	-4,665,578	1,769,882
	87/88	6,800,481	4,254,186	74,054	-4,180,133	2,620,348	4,949,277	20,604	-4,928,673	1,871,808
	88/89	7,176,619	4,489,488	191,900	-4,297,588	2,879,031	5,233,109	82,658	-5,150,451	2,026,168
	89/90	7,562,188	4,730,688	369,796	-4,360,893	3,201,295	5,749,264	237,355	-5,511,909	2,050,279
	90/91	7,954,923	5,687,283	647,195	-5,040,088	2,914,835	6,245,823	546,856	-5,698,967	2,255,956
	91/92	8,351,852	5,971,063	1,101,197	-4,869,866	3,481,986	6,575,459	1,075,390	-5,500,069	2,851,783
	92/93	8,659,753	6,191,193	1,555,389	-4,635,804	4,023,949	6,881,129	1,585,412	-5,295,717	3,364,036
30%	83/84	8,136,775	2,177,658	0	-2,177,658	5,959,117	2,614,000	0	-2,614,000	5,522,775
	84/85	8,620,975	3,848,775	0	-3,848,775	4,772,200	4,259,174	0	-4,259,174	4,361,801
	85/86	9,124,160	5,707,814	12,857	-5,694,957	3,429,203	6,618,138	3,669	-6,614,469	2,509,691
	86/87	9,653,190	7,764,120	56,150	-7,707,970	1,945,220	7,837,529	14,756	-7,822,773	1,830,417
	87/88	10,200,721	8,660,308	146,412	-8,513,896	1,686,825	8,411,382	36,736	-8,374,645	1,826,076
	88/89	10,764,928	9,139,314	357,355	-8,781,959	1,982,969	8,890,771	152,434	-8,738,337	2,026,591
	89/90	11,343,281	9,630,330	706,040	-8,924,290	2,418,991	9,385,048	433,037	-8,952,011	2,391,270
	90/91	11,932,384	10,130,472	1,289,056	-8,841,416	3,090,968	9,892,063	1,044,255	-8,847,808	3,084,576
	91/92	12,527,778	10,635,955	2,173,464	-8,462,492	4,065,286	10,408,927	1,922,505	-8,486,422	4,041,356
	92/93	12,989,630	11,028,063	3,075,828	-7,952,236	5,037,394	10,878,301	2,784,272	-8,094,029	4,895,601

The ten-year cummulative savings from the status quo state fund under the various loan program options are listed in Table 53. The savings range from $21.46 million to $34.39 million (6% to 10% of the status quo state fund).

Table 53
TEN YEAR CUMULATIVE SAVINGS

Loan Program Scenario	Percentage State Fund Reduced	Method to Calculate Tuition Increase	Ten-Year (1983/84 - 1992/93) Cumulative Savings from Status Quo State Approp. Dollars (in millions)	% of Status Quo State Fund Saved
With Forgiveness	10%	Aggregate	23.38	6.66
		Individual	21.46	6.11
	20%	Aggregate	31.66	9.02
		Individual	25.65	7.31
	30%	Aggregate	32.50	9.26
		Individual	31.34	8.93
Without Forgiveness	10%	Aggregate	23.66	6.74
		Individual	21.65	6.17
	20%	Aggregate	32.60	9.29
		Individual	26.28	7.49
	30%	Aggregate	34.39	9.80
		Individual	32.49	9.26

c) State Funding

Table 54 presents the ten-year analysis of the state fund for a loan program with and without forgiveness and for 10%, 20% and 30% reduction in state funds. In 1983/84, the state fund would be in the low to mid twenties, dependent upon the option chosen, and would increase to the high thirties to low forties by 1991-92.

IV. System Outputs

By the year 2000, the physician supply in West Virginia will be virtually unaffected by the loan program and all tuition increase options. The maximum effect is realized with the loan program with forgiveness and a tuition increase reducing the state fund 30%. This case increases the West Virginia medical student graduates practicing in the state by 3% more than the status quo scenario run in the year 2000. This is due primarily to two factors: one is the long lead time before the benefits of a policy affecting medical students will be realized (between seven and ten years), and the other is that conservative assumptions were used. However, there is a linear relationship between the assumptions made and the output. In future runs, the user-specified

Table 54

STATE FUNDING

WITH/ WITHOUT FORGIVENESS	YEAR	State Funding Without Loan Program	STATE FUNDING WITH % OF STATE FUNDING TARGETED					
			10%		20%		30%	
			Aggregate	Individual	Aggregate	Individual	Aggretate	Individual
WITH	83/84	27,122,585	24,894,250	24,906,602	23,149,840	23,128,249	21,163,468	21,599,809
	84/85	28,736,584	26,632,680	26,621,200	25,041,947	25,364,043	23,964,383	24,374,783
	85/86	30,413,866	28,185,988	28,351,465	27,043,418	27,691,882	26,988,998	27,905,412
	86/87	32,177,299	30,102,194	30,289,916	29,746,798	30,410,735	30,251,236	30,351,858
	87/88	34,002,403	31,801,691	32,007,629	31,407,254	32,137,543	32,366,199	32,188,715
	88/89	35,883,093	33,535,936	33,763,341	33,063,106	33,876,921	34,014,172	33,893,421
	89/90	37,810,938	35,293,458	35,763,156	34,711,309	35,807,786	35,593,099	35,506,781
	90/91	39,774,613	37,421,819	37,643,708	37,019,608	37,617,327	37,009,446	36,880,136
	91/92	41,759,259	39,192,168	39,408,644	38,524,114	39,092,953	38,193,762	38,055,186
	92/93	43,298,766	40,540,625	40,767,914	39,611,664	40,203,879	38,939,322	38,885,292
WITHOUT	83/84	27,122,585	24,894,250	24,906,602	23,149,840	23,128,249	21,163,468	21,599,809
	84/85	28,736,584	26,632,680	26,621,200	25,041,947	25,364,043	23,964,383	24,374,783
	85/86	30,413,866	28,185,024	28,351,053	27,040,528	27,691,057	26,984,663	27,904,175
	86/87	32,177,299	30,098,320	30,288,685	29,736,174	30,407,417	30,232,079	30,346,882
	87/88	34,002,403	31,793,575	32,005,199	31,382,055	32,130,596	32,155,578	32,176,327
	88/89	35,883,093	33,518,228	33,756,234	33,004,063	33,856,926	33,900,124	33,856,503
	89/90	37,810,938	35,262,487	35,747,127	34,609,643	35,760,659	35,391,946	35,419,667
	90/91	39,774,613	37,374,331	37,612,661	36,859,778	37,518,658	36,683,645	36,690,037
	91/92	41,759,259	39,120,859	39,353,354	38,277,273	38,907,476	37,693,973	37,717,903
	92/93	43,298,766	40,443,441	40,689,311	39,274,817	39,934,730	38,261,372	38,403,165

assumptions could be adjusted to increase the output. However, it is important to note once again that the forgiveness option has the potential to address problems of maldistribution of practicing physicians dependent on loan pay-back criteria (see Tables 55 - 66 at the end of this scenario).

V. Implications

A. Medical Education: As with Scenario 2, physician medical specialty choice could be affected with loan repayment considerations for students. However, there should be little overall impact on the character of the undergraduate medical student body. With a loan program, tuition can remain manageable. Long-term debt substitutes for proximal financial barriers to medical training for state residents.

B. Health Care Delivery: There is a possible influence on specialty choice and practice location. The state's manpower shortages and distribution problems could be offset to some extent by loan forgiveness programs. This could result in improved access to care in areas that are currently underserved as the number of primary care physicians in those areas increases.

C. Economic: Taxpayers could benefit in the long run as their portion of the medical education tax burden decreases. Students and their families will have higher out-of-pocket costs, and, as physicians repay their loans, the cost of health care to the community may increase.

D. Social: With legislative appropriations reduced somewhat, the state's burden becomes lighter. Otherwise, social implications are status quo.

E. Psychological: Medical students' financial anxieties will increase, once again affecting specialty choice and practice location.

F. Political: There will be greater political pressure from middle- and low-income families.

Table 55

Loan Fund Without Forgiveness
Increase Tuition by 10% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	630	307	116	1,533
2000	589	703	317	140	1,749

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,323	1,122	669	5,268
2000	1,291	2,514	1,224	767	5,796

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	0	0	0	0
2000	0	0	0	0	0

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 56

Loan Fund Without Forgiveness
Increase Tuition by 10% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	630	307	116	1,533
2000	589	703	317	140	1,749

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,323	1,122	669	5,268
2000	1,291	2,514	1,224	767	5,796

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	0	0	0	0
2000	0	0	0	0	0

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 57

Loan Fund With Forgiveness
Increase Tuition by 10% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	630	308	116	1,534
2000	589	703	319	140	1,751

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,323	1,123	669	5,269
2000	1,291	2,514	1,226	767	5,798

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	0	1	0	1
2000	0	0	2	0	2

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 58

Loan Fund With Forgiveness
Increase Tuition by 10% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	482	630	307	116	1,535
2000	592	703	318	140	1,753

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,156	2,323	1,122	669	5,270
2000	1,294	2,514	1,225	767	5,800

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	2	0	0	0	2
2000	3	0	1	0	4

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 59

Loan Fund Without Forgiveness
Increase Tuition by 20% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	633	307	116	1,536
2000	589	711	317	140	1,757

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,326	1,122	669	5,271
2000	1,291	2,522	1,224	767	5,804

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	3	0	0	3
2000	0	8	0	0	8

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 60

Loan Fund Without Forgiveness
Increase Tuition by 20% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	634	307	116	1,537
2000	589	711	317	140	1,757

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,327	1,122	669	5,272
2000	1,291	2,522	1,224	767	5,804

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	4	0	0	4
2000	0	8	0	0	8

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 61

Loan Fund With Forgiveness
Increase Tuition by 20% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	386	550	272	91	1,299
1997	486	633	311	116	1,546
2000	602	710	326	141	1,779

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,029	2,113	998	573	4,713
1997	1,160	2,326	1,126	669	5,281
2000	1,304	2,521	1,233	768	5,826

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	1	0	1	0	2
1997	6	3	4	0	13
2000	13	7	9	1	30

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 62

Loan Fund With Forgiveness
Increase Tuition by 20% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	386	550	271	91	1,298
1997	485	634	308	116	1,544
2000	599	711	320	141	1,770

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,029	2,113	997	573	4,712
1997	1,159	2,327	1,123	669	5,279
2000	1,301	2,522	1,227	768	5,817

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	1	0	0	0	1
1997	5	4	1	0	11
2000	10	8	3	1	21

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 63

Loan Fund Without Forgiveness
Increase Tuition by 30% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	550	271	91	1,297
1997	480	637	307	116	1,541
2000	589	718	317	141	1,765

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,113	997	573	4,711
1997	1,154	2,330	1,122	669	5,276
2000	1,291	2,529	1,224	768	5,812

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	0	0	0	0
1997	0	7	0	0	8
2000	0	15	0	1	16

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 64

Loan Fund Without Forgiveness
Increase Tuition by 30% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	385	551	271	91	1,298
1997	480	635	307	116	1,539
2000	589	713	317	141	1,760

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,028	2,114	997	573	4,712
1997	1,154	2,328	1,122	669	5,274
2000	1,291	2,524	1,224	768	5,807

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	0	1	0	0	1
1997	0	5	0	0	6
2000	0	10	0	1	11

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.
* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 65

Loan Fund With Forgiveness
Increase Tuition by 30% of State Fund
Aggregate Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	387	550	274	91	1,302
1997	490	637	314	116	1,558
2000	608	718	330	141	1,796

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,030	2,113	1,000	573	4,716
1997	1,164	2,330	1,129	669	5,293
2000	1,310	2,529	1,237	768	5,843

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	2	0	3	0	5
1997	10	7	7	0	25
2000	19	15	13	1	47

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 66

Loan Fund With Forgiveness
Increase Tuition by 30% of State Fund
Individual Method

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	300	463	218	69	1,050
1994	386	551	271	91	1,299
1997	487	635	309	116	1,548
2000	602	713	322	141	1,778

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	915	1,892	858	479	4,144
1994	1,029	2,114	997	573	4,713
1997	1,161	2,328	1,124	669	5,283
2000	1,304	2,524	1,229	768	5,825

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	0	0	0	0	0
1994	1	1	0	0	2
1997	7	5	2	0	15
2000	13	10	5	1	29

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Scenario 4
REDUCE ENROLLMENT

I. Description

The status quo West Virginia state spending for medical education in 1981/82 was approximately $22 million. One way to reduce this expenditure is to cut enrollment. This scenario considers the reduction of enrollment by 10%, 20% and 30% at all three medical institutions, and analyzes the impact of those reductions on cost and system outputs, among others.

II. Assumptions

While enrollments are reduced, it is assumed that the number of residency positions and percentage mix of in-state vs. out-of-state students remains the same. By maintaining the same number of residency positions, the residency opportunities in West Virginia for graduates from out-of-state would increase.

III. Financial Analysis

As class sizes become smaller, required teaching resources decrease, thus providing the major cost saving component of the scenario's financial analysis. On the revenue side, the scenario reduces enrollment at each school, thus reducing the revenues from tuition at the three schools. Moreover, as the required teaching resources decrease, the size of the clinical sciences faculty also decreases. This results in the loss of revenues which are generated by the clinical practice of these faculty. In addition, savings which are purely artifacts of accounting allocations and are fixed costs to the system, are also deducted from the total savings resulting from a reduction in class size. The overall net saving to state funds is a consequence of the interaction of all these cost and revenue components, since the state funds cover the difference between total costs and all other revenue sources. This interaction is illustrated in Figure 14.

Table 67 shows the scenario's financial impact for the three schools, as well as for the system as a whole. This analysis presents a one year snapshot view of the impacts of a full scaled reduction policy-one that affects all four classes of medical students - in status quo deflated dollars. On average, in terms of 1981/82 dollars, the scenario results in net saving of $816 thousand, $1.61 million and $2.39 million annually for 10%, 20% and 30% redction in class size respectively. (This translates into a 3.4%, a 6.8% and a 1% savings from the status quo.) It should be pointed out that reducing enrollment by 10% would results in a savings of $540 thousand at WVU, $202 thousands at MU and $73 thousand at WVSOM. Whereas reducing enrollment by 30% would result in a savings of $1.53 million at WVU, $616 thousand at MU and $251 thousand at WVSOM.

Over a period of ten years, as shown in Table 68, a total cumulative net savings of $7.59 million, $14.91 million, and $21.14 million result from a respective 10%, 20% and 30% reduction of enrollment. In the year 1991/92, the

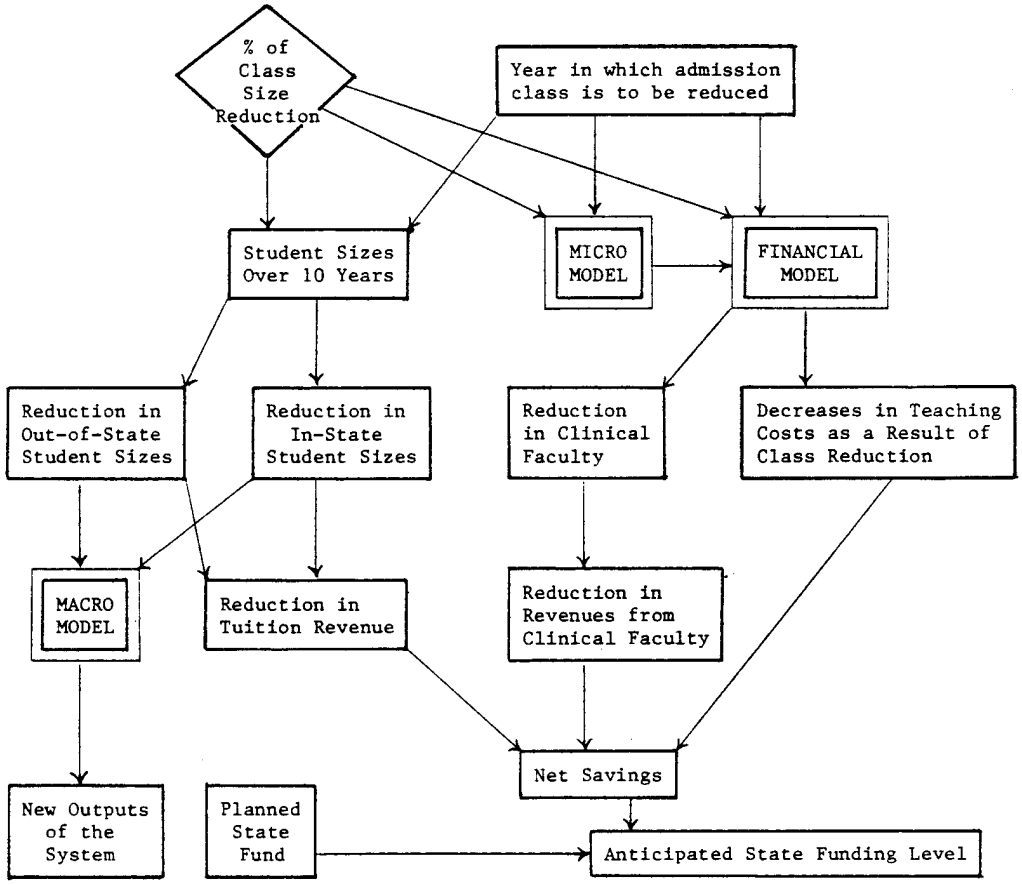

Figure 14: Reduction of Class Size: Cost-Benefit Analysis Model

Table 67

FINANCIAL IMPACT OF REDUCTION SCENARIO IN 1981-82 DEFLATED DOLLARS

Overall Cost Impact: 10% Reduction in Class Size

School	Planned State Fund	Total Savings From Reduced Class Size	Reduction in Non-State Revenue	Cost to the System	Net Savings	New State Fund Level
WVU	15,142,921	969,527	392,934	35,921	540,672	14,602,249
MU	5,530,404	287,267	78,616	6,096	202,555	5,327,849
WVSOM	3,154,139	102,575	28,990	0	73,585	3,080,555
TOTALS	23,827,464	1,359,369	500,540	42,017	816,812	23,010,653

Overall Cost Impact; 20% Reduction in Class Size

School	Planned State Fund	Total Savings From Reduced Class Size	Reduction in Non-State Revenue	Cost to the System	Net Savings	New State Fund Level
WVU	15,142,921	1,838,527	737,391	70,488	1,030,650	14,112,272
MU	5,530,404	576,336	157,475	12,381	406,480	5,123,924
WVSOM	3,154,139	231,630	59,792	0	171,838	2,982,301
TOTALS	23,827,464	2,628,493	954,658	82,869	1,608,968	22,218,497

Overall Cost Impact: 30% Reduction in Class Size

School	Planned State Fund	Total Savings From Reduced Class Size	Reduction in Non-State Revenue	Cost to the System	Net Savings	New State Fund Level
WVU	15,142,921	2,718,866	1,085,870	107,024	1,525,973	13,616,948
MU	5,530,404	871,226	236,237	18,962	616,027	4,914,377
WVSOM	3,154,139	339,692	89,179	0	250,512	2,903,626
TOTALS	23,827,464	3,929,784	1,411,286	125,986	2,392,512	23,827,463

TABLE 68

TEN YEAR FINANCIAL ANALYSIS WITH ENROLLMENT REDUCED*

FOR ALL SCHOOLS

Year	Planned State Fund	PERCENTAGE OF ENROLLMENT REDUCTION					
		10%		20%		30%	
		State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings
82/83	23,303	23,303	0	23,303	0	23,303	0
83/84	26,816	26,816	0	26,816	0	26,816	0
84/85	28,412	28,101	311	27,804	608	27,512	900
85/86	30,070	29,422	648	28,803	1,266	28,195	1,874
86/87	31,813	30,943	870	30,102	1,710	29,274	2,539
87/88	33,616	32,512	1,104	31,442	2,174	30,385	3,231
88/89	35,473	34,339	1,135	33,241	2,232	32,156	3,317
89/90	37,377	36,217	1,160	35,096	2,280	33,989	3,387
90/91	39,314	38,136	1,178	37,000	2,314	35,879	3,436
91/92	41,271	40,085	1,187	38,942	2,329	37,815	3,456

MU

Year	Planned State Fund	PERCENTAGE OF ENROLLMENT REDUCTION					
		10%		20%		30%	
		State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings
82/83	3,949	3,949	0	3,949	0	3,949	0
83/84	6,287	6,287	0	6,287	0	6,287	0
84/85	6,650	6,591	59	6,531	119	6,468	183
85/86	7,020	6,898	122	6,774	246	6,643	377
86/87	7,425	7,224	202	7,020	406	6,808	617
87/88	7,845	7,558	287	7,268	577	6,971	874
88/89	8,278	7,981	297	7,682	595	7,375	902
89/90	8,721	8,417	305	8,110	611	7,794	927
90/91	9,174	8,862	311	8,549	625	8,225	948
91/92	9,631	9,315	316	8,997	635	8,668	963

WVSOM

Year	Planned State Fund	PERCENTAGE OF ENROLLMENT REDUCTION					
		10%		20%		30%	
		State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings
82/83	3,494	3,494	0	3,494	0	3,494	0
83/84	3,656	3,656	0	3,656	0	3,656	0
84/85	3,819	3,774	46	3,714	106	3,665	154
85/86	3,982	3,889	93	3,765	217	3,666	316
86/87	4,140	4,064	76	3,956	184	3,873	267
87/88	4,290	4,240	50	4,155	135	4,098	192
88/89	4,429	4,389	41	4,311	118	4,263	167
89/90	4,552	4,524	28	4,456	95	4,420	132
90/91	4,652	4,640	12	4,586	65	4,566	86
91/92	4,722	4,731	-9	4,696	26	4,696	26

WVU

Year	Planned State Fund	PERCENTAGE OF ENROLLMENT REDUCTION					
		10%		20%		30%	
		State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings	State Fund After Reduct.	Net Savings
82/83	15,861	15,861	0	15,861	0	15,861	0
83/84	16,873	16,873	0	16,873	0	16,873	0
84/85	17,942	17,735	207	17,558	384	17,378	564
85/86	19,068	18,634	434	18,263	805	17,885	1,183
86/87	20,247	19,654	593	19,126	1,121	18,591	1,656
87/88	21,481	20,714	767	20,019	1,462	19,316	2,165
88/89	22,767	21,969	798	21,248	1,519	20,518	2,249
89/90	24,104	23,277	827	22,530	1,574	21,775	2,328
90/91	25,489	24,634	855	23,865	1,624	23,087	2,402
91/92	26,918	26,039	880	25,250	1,668	24,452	2,467

* All figures in thousands of dollars.
Note: Discrepancies may be due to rounding error.

state expenditures drop from $41.27 million to $40.09 million for 10% enrollment reduction ($1.19 million saving); to $38.94 million for 20% enrollment reduction ($2.33 million saving); and to $37.81 million for 30% enrollment reduction ($3.46 million saving). (See Tables 72 - 74 at the end of this scenario for background on the dynamic financial analysis.)

IV. System Output

Since the percentage mix (in-state vs. out-of-state) of incoming students is assumed to remain the same as that of the status quo scenario, the reduction in enrollment would result in a proportionate decrease in system output; i.e., physicians practicing in West Virginia eventually. The projections in the number of physicians practicing in urban/rural West Virginia for 10%, 20% and 30% reduced enrollment are given in Tables 69, 70 and 71 respectively.

By the year 1991, the total impact of the reduced enrollment remains virtually insignificant. By the year 2000, a total decrease of 90, 180 and 270 in physician supply is projected for 10%, 20%, and 30% enrollment reductions respectively. This reflects approximately 1.6%, 3.1% and 4.7% decrease in physician supply as compared with the status quo.

V. Implications

A. Medical Education: The most apparent effect of reducing enrollments will be a corresponding drop in medical education opportunities in the State of West Virginia. The admissions process will become more competitive for students; faculty will face a reduction in their overall size; and the general output of the medical education system will start to drop after several years.

B. Health Care Delivery: As the system output drops, the health care system also suffers from the decrease of physicians in both urban and rural areas. This decrease, however, is estimated to be small; moreover, its impact should not be felt for fifteen to twenty years. Furthermore, the state will still have more than enough physicians to meet the GMENAC figures. However, there may be maldistribution in terms of geographic and clinical specialty distributions.

As the size of clinical sciences faculty drops in response to smaller class size, the availability of these faculty involved in clinical practice at major university hospitals may also decrease.

C. Economic: Economically, the state will benefit from a reduction in their share of medical education costs, which creates the potential for a reduced tax burden on constituencies. As tuition revenue drops, the medical schools will require careful short- and long-term planning to offset changes brought about by reduced revenue. Local communities could be affected by faculty reductions if they leave the communities.

Since West Virginia University will face the largest cut in teaching resources (as can be seen from Table 67), the economic impact to Morgantown could be the most severe of the three schools. On the other hand, since the West

Virginia School of Osteopathic Medicine appears to be operating on the flat part of the average cost curve, a reduction in enrollment is expected to minimally affect Lewisburg economically.

D. Social: In the short term, each institution's social system will be under extreme stress from faculty and staff reductions; morale could be low. While facing increased competition for the more limited medical education opportunities, students will benefit in the long term from the increased social status that those more limited opportunities create.

Again, similar to economic conditions, the social impact will be felt least in Lewisburg and most significantly at Morgantown, where West Virginia University faces the largest cut in resources.

E. Psychological: Faculty could suffer from a highly stressful work environment due to uncertain, shrinking resources, as well as dismembered social networks. These effects, however, will diminish in the long run.

F. Political: Political implications resemble those for status quo, except that there will be increased pressure regionally from those who support the individual institutions and from constituents whose children either are not admitted or wish to be accepted. However, local medical associations and graduating students may be pleased with the reduced competition.

Table 69

Reduce Enrollment by 10%
from 196 to 177

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	297	459	216	68	1,040
1994	376	535	261	90	1,262
1997	464	604	289	114	1,471
2000	567	666	291	135	1,659

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	912	1,888	856	478	4,134
1994	1,019	2,098	987	572	4,676
1997	1,138	2,297	1,104	667	5,206
2000	1,269	2,477	1,198	762	5,706

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	-3	-4	-2	-1	-10
1994	-9	-15	-10	-1	-35
1997	-16	-26	-18	-2	-62
2000	-22	-37	-26	-5	-90

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 70

Reduce Enrollment by 20%
from 196 to 158

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	295	455	214	68	1,032
1994	366	519	251	90	1,226
1997	448	578	271	111	1,408
2000	544	629	265	131	1,569

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	910	1,884	854	478	4,126
1994	1,009	2,082	997	572	4,640
1997	1,122	2,271	1,086	664	5,143
2000	1,246	2,440	1,172	758	5,616

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	-5	-8	-4	-1	-18
1994	-19	-31	-20	-1	-71
1997	-32	-52	-36	-5	-125
2000	-45	-74	-52	-9	-180

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 71

Reduce Enrollment by 30%

PROJECTIONS OF PHYSICIANS PRACTICING IN WEST VIRGINIA
BY SPECIALTY GROUPING AND URBAN/RURAL LOCATION
THROUGH THE YEAR 2000

West Virginia Medical School Graduates

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	105	220	46	16	387
1985	157	289	96	30	572
1988	224	373	159	48	804
1991	293	451	211	68	1,023
1994	357	504	242	89	1,192
1997	432	552	253	109	1,346
2000	522	592	239	126	1,479

Total Physicians Practicing in West Virginia

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	615	1,248	431	238	2,532
1985	703	1,447	565	306	3,021
1988	807	1,666	713	388	3,574
1991	908	1,880	851	478	4,117
1994	1,000	2,067	968	571	4,606
1997	1,106	2,245	1,068	662	5,081
2000	1,224	2,403	1,146	753	5,526

Difference Between this Scenario and the Status Quo

Year	NUMBER OF PHYSICIANS				TOTAL
	URBAN		RURAL		
	P.C.†	N.P.C.*	P.C.†	N.P.C.*	
1982	0	0	0	0	0
1985	0	0	0	0	0
1988	0	0	0	0	0
1991	-7	-12	-7	-1	-27
1994	-28	-46	-29	-2	-105
1997	-48	-78	-54	-7	-187
2000	-67	-111	-78	-14	-270

† Primary Care Specialty Groups: Internal Medicine, Family/General Practice and Pediatrics.

* Non-Primary Care Specialty Groups: Direct Patient Care, Non-Consultants; Direct Patient Care, Consultants; and Indirect Patient Care Specialties

Table 72

TEN YEAR FINANCIAL ANALYSIS WITH 10% ENROLLMENT REDUCTION

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2574965	2729463	3467127	3675155	3895664	4129404	4377168	4639798	4918186	5213277	5526074
REVISED MED INST CSTS	2574965	2729463	3467127	3622164	3700652	3957250	4130374	4378197	4640889	4919342	5214503
NET CHANGE MED INST CSTS	0	0	0	-52990	-195012	-172154	-246794	-261601	-277297	-293935	-311571
STATUS QUO MED ED CSTS	2814691	2983572	3835649	4065788	4309735	4568319	4842418	5132963	5440941	5767398	6113442
REVISED MED ED CSTS	2814691	2983572	3835649	3977813	4123229	4292010	4548648	4821567	5110861	5417513	5742563
NET CHANGE MED ED CSTS	0	0	0	-87974	-186506	-276309	-293770	-311396	-330080	-349885	-370878
STATUS QUO TOTAL COSTS	7792076	8259601	11094695	11760377	12465999	13213959	14006797	14847205	15738037	16682319	17683258
REVISED TOTAL COSTS	7792076	8259601	11094695	11683349	12302700	12935197	13599303	14415261	15280177	16196988	17168807
NET CHANGE TOT CSTS	0	0	0	-77028	-163299	-278763	-407494	-431943	-457860	-485331	-514451
COSTS TO THE SYSTEM	0	0	0	1844	3910	6184	8647	9166	9716	10299	10917
NET CHANGE PRACT PLAN REV	0	0	0	-8305	-17606	-34797	-53988	-57228	-60661	-64301	-68159
NET CHANGE NON-STATE REV	0	0	0	-16120	-37581	-70753	-111518	-126264	-143504	-163713	-187453
STATUS QUO STATE COSTS	3436572	3948891	6287359	6650424	7020136	7425395	7844983	8277558	8721252	9173547	9631135
REVISED STATE COSTS	3436572	3948891	6287359	6591361	6898328	7223570	7557655	7981045	8416612	8862228	9315054
NET CHANGE STATE COSTS	0	0	0	-59063	-121808	-201825	-287328	-296513	-304639	-311320	-316081

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2728239	2891933	3065449	3249376	3444339	3650999	3870059	4102262	4348398	4609302	4885860
REVISED MED INST CSTS	2728239	2891933	3065449	3205448	3351212	3552285	3765422	3991347	4230828	4484678	4753758
NET CHANGE MED INST CSTS	0	0	0	-43928	-93127	-98714	-104637	-110915	-117570	-124624	-132102
STATUS QUO MED ED CSTS	2983144	3162133	3351861	3552973	3766151	3992120	4231647	4485546	4754679	5039959	5342357
REVISED MED ED CSTS	2983144	3162133	3351861	3503744	3661787	3881495	4114384	4361247	4622922	4900297	5194315
NET CHANGE MED ED CSTS	0	0	0	-49228	-104364	-110625	-117263	-124299	-131757	-139662	-148042
STATUS QUO TOTAL COSTS	4173551	4423964	4689402	4970766	5269012	5585153	5920262	6275478	6652006	7051127	7474194
REVISED TOTAL COSTS	4173551	4423964	4689402	4909682	5139514	5447885	5774758	6121244	6488518	6877829	7290499
NET CHANGE TOT CSTS	0	0	0	-61084	-129498	-137268	-145504	-154234	-163488	-173297	-183695
COSTS TO THE SYSTEM	0	0	0	0	0	0	0	0	0	0	0
NET CHANGE PRACT PLAN REV	0	0	0	-2674	-5668	-6008	-6369	-6751	-7156	-7585	-8040
NET CHANGE NON-STATE REV	0	0	0	-15562	-36599	-61684	-95451	-113649	-135434	-161519	-192761
STATUS QUO STATE COSTS	3432230	3493686	3656247	3819475	3982028	4140066	4290437	4429221	4551571	4651519	4721739
REVISED STATE COSTS	3432230	3493686	3656247	3773952	3889129	4064483	4240384	4388636	4523517	4639741	4730805
NET CHANGE STATE COSTS	0	0	0	-45522	-92899	-75583	-50053	-40585	-28054	-11779	9065

WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	6266976	6642995	7041575	7464069	7911913	8386628	8889826	9423215	9988608	10587925	11223200
REVISED MED INST CSTS	6266976	6642995	7041575	7342059	7483414	7956385	8258240	8753735	9278959	9835697	10425838
NET CHANGE MED INST CSTS	0	0	0	-122011	-428500	-430243	-631585	-669481	-709649	-752228	-797362
STATUS QUO MED ED CSTS	7410017	7854618	8325895	8825448	9354975	9916274	10511250	11141925	11810441	12519067	13270211
REVISED MED ED CSTS	7410017	7854618	8325895	8659584	9003342	9310849	9719028	10302170	10920300	11575518	12270049
NET CHANGE MED ED CSTS	0	0	0	-165865	-351633	-605425	-792222	-839755	-890140	-943549	-1000162
STATUS QUO TOTAL COSTS	28911431	30646116	32484883	34433976	36500015	38690016	41011417	43472102	46080428	48845254	51775969
REVISED TOTAL COSTS	28911431	30646116	32484883	34160783	35920846	37734333	39636125	42014292	44535150	47207258	50039694
NET CHANGE TOT CSTS	0	0	0	-273193	-579169	-955683	-1375292	-1457810	-1545278	-1637995	-1736275
COSTS TO THE SYSTEM	0	0	0	12427	26346	39944	50955	54012	57253	60688	64330
NET CHANGE PRACT PLAN REV	0	0	0	-38610	-81853	-254748	-448097	-474982	-503481	-533690	-565712
NET CHANGE NON-STATE REV	0	0	0	-54421	-119800	-323053	-557384	-606127	-660855	-722538	-792329
STATUS QUO STATE COSTS	14990532	15860691	16872864	17942204	19067752	20247251	21480521	22766664	24103885	25489264	26918485
REVISED STATE COSTS	14990532	15860691	16872864	17735860	18634729	19654566	20713567	21968994	23276715	24634495	26038868
NET CHANGE STATE COSTS	0	0	0	-206345	-433024	-592685	-766954	-797671	-827171	-854769	-879616

ALL SCHOOLS

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	11570180	12264391	13574151	14388600	15251916	16167031	17137053	18165276	19255193	20410504	21635134
REVISED MED INST CSTS	11570180	12264391	13574151	14169671	14535278	15465920	16154037	17123279	18150676	19239716	20394099
NET CHANGE MED INST CSTS	0	0	0	-218929	-716638	-701111	-983016	-1041997	-1104517	-1170788	-1241035
STATUS QUO MED ED CSTS	13207852	14000323	15513404	16444209	17430861	18476713	19585316	20760435	22006061	23326424	24726010
REVISED MED ED CSTS	13207852	14000323	15513404	16141142	16788359	17484354	18382061	19484984	20654083	21893328	23206928
NET CHANGE MED ED CSTS	0	0	0	-303067	-642502	-992359	-1203255	-1275450	-1351977	-1433096	-1519081
STATUS QUO TOTAL COSTS	40877058	43329681	48268980	51165119	54235026	57489128	60938476	64594784	68470471	72578700	76933422
REVISED TOTAL COSTS	40877058	43329681	48268980	50753814	53363060	56117415	59010186	62550797	66303845	70282076	74499000
NET CHANGE TOT CSTS	0	0	0	-411305	-871966	-1371713	-1928290	-2043987	-2166626	-2296624	-2434421
COSTS TO THE SYSTEM	0	0	0	14272	30256	46129	59603	63179	66970	70988	75247
NET CHANGE PRACT PLAN REV	0	0	0	-49588	-105127	-295554	-508454	-538961	-571298	-605576	-641911
NET CHANGE NON-STATE REV	0	0	0	-86103	-193980	-455490	-764352	-846039	-939793	-1047769	-1172543
STATUS QUO STATE COSTS	21859334	23303268	26816471	28412103	30069916	31812713	33615941	35473443	37376708	39314330	41271359
REVISED STATE COSTS	21859334	23303268	26816471	28101173	29422186	30942619	32511606	34338674	36216844	38136464	40084727
NET CHANGE STATE COSTS	0	0	0	-310930	-647730	-870094	-1104335	-1134769	-1159864	-1177867	-1186632

Table 73

TEN YEAR FINANCIAL ANALYSIS WITH 20% ENROLLMENT REDUCTION

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2574965	2729463	3467127	3675155	3895664	4129404	4377168	4639798	4918186	5213277	5526074
REVISED MED INST CSTS	2574965	2729463	3467127	3571869	3594078	3783098	3880980	4113839	4360669	4622309	4899648
NET CHANGE MED INST CSTS	0	0	0	-103286	-301586	-346306	-496188	-525959	-557517	-590968	-626426
STATUS QUO MED ED CSTS	2814691	2983572	3835649	4065788	4309735	4568319	4842418	5132963	5440941	5767398	6113442
REVISED MED ED CSTS	2814691	2983572	3835649	3926830	4015144	4098253	4251557	4506651	4777050	5063673	5367493
NET CHANGE MED ED CSTS	0	0	0	-138958	-294591	-470066	-590861	-626312	-663891	-703725	-745948
STATUS QUO TOTAL COSTS	7792076	8259601	11094695	11760377	12465999	13213959	14006797	14847205	15738037	16682319	17683258
REVISED TOTAL COSTS	7792076	8259601	11094695	11605072	12136754	12653826	13189254	13980609	14819446	15708612	16651129
NET CHANGE TOT CSTS	0	0	0	-155305	-329246	-560134	-817543	-866596	-918591	-973707	-1032129
COSTS TO THE SYSTEM	0	0	0	3767	7985	12606	17563	18616	19733	20917	22172
NET CHANGE PRACT PLAN REV	0	0	0	-16754	-35518	-69920	-108321	-114821	-121710	-129013	-136753
NET CHANGE NON-STATE REV	0	0	0	-32385	-75469	-141832	-223381	-252893	-287396	-327836	-375342
STATUS QUO STATE COSTS	3436572	3948891	6287359	6650424	7020136	7425395	7844983	8277558	8721252	9173547	9631135
REVISED STATE COSTS	3436572	3948891	6287359	6531271	6774345	7019700	7268384	7682471	8109790	8548594	8996519
NET CHANGE STATE COSTS	0	0	0	-119153	-245791	-405695	-576599	-595087	-611462	-624954	-634616

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2728239	2891933	3065449	3249376	3444339	3650999	3870059	4102262	4348398	4609302	4885860
REVISED MED INST CSTS	2728239	2891933	3065449	3152395	3238739	3433063	3639047	3857390	4088833	4334163	4594213
NET CHANGE MED INST CSTS	0	0	0	-96981	-205600	-217936	-231012	-244872	-259565	-275139	-291647
STATUS QUO MED ED CSTS	2983144	3162133	3351861	3552973	3766151	3992120	4231647	4485546	4754679	5039959	5342357
REVISED MED ED CSTS	2983144	3162133	3351861	3443978	3535082	3747187	3972018	4210339	4462959	4730737	5014581
NET CHANGE MED ED CSTS	0	0	0	-108995	-231069	-244933	-259629	-275207	-291719	-309223	-327776
STATUS QUO TOTAL COSTS	4173551	4423964	4689402	4970766	5269012	5585153	5920262	6275478	6652006	7051127	7474194
REVISED TOTAL COSTS	4173551	4423964	4689402	4832828	4976584	5275179	5591690	5927191	6282823	6659792	7059380
NET CHANGE TOT CSTS	0	0	0	-137938	-292428	-309973	-328572	-348286	-369183	-391334	-414814
COSTS TO THE SYSTEM	0	0	0	0	0	0	0	0	0	0	0
NET CHANGE PRACT PLAN REV	0	0	0	-6426	-13623	-14441	-15307	-16226	-17199	-18231	-19325
NET CHANGE NON-STATE REV	0	0	0	-32202	-75486	-125793	-193471	-230022	-273755	-326098	-388765
STATUS QUO STATE COSTS	3432230	3493686	3656247	3819475	3982028	4140066	4290437	4429221	4551571	4651519	4721739
REVISED STATE COSTS	3432230	3493686	3656247	3713739	3765086	3955886	4155336	4310957	4456143	4586283	4695690
NET CHANGE STATE COSTS	0	0	0	-105735	-216942	-184180	-135101	-118264	-95428	-65236	-26049

WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	6266976	6642995	7041575	7464069	7911913	8386628	8889826	9423215	9988608	10587925	11223200
REVISED MED INST CSTS	6266976	6642995	7041575	7252955	7294515	7590055	7693868	8155501	8644831	9163520	9713332
NET CHANGE MED INST CSTS	0	0	0	-211114	-617398	-796573	-1195958	-1267715	-1343778	-1424405	-1509869
STATUS QUO MED ED CSTS	7410017	7854618	8325895	8825448	9354975	9916274	10511250	11141925	11810441	12519067	13270211
REVISED MED ED CSTS	7410017	7854618	8325895	8571188	8815944	8878880	9001580	9541675	10114175	10721026	11364287
NET CHANGE MED ED CSTS	0	0	0	-254260	-539031	-1037394	-1509670	-1600250	-1696265	-1798041	-1905924
STATUS QUO TOTAL COSTS	28911431	30646116	32484883	34433976	36500015	38690016	41011417	43472102	46080428	48845254	51775969
REVISED TOTAL COSTS	28911431	30646116	32484883	33947980	35469703	36913768	38403430	40707636	43150094	45739100	48483446
NET CHANGE TOT CSTS	0	0	0	-485996	-1030312	-1776248	-2607986	-2764466	-2930334	-3106154	-3292523
COSTS TO THE SYSTEM	0	0	0	22720	48166	74638	99988	105988	112347	119088	126233
NET CHANGE PRACT PLAN REV	0	0	0	-48352	-102506	-444625	-827429	-877074	-929699	-985481	-1044610
NET CHANGE NON-STATE REV	0	0	0	-79974	-178399	-581233	-1046003	-1139363	-1244445	-1363177	-1497845
STATUS QUO STATE COSTS	14990532	15860691	16872864	17942204	19067752	20247251	21480521	22766664	24103885	25489264	26918485
REVISED STATE COSTS	14990532	15860691	16872864	17558902	18264005	19126875	20018525	21247549	22530344	23865375	25250039
NET CHANGE STATE COSTS	0	0	0	-383302	-803747	-1120377	-1461996	-1519115	-1573541	-1623889	-1668445

ALL SCHOOLS

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	11570180	12264391	13574151	14388600	15251916	16167031	17137053	18165276	19255193	20410504	21635134
REVISED MED INST CSTS	11570180	12264391	13574151	13977219	14127332	14806216	15213895	16126729	17094333	18119993	19207192
NET CHANGE MED INST CSTS	0	0	0	-411381	-1124584	-1360815	-1923157	-2038547	-2160860	-2290511	-2427942
STATUS QUO MED ED CSTS	13207852	14000323	15513404	16444209	17430861	18476713	19585316	20760435	22006061	23326424	24726010
REVISED MED ED CSTS	13207852	14000323	15513404	15941996	16366170	16724319	17225155	18258665	19354184	20515436	21746362
NET CHANGE MED ED CSTS	0	0	0	-502213	-1064691	-1752393	-2360160	-2501770	-2651876	-2810989	-2979648
STATUS QUO TOTAL COSTS	40877058	43329681	48268980	51165119	54235026	57489128	60938476	64594784	68470471	72578700	76933422
REVISED TOTAL COSTS	40877058	43329681	48268980	50385881	52583041	54842773	57184374	60615437	64252363	68107505	72193955
NET CHANGE TOT CSTS	0	0	0	-779239	-1651986	-2646355	-3754101	-3979347	-4218108	-4471195	-4739467
COSTS TO THE SYSTEM	0	0	0	26486	56151	87244	117551	124604	132080	140005	148405
NET CHANGE PRACT PLAN REV	0	0	0	-71532	-151647	-528985	-951057	-1008121	-1068608	-1132725	-1200688
NET CHANGE NON-STATE REV	0	0	0	-144561	-329355	-848859	-1462855	-1622278	-1805597	-2017111	-2261952
STATUS QUO STATE COSTS	21859334	23303268	26816471	28412103	30069916	31812713	33615941	35473443	37376708	39314330	41271359
REVISED STATE COSTS	21859334	23303268	26816471	27803912	28803436	30102460	31442245	33240978	35096277	37000251	38942249
NET CHANGE STATE COSTS	0	0	0	-608191	-1266480	-1710252	-2173696	-2232466	-2280432	-2314079	-2329110

Table 74

TEN YEAR FINANCIAL ANALYSIS WITH 30% ENROLLMENT REDUCTION

MARSHALL UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2574965	2729463	3467127	3675155	3895664	4129404	4377168	4639798	4918186	5213277	5526074
REVISED MED INST CSTS	2574965	2729463	3467127	3518534	3481213	3601540	3623132	3840520	4070951	4315208	4574120
NET CHANGE MED INST CSTS	0	0	0	-156620	-414451	-527864	-754036	-799278	-847235	-898069	-951953
STATUS QUO MED ED CSTS	2814691	2983572	3835649	4065788	4309735	4568319	4842418	5132963	5440941	5767398	6113442
REVISED MED ED CSTS	2814691	2983572	3835649	3872844	3900694	3897039	3945333	4182053	4432976	4698955	4980892
NET CHANGE MED ED CSTS	0	0	0	-192944	-409041	-671280	-897085	-950910	-1007965	-1068443	-1132549
STATUS QUO TOTAL COSTS	7792076	8259601	11094695	11760377	12465999	13213959	14006797	14847205	15738037	16682319	17683258
REVISED TOTAL COSTS	7792076	8259601	11094695	11523130	11963036	12364440	12770946	13537203	14349435	15210401	16123025
NET CHANGE TOT CSTS	0	0	0	-237247	-502964	-849519	-1235851	-1310002	-1388602	-1471918	-1560233
COSTS TO THE SYSTEM	0	0	0	5851	12404	19492	26898	28512	30223	32036	33959
NET CHANGE PRACT PLAN REV	0	0	0	-25145	-53307	-104911	-162516	-172267	-182603	-193559	-205173
NET CHANGE NON-STATE REV	0	0	0	-48592	-113234	-212780	-335106	-379375	-431132	-491795	-563055
STATUS QUO STATE COSTS	3436572	3948891	6287359	6650424	7020136	7425395	7844983	8277558	8721252	9173547	9631135
REVISED STATE COSTS	3436572	3948891	6287359	6467620	6642810	6808148	6971137	7375443	7794005	8225460	8667916
NET CHANGE STATE COSTS	0	0	0	-182805	-377326	-617247	-873846	-902115	-927246	-948087	-963219

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	2728239	2891933	3065449	3249376	3444339	3650999	3870059	4102262	4348398	4609302	4885860
REVISED MED INST CSTS	2728239	2891933	3065449	3106652	3141765	3330271	3530087	3741892	3966406	4204390	4456653
NET CHANGE MED INST CSTS	0	0	0	-142724	-302574	-320728	-339972	-360370	-381993	-404912	-429207
STATUS QUO MED ED CSTS	2983144	3162133	3351861	3552973	3766151	3992120	4231647	4485546	4754679	5039959	5342357
REVISED MED ED CSTS	2983144	3162133	3351861	3392909	3426817	3632426	3850372	4081394	4326277	4585854	4861005
NET CHANGE MED ED CSTS	0	0	0	-160063	-339334	-359694	-381276	-404152	-428401	-454105	-481352
STATUS QUO TOTAL COSTS	4173551	4423964	4689402	4970766	5269012	5585153	5920262	6275478	6652006	7051127	7474194
REVISED TOTAL COSTS	4173551	4423964	4689402	4768477	4840159	5130568	5438402	5764707	6110589	6477224	6865858
NET CHANGE TOT CSTS	0	0	0	-202289	-428853	-454584	-481859	-510771	-541417	-573902	-608336
COSTS TO THE SYSTEM	0	0	0	0	0	0	0	0	0	0	0
NET CHANGE PRACT PLAN REV	0	0	0	-9336	-19793	-20981	-22240	-23574	-24989	-26488	-28077
NET CHANGE NON-STATE REV	0	0	0	-48000	-112587	-188009	-289485	-344269	-409822	-488288	-582238
STATUS QUO STATE COSTS	3432230	3493686	3656247	3819475	3982028	4140066	4290437	4429221	4551571	4651519	4721739
REVISED STATE COSTS	3432230	3493686	3656247	3665186	3665761	3873491	4098063	4262719	4419977	4565905	4695640
NET CHANGE STATE COSTS	0	0	0	-154289	-316266	-266575	-192374	-166502	-131595	-85614	-26099

WEST VIRGINIA UNIVERSITY SCHOOL OF MEDICINE

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	6266976	6642995	7041575	7464069	7911913	8386628	8889826	9423215	9988608	10587925	11223200
REVISED MED INST CSTS	6266976	6642995	7041575	7160835	7099367	7216371	7121101	7548367	8001269	8481346	8990226
NET CHANGE MED INST CSTS	0	0	0	-303235	-812546	-1170257	-1768725	-1874848	-1987339	-2106579	-2232974
STATUS QUO MED ED CSTS	7410017	7854618	8325895	8825448	9354975	9916274	10511250	11141925	11810441	12519067	13270211
REVISED MED ED CSTS	7410017	7854618	8325895	8479375	8621300	8438509	8273851	8770282	9296499	9854289	10445547
NET CHANGE MED ED CSTS	0	0	0	-346073	-733676	-1477765	-2237399	-2371643	-2513941	-2664778	-2824665
STATUS QUO TOTAL COSTS	28911431	30646116	32484883	34433976	36500015	38690016	41011417	43472102	46080428	48845254	51775969
REVISED TOTAL COSTS	28911431	30646116	32484883	33729006	35005478	36078683	37154654	39383933	41746969	44251787	46906894
NET CHANGE TOT CSTS	0	0	0	-704970	-1494537	-2611333	-3856763	-4088169	-4333459	-4593467	-4869075
COSTS TO THE SYSTEM	0	0	0	33762	71574	111675	151816	160925	170581	180815	191664
NET CHANGE PRACT PLAN REV	0	0	0	-60489	-128236	-639883	-1212466	-1285214	-1362326	-1444066	-1530710
NET CHANGE NON-STATE REV	0	0	0	-107922	-242076	-844796	-1540327	-1678647	-1834446	-2010610	-2210563
STATUS QUO STATE COSTS	14990532	15860691	16872864	17942204	19067752	20247251	21480521	22766664	24103885	25489264	26918485
REVISED STATE COSTS	14990532	15860691	16872864	17378918	17886866	18592389	19315900	20518067	21775453	23087222	24451637
NET CHANGE STATE COSTS	0	0	0	-563287	-1180886	-1654862	-2164621	-2248597	-2328432	-2402042	-2466848

ALL SCHOOLS

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
STATUS QUO MED INST CSTS	11570180	12264391	13574151	14388600	15251916	16167031	17137053	18165276	19255193	20410504	21635134
REVISED MED INST CSTS	11570180	12264391	13574151	13786021	13722345	14148182	14274320	15130779	16038626	17000943	18021000
NET CHANGE MED INST CSTS	0	0	0	-602579	-1529571	-2018849	-2862733	-3034497	-3216567	-3409561	-3614134
STATUS QUO MED ED CSTS	13207852	14000323	15513404	16444209	17430861	18476713	19585316	20760435	22006061	23326424	24726010
REVISED MED ED CSTS	13207852	14000323	15513404	15745128	15948811	15967973	16069556	17033729	18055753	19139098	20287444
NET CHANGE MED ED CSTS	0	0	0	-699080	-1482050	-2508739	-3515760	-3726705	-3950307	-4187326	-4438565
STATUS QUO TOTAL COSTS	40877058	43329681	48268980	51165119	54235026	57489128	60938476	64594784	68470471	72578700	76933422
REVISED TOTAL COSTS	40877058	43329681	48268980	50020613	51808672	53573692	55364002	58685842	62206993	65939413	69895777
NET CHANGE TOT CSTS	0	0	0	-1144507	-2426354	-3915436	-5574473	-5908942	-6263478	-6639287	-7037644
COSTS TO THE SYSTEM	0	0	0	39612	83978	131166	178715	189437	200804	212852	225623
NET CHANGE PRACT PLAN REV	0	0	0	-94970	-201337	-765775	-1397221	-1481055	-1569918	-1664113	-1763960
NET CHANGE NON-STATE REV	0	0	0	-204514	-467898	-1245585	-2164918	-2402291	-2675401	-2990693	-3355855
STATUS QUO STATE COSTS	21859334	23303268	26816471	28412103	30069916	31812713	33615941	35473443	37376708	39314330	41271359
REVISED STATE COSTS	21859334	23303268	26816471	27511723	28195437	29274028	30385100	32156229	33989435	35878588	37815193
NET CHANGE STATE COSTS	0	0	0	-900380	-1874478	-2538685	-3230841	-3317214	-3387274	-3435742	-3456166

5. SCENARIO ASSESSMENT MATRIX

The Scenario Development and Evaluation Process calls for an evaluation of the implications of the scenarios. This assessment completes the initial sequence of events and suggests refinement of the goals and objectives, scenarios, and assumptions for a second round of analysis in support of policy formulation. The iterative nature of the Scenario Development and Evaluation Process enhances the potential for structuring scenarios that are responsive to the multiple constituences with an interest in medical education in West Virginia.

The scenario assessment matrix (Figure 15) arrays each scenario against the goals and objectives developed by the West Virginia Board of Regents. This context for evaluation of the implications suggests that goals and objectives, as well as scenarios, can be revised. The various scenarios have distinct effects on specific goals and objectives.

For purposes of assessment of the scenario in terms of the goals and objectives, four goals and objectives have been grouped in two sets. "Effective and efficiency" was considered to be necessary for "quality education within resources." Further, a priority for "primary care training" was seen as an espect of the goal of "numbers and kinds of physicians and locations."

These modifications yield six categories in which to assess each scenario. The assessment is an ends-means evaluation. The goals and objective established the ends, the scenarios are posited means for their realization. This consideration of ends and means provokes new formulations.

The status quo scenario has a 1+ overall score in addressing the goals and objections. This is the lowest of the four scenarios. The increase tuition with a revolving loan fund and forgiveness receives the highest score.

The "Status Quo Scenario" reveals a system of medical education in West Virginia destined to be the subject of increasing fiscal stress in the face of a potential surplus of physicians. Budgetary requirements to perpetuate the status quo over the next ten years may require substantial resource allocation trade-off decisions by the state legislature from other sectors of the state's responsibilities. The status quo does not appear to be a strong alternative. Innovations within the system would appear to be necessary.

The "Increase Tuition Scenario" saves the state significant funds, but at the expense of placing financial barriers to educational opportunities for state residents. This scenario has minor to no affects on the availability of physicians by location and specialty, and has no impact on MD/DO cooperation. Once again, improvement in health status is assumed to be positive.

The Health Affairs Committee of the West Virginia Board of Regents placed great emphasis on the system's strategy to meet the state's educational needs as their priority goal. The "Increase Tuition and Revolving Loan Fund With Forgiveness Scenario" contributes most positively toward that strategy.

GOALS AND OBJECTIVES / SCENARIOS	1. Systems Strategy to Meet Educational Needs	2. Quality Education within Resources	3. Effectiveness/Efficiency	4. Primary Care Training	6. Numbers and Kinds Physicians & Location	5. Educational Opportunity	7. M.D./D.O. Cooperation	8. Improvement in Health Status	9. TOTAL
Status Quo	-	-		+		+	0	+	1+
Increase Tuition	+	+		0		-	0	+	2+
Increase Tuition With Revolving Loan Fund With & W/O Forgiveness — With	+	+		+		+	0	+	5+
Increase Tuition With Revolving Loan Fund With & W/O Forgiveness — W/Out	+	+		0		+	0	+	4+
Reduce Enrollment	+	+		0		-	0	+	2+

+ Positive
0 Neutral
- Negative

Figure 15: Scenario Assessment Matrix

Significant state funds are saved by increasing tuition levels at all the medical schools, while removing major financial barriers to medical training for state residents, as well as addressing maldistribution of West Virginia physician manpower with loan forgiveness options. Numerous educational opportunities for state residents are maintained. MD/DO cooperation is unaffected. And, assuming the status quo has a positive effect on health status, this scenario also contributes positively toward this goal. The loan program without forgiveness saves more state dollars than the loan program with forgiveness in the short term. However, no mechanism would exist to affect physician availability by location and specialty.

The "Reduce Enrollment Scenario" saves state dollars by reducing the number of physicians educated. Educational opportunities are therefore affected negatively. According to the adjusted GMENAC figures, it appears that West Virginia will have a surplus of physicians in the year 2000; thus, the reduction in the numbers of physicians educated may contribute positively to the overall system's strategy. However, this scenario does not address the problem of maldistribution.

Individual readers of this report will no doubt weigh the impacts of scenarios for individual goals and objectives differently. For example, a more discrete scoring system with Positive 5 - 4 - 3 - 2 - 1 - 0 - 1 - 2 - 3 - 4 to Negative 5 could be used, where one assumes greater distinction among scenarios for given goals and objectives. However, the exercise does not seek an absolute score for the selection of preferred scenarios, but rather an evaluation of the implications as shown in the Scenario Development and Evaluation Process (Figure A).

This report in its entirety has been developed to assist the West Virginia Board of Regents in the utilization and modification of the goals, objectives, scenarios, and assumptions in order to formulate preferred strategies that constitute policy alternatives concerning the future of medical education in the State of West Virginia. It is the hope of the project staff that this collaborative endeavor will contribute to the adoption of policies that will lead to more cost-effective medical education in West Virginia.

VII. BIBLIOGRAPHY

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The bibliography includes:

1. Items obtained and used directly in project-related tasks.

2. Items obtained and used as background material during the project.

3. Items pertaining to various phases of the project but not deemed relevant enough to obtain. These items are included to provide a comprehensive bibliography on the subject as a by-product of the project.

The following abbreviations were used to identify source agencies for materials:

NTIS: National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161.

ERIC: Educational Resources Information Clearinghouse. Document reproduction service. P.O. Box 190, Arlington, Virginia 22210.

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