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ANE BUREAU  
HEALTH SECTOR FINANCING MODEL  
FOR MICROCOMPUTERS

October 1988

**Resources for  
Child Health  
Project**

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**REACH**



John Snow, Inc.  
1100 Wilson Boulevard, 9th Floor  
Arlington, VA  
22209 USA  
Telex: 272896 JSIW UR  
Telephone: (703) 528-7474

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**ASIA AND NEAR EAST BUREAU**  
**HEALTH SECTOR FINANCING MODEL FOR MICROCOMPUTERS**

**October 1988**

**Marty Makinen, Ph.D., Abt Associates, Inc.**  
**Samir Zaman, Abt Associates, Inc.**  
**David Deal, Abt Associates, Inc.**

**The Resources for Child Health Project (REACH)**  
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## FOREWORD

The Resources for Child Health (REACH) Project was initiated by the U.S. Agency for International Development (A.I.D.) to provide technical assistance to developing countries in the areas of immunization and health care financing (HCF). The overall goal of A.I.D. assistance in the health sector is to improve health status in developing countries through support of cost-effective interventions directed at the most needy populations -- poor mothers and children. A.I.D. health assistance is seen primarily as an investment in the development of national self-sufficiency in achieving sustainable improvements in health status as reflected by reductions in infant, child, and maternal mortality and morbidity.

Sustaining improvements in health status requires, in addition to direct program support, support for strengthening the national capacity to generate and manage resources more effectively. The provision of such support is the basis for the A.I.D. effort in health care financing and its implementation is a central focus of the REACH project. REACH health care financing technical assistance focuses on the generation of improvements in resource allocation, efficiency, resource mobilization, and equity in the health sector. The goal of this assistance is to increase the effective level of resources available for health in developing countries by supporting, where appropriate, the implementation of activities to increase the level and direction of government commitment to health, mobilize increased revenues from users of health services and other nongovernmental sources, and improve the efficiency with which available resources are utilized in both the public and the private sectors.

As part of this effort, REACH has conducted a number of major studies of health financing in Africa, Asia, and Latin America which examine the costs of health services, patterns of utilization, the potential for generating additional resources, and management efficiency in the health sector. In addition, REACH has conducted several workshops to provide training in health care financing to health workers and decision-makers in A.I.D.-assisted countries. REACH has also carried out several multi-country comparative analyses in order to draw lessons learned and share this experience with other countries.

An important component of the REACH effort in health care financing is the development and dissemination of methodologies aimed at allowing decision-makers and analysts to examine financing issues in the health sector. Along these lines, REACH has developed a Guidance for the Costing of Health Service Delivery Projects for the ANE Bureau, which has been widely distributed to USAID Missions in Asia, Africa, and Latin America. The ANE Bureau Health Sector Financing Model is another example of the REACH effort in health financing methodology development. As noted in the text, this computer model is intended to "provide a tool for A.I.D. Health, Population, and Nutrition Officers to demonstrate the effects of government investment and revenue policy choices on the financial sustainability of the health sector." Because the model was developed for use with Lotus 1-2-3 and is menu-driven, it provides a relatively easy to

use method for decision-makers to examine the relationship between the future recurrent cost needs of proposed investments and the country's ability to provide needed health services.

The REACH Project invites comments on all of our publications and welcomes the opportunity to continue our collaboration with interested colleagues through the widest possible dissemination and discussion of REACH materials.

Gerald Rosenthal, Ph.D.  
Associate Director for Health  
Care Financing  
The REACH Project  
May 1989

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## **I. INTRODUCTION**

In an effort to provide needed health services to the population, many governments in the developing world have launched ambitious investment plans aimed at building health infrastructure. Often this investment has focused on relatively expensive curative care facilities in urban areas, leaving few resources for providing services to rural populations and preventive care. Moreover, the investment plans have been pursued without a clear knowledge of the magnitude of recurrent costs they would engender. Further, there is little understanding of the potential importance of alternative financing sources for ensuring ongoing operations. The limited ability to plan the allocation of scarce resources for health and a government commitment to provide free care for all often means in reality that the quality of care is low and medicine and supplies are unavailable.

In recent years, worsening economic conditions in developing countries have made the allocation of scarce resources a more difficult process. Each decision to commit resources to one program means that these resources are not available for other programs. Moreover, each investment decision implies a commitment to meet the recurrent costs associated with that investment. The need for financial planning based on resource use and availability has become more important. A.I.D. can play a leading role in assisting health planners in developing countries improve their ability to deal with difficult financial decisions in the health sector.

## **II. PURPOSE OF THE MODEL**

The Resources for Child Health Project was requested to develop this Health Sector Financing Model in order to provide a tool for A.I.D. Health, Population and Nutrition Officers to demonstrate the effects of government investment and revenue policy choices on the financial sustainability of the health sector. The model shows the effect of alternative investment and recurrent financing plans on resources and health services.

Several policy questions are addressed by the model and include: what will be the recurrent costs of providing a set of health services to a given percentage of the population? Alternatively, if planners have only a given sum of money to spend on a set of services, what percentage of the population can they expect to cover on an ongoing basis? How much revenue can the government expect to obtain from charging user fees at hospitals and/or health centers? What are the implications of raising or lowering the level of external aid to the health sector?

In addition, the model graphically displays the excess or shortfall of revenue over expenditure over a five-year period for any given combination of investment and revenue choices for the government. Since the model is interactive, the user may choose combination of financing mechanisms to arrive at desired revenue totals from various sources. On the investment

side, the user may raise or reduce expenditures in order to live within the dual constraints of operating and investment resources. In addition, recurrent cost parameters, such as the rate of growth of salaries, may be selected and modified by the user. By viewing the effects of possible policy choices, health policy makers may be able to make more optimal resource allocation decisions.

### III. USING THE HEALTH FINANCING MODEL FOR POLICY DIALOGUE

The model may be used by decision makers and analysts in the health sector to carry out more coherent and rational planning. Too often planning is conducted based on coverage and quality of services objectives, while paying little attention to the resources required to realize these plans. Moreover, recurrent financing implications are seldom taken into account. When investment plans outstrip the ability (or willingness) of governments to pay operating costs, the quality and quantity of services delivered are jeopardized. Facilities go understaffed and there are shortages of drugs and supplies.

A reason why financial planning is not performed is that the iterative process of planning and re-planning to fit within resource constraints is difficult and time-consuming. Analysts and decision makers may be aware of interrelationships among resource allocation, coverage, and quality of services; however, the process of learning the magnitude of the effect of resource allocation decisions on service delivery is tedious and time-consuming when performed by hand.

The Asia and Near East (ANE) Bureau Health Sector Financing Model incorporates most of the important interrelationships among resources and coverage and sets operating and investment budget constraints under which resource allocation choices can be made. This process involves moving from an ideal plan that meets all coverage goals but far surpasses likely available resources to a realistic plan that comes closest to meeting coverage goals but stays within the constraints of likely and feasible sources of funding. The health plans that result should be much more realistic.

Although the planning process varies from country to country, many countries undertake investment programming on a five-year cycle for Five-Year Development Plans. It is at this stage that decisions to build more hospitals and health facilities are made. Investment budgeting, whether from donors or the government itself, is conducted as well. However, budget plans for operating or recurrent costs are made on an annual basis and these two processes are often not closely linked. For example, the decision whether to build new hospitals may not take into account how their operating costs would fit into the annual budgeting process. The result may be shortages of needed resources for operation.

The exercises produced by the Health Sector Financing Model can be used to illustrate the links between investments and coverage and quality objectives. The model displays health services coverage indicators for

each package of investment plans chosen. The quality of health services is difficult to evaluate. The model permits some appreciation of the quality of services offered through key indicators, such as the mix of personnel assigned to facilities and the amount of funds allocated to drugs and supplies.

The user (decision-maker or analyst) begins the process by entering information about the current situation in the health sector and ideal targets for the end of the planning period (usually five years) into the model. These ideal plans could include improving coverage by expanding the number of health facilities; or improving quality by changing or increasing the staffing mix, providing more equipment, or improving the drug and supply distribution system. Staff welfare could be improved by raising salaries at a rate greater than inflation. User charges could be kept low or not made at all. Quickly, the Health Sector Financing Model tells the user the investment and operating costs of reaching these targets. The model shows whether investment, operating costs, or both will be in excess of likely availability.

At this point, a series of "what if" interactions can be performed. The decision maker could use the model to test the effect of various modifications of target goals on costs and revenues. For example, the effects of reducing planned increases in facilities on operating and investment costs could be tested. How many fewer hospitals could be built to be within the resource constraint? What would the population-to-hospital-bed ratio be as a result? What would be the operating and investment costs of building health centers rather than hospitals? What would be the cost savings if staff with a lower level of training were substituted for physicians in health facilities, and would health output be affected?

The model can test all of these possibilities in terms of costs and coverage rapidly. In addition, the model provides graphic output (in the form of pie charts) that show the relative shares of various cost components. This could help identify important cost centers and guide where cost cuts could be made.

On the revenue side, the tradeoffs among investment and operating budgets, raising user charges, or pressing for greater allocations from national budgets can be analyzed. In cases where funds are fungible, the user could test the impact of shifting funds out of investment accounts into operating accounts. A reduction in investment spending would lower the need for operating funds, while adding to their availability. By relying more heavily on donor funding for investment and reassigning planned government investment funds to operating costs, coverage targets might be achieved more readily. Countries which show surplus investment funding with resources coming from both donor and government sources, but a shortfall in operating costs, would benefit from an example of this kind of reallocation.

If a government is considering collecting revenue from user charges, the effects of this financing strategy on total revenues from various combinations of fee levels for ambulatory and hospitalization services can be tested as well. The fee levels which appear to be the most acceptable to government officials and the population (on a theoretical basis) can be matched against the total revenue potential of this financing option.

It frequently is argued that quality improvement must accompany or precede imposition of user charges. The model can help show how additional revenues generated from user charges could be used to increase drugs, supplies and personnel at the facilities used by those who pay charges.

Finally, the amount of resources needed for next year's health budget can be documented better and expressed quantitatively in terms of coverage and quality improvements foregone, the necessity of holding down wages, and/or the increases in user charges that will be required. This kind of hard information is likely to be much more persuasive than qualitative pleadings for additional government funds for the sector. Further, by showing financial analysts and economists in Ministries of Planning and Finance and the National Treasury that such a model has been used to rationalize spending plans by relating them to costs, the health ministry can demonstrate that it is serious about using resources efficiently.

#### IV. HOW THE MODEL WORKS

The model is user friendly and menu driven (see Appendix A). The model works by taking data entered by the user and transforming them into a set of outputs in the form of numerical tables and graphs. These outputs are grouped in four categories: **revenues**, **expenditures**, **services**, and **health services indicators**, plus the key output that combines revenues and expenditures. Revenues and expenditures are divided into capital and recurrent categories.

Displays in the form of pie charts are used to illuminate both the sources of revenue and expenditure cost centers for each of the five years, given the options chosen by the user. These pie charts are complemented by numerical tables showing the same information. Finally, a table and a bar graph combine the revenue and expenditure information to show how projected revenues match up to expected expenditures given the choices made on a yearly basis. (Examples of numerical tables and displays produced by the model are in Appendices C and D.)

To relate the investment and revenue choices to the health services provided, the model produces "services available" and "health services indicators" outputs. The first of these shows, in the form of a line chart, the combination of services (in proportions of the base year) that could be paid for each year with the revenue resulting from the choices selected. The second set of outputs shows, in a table and a line chart, coverage measures such as the population per hospital bed or health professional for each year resulting from the policies chosen.

## V. LIMITATIONS OF THE MODEL

The ANE Bureau Health Sector Financing Model simplifies and standardizes the organization and financing of health services in order to be applicable to all country situations. As a result, the model has several limitations. The model uses only two types of facilities (hospitals offering inpatient and outpatient services and health centers offering only outpatient services) and four sources of revenue (government budgetary allocations, external support, and user fees from hospitals and health centers) for investment and recurrent spending. All of the relations in the model are arithmetic so they offer only a first approximation of a country-specific situation.

Further, demand for health services is assumed to be perfectly inelastic (i.e., raising fees does not decrease the demand for services by the population), although in reality the quantity of services demanded is likely to vary with the level of user charges. As a result, the additional revenues generated by raising fees, as well as the loss in revenues resulting from lowering fees, will be overstated in the model. However, for the limited purposes for which it is intended, the model should generate useful results.

The model is designed to cover a five-year period: a base year and four subsequent years. The model can be modified easily to accommodate additional types of facilities, sources of revenue, and numbers of future years to make it more closely approximate a country-specific situation.

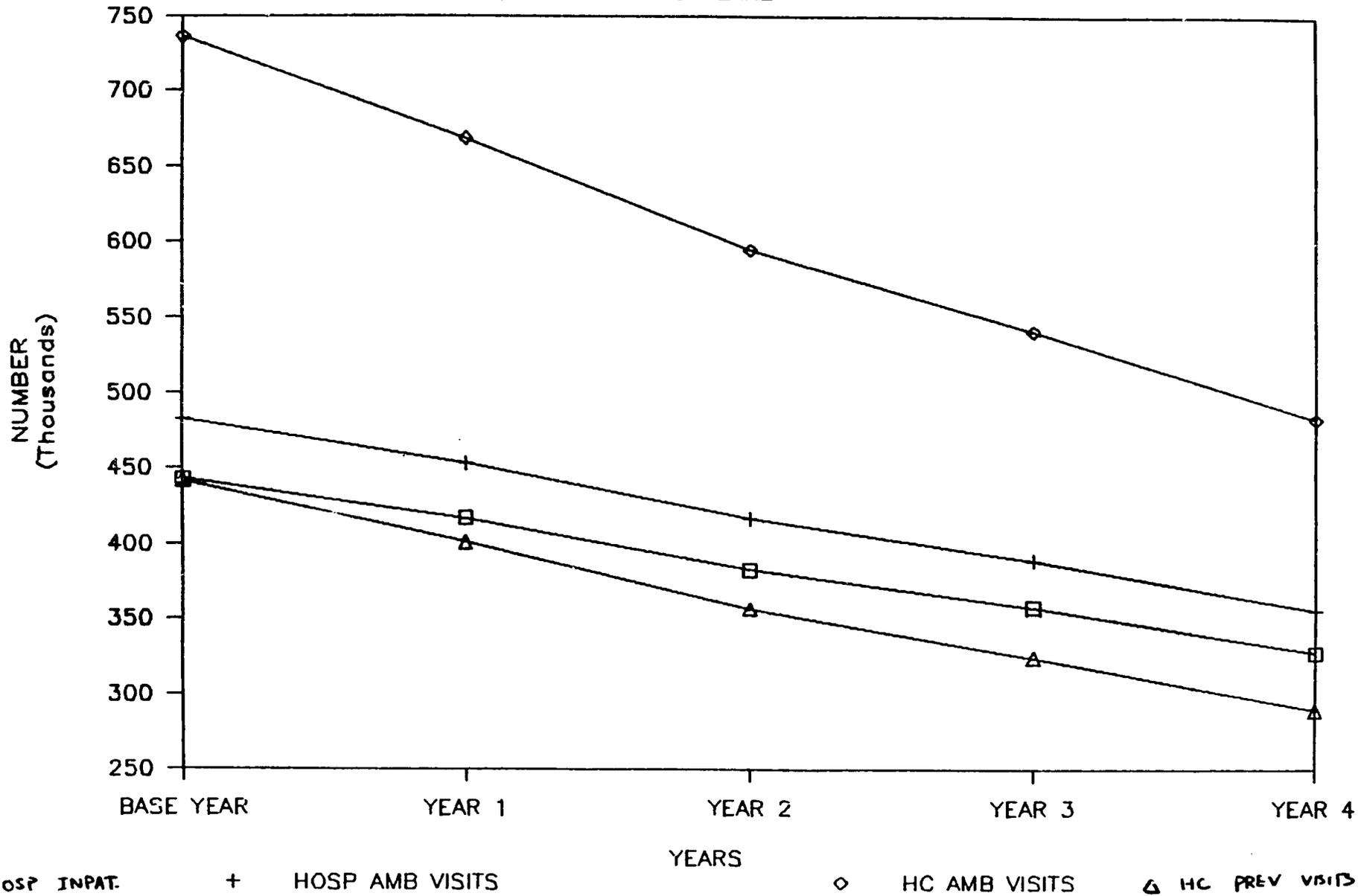
## VI. INTERPRETATION OF THE MODEL RESULTS

Instructions for using the model are given in Appendix A, A Practical Guide to the Model. The user can either work from the data which are currently in the model (which were represent the health sector in Bangladesh in 1980) and gain an understanding of the general financing relationships in the health sector, or enter data which reflect the situation in his or her own country. After all initial data and goals have been entered, the user can examine the tables and graphs produced to see the results of the decisions made. For example, several of the graphs produced show the sources of funds and areas of expenditure, allowing the decision maker to see where budgetary cuts or revenue increases would have the greatest effect.

As another example, given the data which are currently in the model, the model produced a graph (see the next page) which shows that budgetary deficits each year will result in declining levels of services available to the population. This sort of information can be extremely valuable in health policy discussions with decision makers in developing countries.

# POSSIBLE SERVICES FROM EXPECTED REV

FIVE YEARS



After examining the graphs and tables produced from the initial data, the user can experiment with changes to see how they will affect the viability of the health care system. To use only a small section of one of the tables produced by the model as an example, the table below shows total expenditure subtracted from total revenue (see Table A). With the initial data, we can see that in Year 4 we are faced with a \$38.41 million deficit in the public health sector.

**Table A**  
**Results of Initial Data**

**REVENUES AND EXPENDITURES AND THEIR DIFFERENCES**  
**(IN MILLIONS \$)**

	Base Year	Year 1	Year 2	Year 3	Year 4
TOTAL REVENUES	51.34	52.39	53.50	54.72	56.06
TOTAL EXPENDITURES	47.97	56.34	67.49	79.12	94.47
TOTAL REVENUE-EXPEND	3.37	(3.95)	(13.99)	(24.40)	(38.41)

Now the user may experiment with different decisions to see how they affect this deficit. (Step-by-step instructions for duplicating these examples are given in Appendix A.) By lowering the goal for the number of hospitals to be built by Year 4 from 120 to 100, the following results are obtained:

**Table B**  
**After Lowering Goal for Number of Hospitals**

**REVENUES AND EXPENDITURES AND THEIR DIFFERENCES**  
**(IN MILLIONS \$)**

	Base Year	Year 1	Year 2	Year 3	Year 4
TOTAL REVENUES	51.34	52.21	53.10	54.07	55.12
TOTAL EXPENDITURES	47.01	54.03	63.39	72.83	85.36
TOTAL REVENUE-EXPEND	4.34	(1.82)	(10.28)	(18.76)	(30.24)

While the Ministry of Health will still operate at a deficit in Year 4, this deficit has been reduced by over \$8 million. If instead of lowering the goal for the number of hospitals the user changes the number of physicians per 155-bed hospital from 35 to 25, the deficit is reduced from \$38.41 million to \$34.82 million (see Table C). A decision must be made as to whether the reduction in the quality of health services resulting from such a decision would be worth the cost of savings.

**Table C**  
**After Lowering the Number of Physicians per Hospital**

REVENUES AND EXPENDITURES AND THEIR DIFFERENCES  
(IN MILLIONS \$)

	Base Year	Year 1	Year 2	Year 3	Year 4
TOTAL REVENUES	51.34	52.39	53.50	54.72	56.06
TOTAL EXPENDITURES	47.60	55.49	65.93	76.66	90.88
TOTAL REVENUE-EXPEND	3.74	(3.10)	(12.43)	(21.95)	(34.82)

A final example would be to look at what would happen to this deficit if the percentage of the total government recurrent budget devoted to health were increased from nine percent to 15 percent. Table D below shows that the budget deficit would be reduced from \$38.41 million to \$29.05 million. This change is not greater because a large share of the recurrent budget of the health sector is contributed by external donors rather than by the government (see sample graphs and tables in Appendices C and D).

**Table D**  
**After Increasing the Percentage of the Government Recurrent Budget Devoted to Health**

REVENUES AND EXPENDITURES AND THEIR DIFFERENCES  
(IN MILLIONS \$)

	Base Year	Year 1	Year 2	Year 3	Year 4
TOTAL REVENUES	51.34	61.48	62.68	63.99	65.43
TOTAL EXPENDITURES	47.97	56.34	67.49	79.12	94.47
TOTAL REVENUE-EXPEND	3.37	5.14	(4.81)	(15.13)	(29.05)

By examining the effects of changes on the tables and graphs produced by the model, the decision maker can gain knowledge about how policy changes would improve the viability of the health sector.

## **APPENDICES**

- Appendix A: Practical Guide for the Model**
- Appendix B: Greeting and Instructions**
- Appendix C: Sample Tables**
- Appendix D: Sample Graphs and Figures**
- Appendix E: Formulas Used in the Model**

**Appendix A**

**Practical Guide for the Model**

## PRACTICAL GUIDE FOR THE MODEL

### DATA REQUIREMENTS AND SOURCES

The data required for the model are grouped in six categories (shown in Appendix C, Tables I, II, and III): 1) basic facility-specific data, 2) macro rates and figures, 3) coverage data, 4) personnel salaries, 5) source of funds, and 6) expenditure data. The facility-specific data include staffing and levels of use of facilities. The macro information includes GDP growth rates, population growth rates, and the inflation rate. Data needed to calculate coverage indicators include numbers of facilities, beds, and health personnel. Personnel salary data are the average salaries of each type of health personnel. The source of funds information includes 1) overall government capital and recurrent budget allocations; 2) the percentages of each allocated to health; and 3) user fee information. The expenditure data include non-personnel costs of operating hospitals and health centers. The model is "calibrated" with these data for a base planning year. (The data shown in Tables I, II, and III are roughly based on data from Bangladesh in 1980 -- from data that could be found "off the shelf" from secondary sources.)

In its present form, the model is useful for demonstrating the effects of certain changes in the structure and method of financing of the public health sector on the long-term sustainability of health services provision. Thus, the model can be used as a pedagogical tool without entering new data on costs and facilities. In many countries, it should be possible to find data which, if entered into the model, will present a picture of the health sector in that country. In other countries, the structure of the health sector may be so different that the model cannot adequately represent that country's situation without changes to the programming. If that is the case, the model can still be used as it is to demonstrate financial relationships in the health sector.

Once the model has been calibrated, it prompts the user to provide data for future years (shown in the last four columns of Tables I, II, and III). Changes can be made in variables exogenous to the health sector, such as the population growth rate, and in choice variables, such as the numbers of hospitals, fees, charges, or the rates of salary increases. Usually, the user will begin by entering the desired targets (e.g., numbers of new hospitals to be opened) and the currently employed sources of revenue (e.g., the amount of government budget allocated to health). The model calculates the balances between required and available resources, using the choices entered initially. The user then may begin to modify these targets (e.g., construct fewer new health centers) and revenue sources (e.g., charge higher user fees for ambulatory visits) to try to reach a financial balance.

Sources of data for the model include Ministry of Health records, donor organizations, and Ministry of Plan and Finance for financial statistics.

#### OUTPUT DATA

Table IV in Appendix C shows the four categories (revenues, expenditures, services, and health indicators) of output data that are transformed into the displays described previously. The base year figures should be the actual figures for the present year. The figures for Years 1 to 4 are generated by the projections of exogenous variables and policy selections made by the user. The possible services from given revenue are calculated by dividing revenues by the cost per unit of each service. Health services indicators are calculated by dividing the total population by the service indicator (e.g. population per physician). The formulas used to calculate revenues and expenditures are spelled out in Appendix E.

#### TECHNICAL NOTES

This model is a simple representation of financing in the health sector. A more elaborate model could be built in which some of the basic assumptions (such as the elasticity of demand for health services) could be altered and more variables added.

The present model is written for use on IBM-compatible personal computers in Lotus 1-2-3, release 2.0, which is a powerful, flexible, and relatively simple spreadsheet program that is widely used. However, for a model this size, Lotus requires up to ten minutes to perform all of the calculations and other steps necessary to produce the output graphs and charts. This time may be too long for a user wanting to perform a variety of financing and investment scenarios. Rewriting the model in a common programming language should shorten this process by up to 90 percent, and a more elaborate model would require that this be done.

#### HOW TO USE THE MODEL ON A MICROCOMPUTER

The following hardware and software are required to run the model successfully:

- o IBM or IBM-compatible personal computer;
- o Computer monitor with graphics capability, preferably with a high resolution screen (a Hercules card is suggested);
- o MS-DOS;
- o Lotus 1-2-3, Release 2.0

A basic knowledge of PCs and Lotus 1-2-3 is recommended, but not necessary, to operate the model.

#### A. Computers with a Hard Disk

To begin operation, turn the computer on. The computer will load MS-DOS into the memory and default to Drive C (hard disk). If Lotus version 2.0 is on the hard drive, load it by using the procedures set up for that particular computer. If Lotus is not on the hard drive, insert a floppy with Lotus version 2.0 on it in drive A, then key in "A:LOTUS" and hit "ENTER" (or "RETURN"). Under either procedure, Lotus should now be loaded. A menu offering several choices will be on the screen. Choose 1-2-3. You will be taken into a blank spreadsheet. To bring up the menu, type a slash ("/"). Change the default directory by keying in the sequence "WGDD.", (Worksheet, Global, Default, Directory). If the second line reads "Directory at startup: A:," hit "ENTER," then "Q" and continue. If the second line reads otherwise, backspace to erase the current startup, then key in "A:," "ENTER," then "Q" and continue. Insert the disk with the model in Drive A. Now key in "/FR", (File, Retrieve) and "ENTER" to load the model. From this point forward you will be guided by menus.

#### B. Computers with Floppy Drives Only

For a computer with only floppy drives, the procedure is slightly different. In this case insert the MS-DOS disk into drive A and then turn the computer on. This will load MS-DOS automatically. The computer will prompt you to fill in the date and time, which you can do or bypass by pressing "ENTER" twice. Then replace the DOS disk with the Lotus Version 2.0 disk. Type in "LOTUS" and then press "ENTER." After a short pause a menu will appear offering several choices. Choose 1-2-3, then wait until you get a blank spreadsheet. Replace the Lotus disk with the Health Sector Financing Model disk and type "/FR" and press "ENTER." The model will then take over and guide you through the entire procedure.

Whenever the model is activated, the letters "CMD" will appear at the bottom of the screen. If at any time the model becomes de-activated and "CMD" no longer appears at the bottom, you may re-activate the model by simultaneously pressing "ALT" and "A." If you wish to de-activate the model you should simultaneously press "CTRL" and "BREAK," then "ESC," if necessary. To exit from the model, press simultaneously "ALT" and "Q."

#### C. Step-by-Step Instructions

The menus in the Health Sector Financing Model will guide the user through the procedures for using the model. However, these step-by-step instructions for duplicating the examples in Section VI will give the user an introduction to how the model works.

Once you have retrieved the model's worksheet (AUTO123.WK1) by typing /FR, a screen will appear which introduces the model and gives some basic instructions. Read this screen and press "ENTER" (or "RETURN") to go to a second introductory screen. Read it and press "ENTER" again.

Now you will come to the first menu in the model, which looks like this:

CHANGE OR VIEW DATA    PRODUCE GRAPHS

You can use the right and left arrow keys to move from one choice to the other. You will see that as the highlighted bar moves from one menu choice to another, the description of that choice in the line below changes as well. In the example below, the highlighted choice is in boldface:

**CHANGE OR VIEW DATA**    PRODUCE GRAPHS  
CHANGE OR VIEW DATA USED IN THE MODEL

CHANGE OR VIEW DATA    **PRODUCE GRAPHS**  
PRODUCE GRAPHS USING PRESENT DATA

From this point on in the instructions, menus will be represented by a list of the choices offered, with the description of each choice indented below it. The menus have also been given numbers so that you may look back to find a given menu in the directions. These numbers are in the instructions only; they do not appear in the model itself. The first menu will thus be represented as:

1. **CHANGE OR VIEW DATA**  
    CHANGE OR VIEW DATA USED IN THE MODEL
- PRODUCE GRAPHS**  
    PRODUCE GRAPHS USING PRESENT DATA

Use the arrow keys to move to the first choice, **CHANGE OR VIEW DATA**, and press "ENTER".

**NOTE:** During the first run-through of the model, do not change any numbers and you will get the results shown in Table A of Section VI. Instructions on duplicating Tables B through D will be given after the initial instructions.

The model will now bring you to the Macro Screen, which shows the macroeconomic variables. As you press "ENTER", the model will automatically move you to the cells where you can change data. (To enter a new number to replace an old number, you would type that number and press "ENTER".) To go to the next cell without changing the data, simply press "ENTER".

When you have gone through all the numbers that can be changed on the Macro Screen, a new menu will appear at the top of the screen. This menu has the following choices:

2. **FURTHER CHANGES TO MACRO DATA**  
MAKE MORE CHANGES TO THE MACROECONOMIC VARIABLE DATA

**CONTINUE**  
CONTINUE WITH DATA VIEW/CHANGE PROCEDURE

**PRODUCE GRAPHS**  
PRODUCE GRAPHS USING PRESENT DATA

If you chose FURTHER CHANGES TO MACRO DATA, you will go back to the beginning of this step. Choose CONTINUE to go to the next screen, the Coverage Screen. This screen contains tables showing goals for coverage of the population with health services. At this point, leave all data as it is by pressing "ENTER" until the next menu comes up. This menu has the following choices:

3. **FURTHER CHANGES TO COVERAGE DATA**  
MAKE MORE CHANGES TO THE COVERAGE MEASURE DATA

**CONTINUE**  
CONTINUE WITH DATA VIEW/CHANGE PROCEDURE

**PRODUCE GRAPHS**  
PRODUCE GRAPHS USING PRESENT DATA

Choose FURTHER CHANGES to repeat this step, or CONTINUE to go on to the next screen.

The next screen is the Salary Screen, which shows the goals for annual changes in salaries for health professionals. Hit "ENTER" until you bring up the next menu, which includes the following choices:

4. **FURTHER CHANGES TO THE SALARY DATA**  
MAKE MORE CHANGES TO THE SALARY VARIABLE DATA

**CONTINUE**  
CONTINUE WITH DATA VIEW/CHANGE PROCEDURE

**PRODUCE GRAPHS**  
PRODUCE GRAPHS USING PRESENT DATA

Choose FURTHER CHANGES to repeat this step or CONTINUE to go on.

The next screen is the Revenue Screen, which gives information on government capital and recurrent budgets, the percentage of each which goes to the health sector, external aid for health, and fees for health services.

On this screen, the user can enter changes to the size of the government budget, the percentage which goes to health, or the amount of external assistance for the health sector. In addition, the user can set new fee levels for hospital admittance and ambulatory care. In the last two rows, the user can decide whether or not to charge fees at all by entering 0 for No or 1 for Yes. There are quite a few cells on this screen where the user can change information. For the moment, leave all numbers the same. Press "ENTER" until you get to the last row on this screen. The next menu will appear at the top of this screen. This menu includes the following choices:

5. **FURTHER CHANGES TO THE REVENUE DATA**
  - MAKE MORE CHANGES TO THE REVENUE VARIABLE DATA
  - MACRO DATA**
    - MAKE MORE CHANGES TO THE MACROECONOMIC VARIABLE DATA
  - COVERAGE**
    - MAKE MORE CHANGES TO THE COVERAGE MEASURE DATA
  - SALARY**
    - MAKE MORE CHANGES TO THE SALARY VARIABLE DATA
  - PRODUCE**
    - PRODUCE GRAPHS USING PRESENT DATA

Choose **FURTHER CHANGES** if you want to repeat the last step. Choose **MACRO DATA**, **COVERAGE**, or **SALARY** to go back to the earlier screens. If you are ready to continue, choose **PRODUCE** to have the model begin to produce tables and graphs from the initial data.

It will take the model several minutes to produce the graphs and tables. When it is done, a menu will appear at the top of the screen which has the following choices:

6. **VIEW AGGREGATED GRAPHS**
  - VIEW GRAPHS OR TABLES PRODUCED FROM AGGREGATED DATA
  - PRODUCE DETAILED GRAPHS**
    - PRODUCE GRAPHS AND TABLES FROM DETAILED DATA
  - EXIT**
    - EXIT THE MODEL WITHOUT PRODUCING GRAPHS OF THE PRESENT DATA

To examine the graphs and tables produced by the model, chose VIEW AGGREGATED GRAPHS. (If you chose PRODUCE DETAILED GRAPHS, the model will produce a number of more detailed graphs and tables from the same data. This process will take several more minutes, and is not necessary at this point.)

After you choose VIEW, another menu will appear at the top of the screen offering the following choices:

- 7. **GRAPHS**  
VIEW GRAPHS PRODUCED
  
- TABLES**  
VIEW TABLES PRODUCED
  
- PREVIOUS MENU**  
BACKUP TO PREVIOUS MENU
  
- DATA CHANGE**  
MAKE FURTHER CHANGES TO DATA

Choosing GRAPHS allows you to look at the graphs produced by the model; TABLES shows you the tables containing the same information; PREVIOUS MENU takes you back to the previous step; and DATA CHANGE takes you all the way back to the Macro Screen to go through the steps of changing data again.

Choose TABLES to find the table shown in Section VI. This will bring you to the next menu:

- 8. **REVENUE**  
VIEW REVENUE TABLE FOR ALL FIVE YEARS
  
- EXPENDITURE**  
VIEW EXPENDITURE TABLE FOR ALL FIVE YEARS
  
- DEFICIT/SURPLUS**  
VIEW REVENUES AND EXPENDITURES TABLE FOR ALL FIVE YEARS
  
- SERVICES**  
VIEW TABLE OF POSSIBLE SERVICES FROM GIVEN REVENUE
  
- PREVIOUS**  
BACKUP TO PREVIOUS MENU
  
- EXIT**  
EXIT THE MODEL

Choose DEFICIT/SURPLUS to examine how revenues compare with expenditures given the initial data entered. The first three rows on the table which will appear on the screen are reproduced in Table A of Section VI. As you can see, there is a slight surplus of revenue over expenditures in the base year, but a large deficit of US\$38.41 million is expected by Year 4.

Press "ENTER" to go back to the menu. Now you can try changing some of the choices made while entering data in order to test the effect on the deficit. Choose PREVIOUS to back up to Menu 7 above. Choose DATA CHANGE. This will bring you back to Menu 5 above. Choose COVERAGE to go to the Coverage Screen. On this screen, the first cell to which the model brings you is the goal for the number of hospitals to be built by Year 4. Lower this from 120 by typing 100 and pressing "ENTER". Press "ENTER" six more times to bring up the menu. Choose PRODUCE GRAPHS to create new graphs and tables with this new information. It will take several minutes.

\* When the model is done producing the graphs and tables, it will bring up Menu 6 again. Choose VIEW AGGREGATED GRAPHS to go to Menu 7. Choose TABLES to go to Menu 8. Choose DEFICIT/SURPLUS to view the table comparing revenues with expenditures over five years.

The first three lines of the table appear in Table B in Section VI. As you can see, the deficit in Year 4 has been reduced as a result of the lower goal you chose for the number of hospitals to build.

Let us try the next example. Hit "ENTER" to return to Menu 8. Choose PREVIOUS to go back to Menu 7. Choose DATA CHANGE to go to Menu 5. Choose COVERAGE to bring up the Coverage Screen.

Change the number of hospitals back to 120 by typing 120 and pressing "ENTER". Press "ENTER" two more times to move to the cell with the number of physicians per hospital. Change the number by typing 25 and pressing "ENTER". Press "ENTER" three more times to bring up the menu. Choose PRODUCE GRAPHS. To view Table C in Section VI, repeat the steps in the paragraph above with the asterisk (\*).

To try the last example, press "ENTER" to go to Menu 8. Choose PREVIOUS to go to Menu 7. Choose DATA CHANGE to go to Menu 5. Choose COVERAGE to bring up the Coverage Screen.

Press "ENTER" three times to go to the number of physicians per hospital. Change this number back to 35 by typing 35 and pressing "ENTER". Press "ENTER" three more times to bring up the menu.

Now you want to go to the Revenue Screen. To do this, you must go through the Salary Screen first. Choose CONTINUE to move to the Salary Screen. Bypass this screen by pressing "ENTER" four times until the menu appears at the top of the screen. Choose CONTINUE to move to the Revenue Screen.

Press "ENTER" 12 times to go to the cell showing the percentage of the government's recurrent budget going to the health sector in Year 1. Type 0.15 and "ENTER" to change it from nine percent to 15 percent. Do the same for Years 2-4. Press "ENTER" 18 more times to bring up the menu. Choose PRODUCE to produce graphs and tables from this new information. Wait several minutes. To view Table D in Section VI, follow the directions in the paragraph above with the asterisk (\*).

Press "ENTER" to go back to the menu. Use the arrow keys to move to EXIT and press "ENTER" to leave the model and quit Lotus 1-2-3. Choose Yes when the program asks you to confirm the quit. You can now take out your disk and put it away.

If at any time you want to save the changes you have made to the model, choose No after choosing EXIT. Then type / File Save, "ENTER", and then choose Replace. This will wipe out the original version of the model, so you should copy the model onto another disk before doing this. Now you can quit Lotus 1-2-3 by typing / , choosing Quit, and then choosing Yes.

Now that you have tried duplicating these examples, you can explore the rest of the model on your own by following the directions provided in the menus. You can view the many graphs produced by the model. Some of these graphs may be difficult to read, but all of the information is duplicated in the tables produced by the model. You can produce and view detailed graphs and tables which break down revenues and expenditures into recurrent/capital categories and hospital/health center categories. You can try out different changes to the choices made in the model in order to examine the effects on the sustainability of health services. Good luck!

**APPENDIX B**

**Greeting and Instructions**

-----  
\*\*WELCOME TO THE ANE BUREAU HEALTH SECTOR FINANCING MODEL\*\*  
DEVELOPED BY THE RESOURCES FOR CHILD HEALTH (REACH) PROJECT  
-----

- o THIS MODEL WILL DEMONSTRATE THE EFFECT OF POLICY CHOICES ON THE LONG TERM SUSTAINABILITY OF HEALTH SERVICES IN A SPECIFIED COUNTRY.
- o IT CONSIDERS THE INFLUENCE OF MAJOR DETERMINANTS ON THE SUPPLY OF HEALTH SERVICES AND CALCULATES THE COST TO PROVIDE THEM.
- o IT ALSO EXAMINES THE MAJOR SOURCES OF REVENUE FOR THE HEALTH SECTOR AND COMPUTES THE EXCESS OR SHORTFALL OF REVENUES OVER EXPENDITURES.
- o THE MODEL FORECASTS REVENUES AND EXPENDITURES OVER FIVE YEARS, TAKING INTO CONSIDERATION VARIOUS EXOGENOUS FACTORS SUCH AS GROWTH OF GDP AND POPULATION, AND DESIRED IMPROVEMENTS IN THE RATIOS OF POPULATION TO HOSPITAL BEDS, PHYSICIANS, NURSES, ETC.

PRESS THE ENTER KEY TO CONTINUE

- o THE MODEL IS AUTOMATED AND INTERACTIVE. INSTRUCTIONS AND MENUS WILL GUIDE YOU THROUGH THE PROCESS.
- o THE [CMD] AT THE BOTTOM OF THE SCREEN SIGNIFIES THAT THE MODEL IS ACTIVATED. IF THE [CMD] IS NOT VISIBLE AND YOU WOULD LIKE TO ACTIVATE THE MODEL, PRESS THE [ ALT ] AND [ A ] KEYS SIMULTANEOUSLY.
- o IF AT ANY TIME THE MODEL BECOMES MISALIGNED, YOU SHOULD TURN THE MODEL OFF BY PRESSING THE [ CTL ] AND [ BREAK ] KEYS SIMULTANEOUSLY AND THEN THE [ESC] KEY IF NECESSARY, TO GET RID OF THE FLASHING !ERROR! MESSAGE. RESTART THE MODEL AS DESCRIBED ABOVE.
- o TO EXIT THE MODEL, SELECT "EXIT" WHEN PROMPTED IN THE MAIN MENUS, OR PRESS THE [ ALT ] AND [ Q ] KEYS SIMULTANEOUSLY.

PLEASE PRESS ENTER WHEN READY TO CONTINUE

**APPENDIX C**

**Sample Tables**

HEALTH FINANCING MODEL: TABLE I

BASIC FACILITY-SPECIFIC DATA	BASE-YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
NO. OF HOSP	90				
NO. OF BEDS PER HOSP	150				
# OF HOSPITALIZATIONS PER HOSP	4,599				
# OF AMBULATORY VISITS PER HOSP	5,000				
HOSP - ANNUAL INPATIENT DAYS	413,910				
HOSP - ANNUAL AMBULATORY VISITS	450,000				
NO. OF PHYSICIANS PER HOSP	30				
NO. OF 1-CL NURSES PER HOSP	100				
NO. OF 2-CL NURSES PER HOSP	150				
# OF AMB. VISITS PER HC	2,500				
# OF PREVENTIVE VISIT PER HC	15,000				
HEALTH CTR - ANNUAL AMB VISITS	687,500				
HEALTH CTR - ANNUAL PREV VISITS	4,125,000				
NO. OF HCs	275				
NO. OF AUXILIARY PERSONNEL/HC	1				
NO. OF 1-CL NURSES/HEALTH CENTER	0				
NO. OF 2-CL NURSES/HEALTH CENTER	0				
NO. OF PHYSICIANS /HC	0	0	0	0	0
NO. OF PRIVATE PRACTITIONERS	7,781	7,769	8,164	8,364	8,569
TOTAL NO. OF PHYSICIANS	10,481	11,015	11,576	12,161	12,769

HEALTH FINANCING MODEL: TABLE 11

MACRO RATES AND FIGURES	BASE-YEAR RATE/FIGUR	YEAR 1 FIGURE	YEAR 2 FIGURE	YEAR 3 FIGURE	YEAR 4 FIGURE
TOTAL POPULATION (IN MILLIONS)	98	100	103	105	106
GROWTH RATE OF GDP	0.60%	1.75%	1.75%	1.75%	1.75%
GROWTH RATE OF POPULATION	2.41%	2.45%	2.45%	2.45%	2.45%
INFLATION RATE	10.00%	12.00%	15.00%	12.00%	15.00%
COVERAGE DATA	BASE-YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
NO. OF HOSP	90	98	105	113	120
NO. OF HCS	275	288	300	313	325
NO. OF BEDS/HOSP	150	151	153	154	155
NO. OF PHYSICIANS/HOSP	30	31	33	34	35
NO. OF NURSE1/HOSP	100	103	105	108	110
NO. OF NURSE2/HOSP	150	151	153	154	155
NO. OF AUX.PERSONNEL/HC	1	1	1	1	1
HEALTH SERVICES INDICATORS	BASE-YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
RATIO OF POPN TO HOSP BED	7,259	6,806	6,421	6,090	5,802
RATIO OF POPN TO HEALTH CTR	3,564	3,491	3,427	3,371	3,321
RATIO OF POPN TO PHYSICIAN	9,350	9,111	8,882	8,662	8,452
RATIO OF POPULATION TO NURSES	4,356	4,057	3,803	3,584	3,394
RATIO OF POPN TO AUX.PERSONNEL	3,564	3,491	3,427	3,371	3,321
PERSONNEL SALARY	BASE-YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
PHYSICIAN'S ANNUAL SALARY	\$1,659	\$1,792	\$1,935	\$2,090	\$2,257
1-CL NURSE'S ANNUAL SALARY	\$300	\$345	\$397	\$456	\$525
2-CL NURSE'S ANNUAL SALARY	\$250	\$288	\$331	\$380	\$437
AUX. PERSONNEL'S ANNUAL SALARY	\$230	\$265	\$304	\$351	\$402
SOURCES OF FUNDS	BASE-YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GOVT DEV.BUDGET (CAPITAL:IN MIL)	\$150	\$152	\$153	\$155	\$156
GOVT REV. BUDGET (RECUR:IN MIL)	\$150	\$152	\$153	\$155	\$156
% DEV.BUDGET TO HLTH	\$0	\$0	\$0	\$0	\$0
% REV.BUDGET TO HLTH	\$0	\$0	\$0	\$0	\$0
EXT.AID TO HLTH (CAPITAL:IN MIL)	\$10	\$10	\$10	\$10	\$10
EXT.AID TO HLTH (RECUR:IN MIL)	\$10	\$10	\$10	\$10	\$10
HOSP ADMITTANCE FEE	\$5	\$6	\$6	\$7	\$7
FEE PER AMBULATORY VISIT	\$2	\$2	\$2	\$3	\$3
USE FEE FOR HOSP (YES=1; NO=0)	1	1	1	1	1
USE FEE FOR AMB SERV(YES=1;NO=0)	1	1	1	1	1

HEALTH FINANCING MODEL: TABLE III

EXPENDITURE DATA	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
CONSTRUCTION COST OF A HOSP	25,000	28,000	32,200	36,064	41,474
EQUIPMENT COST OF A HOSP	45,000	50,400	57,960	64,915	74,652
OTHER INVEST COST OF A HOSP	7,000	7,840	9,016	10,098	11,613
COST HOSP CONSUMMABLES/INPAT DAY	3	3	4	4	5
COST OF MEDICINES/INPAT DAY	2	2	3	2	3
COST LAB & DIAGNOSTICS/INPAT DAY	4	4	5	6	7
COST OPER & MAINT./HOSP	30,000	33,600	38,640	43,277	49,768
CONSTRUCTION COST OF A HC	6,000	6,720	7,728	8,655	9,954
EQUIPMENT COST OF A HC	5,000	5,600	6,440	7,213	8,255
OTHER INVEST COST OF A HC	1,500	1,680	1,932	2,164	2,488
COST OF CONSUMMABLES/AMB VISIT	2	2	3	3	3
COST MEDICINES/AMBULATORY VISIT	2	2	2	2	2
COST LAB & DIAGNOSTICS/AMB VISIT	2	2	3	3	3
COST PREVENTIVE SERVICES/VISIT	1	1	1	1	1
COST OPER & MAINT./HC	7,000	7,840	9,016	10,098	11,613
TRAINING COST/PHYSICIAN	1,500	1,680	1,932	2,164	2,488
TRAINING COST/NURSE1	300	336	386	433	498
TRAINING COST/NURSE2	250	280	322	361	415
TRAINING COST/AUX.PERSONNEL	100	112	129	144	166
COST OF CENTRAL ADMINISTRATION	9,400,000	10,528,000	12,107,200	13,560,064	15,594,074
OTHER HEALTH COST (CAPITAL)	4,053,030	4,539,394	5,220,303	5,846,739	6,723,750
OTHER HEALTH COST (RECURRENT)	4,053,030	4,539,394	5,220,303	5,846,739	6,723,750

## HEALTH FINANCING MODEL: TABLE IVa

HEALTH SECTOR REVENUES	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GOVT HLTH BUDGET-CAP	13,500,000	13,635,000	13,770,000	13,906,337	14,044,023
EXTERNAL AID-CAP	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
GOVT HLTH BUDGET-REC	13,500,000	13,635,000	13,770,000	13,906,337	14,044,023
EXTERNAL AID-REC	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
HOSP-PT SERV FEES	2,969,550	3,538,714	4,157,370	4,859,264	5,654,416
HCs-PT SERV FEES	1,375,000	1,581,250	1,800,000	2,045,455	2,320,661
TOTAL CAPITAL REVENUE	23,500,000	23,635,000	23,770,000	23,906,337	24,044,023
TOTAL RECURRENT REVENUE	27,844,550	28,754,964	29,727,370	30,811,055	32,019,100
TOTAL REVENUES	51,344,550	52,389,964	53,497,370	54,717,391	56,063,123
HLTH SECTOR RECURRENT EXPENDITUR	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
HOSP SALARIES	10,554,300	13,146,717	16,271,666	20,029,466	24,538,559
HOSP CONSUMMABLES	2,141,730	2,598,632	3,218,366	3,861,968	4,737,347
HOSP MEDS	1,502,820	1,623,422	2,258,238	2,709,885	3,324,126
HOSP LABS	2,555,640	3,100,843	3,840,275	4,608,330	5,652,885
HOSP OPER & MAINT	2,700,000	3,276,000	4,057,200	4,868,640	5,972,196
HC SALARIES	65,250	76,044	91,253	109,313	130,738
HC CONSUMMABLES	1,375,000	1,610,000	1,932,000	2,254,000	2,695,784
HC MEDS	1,031,250	1,207,500	1,449,000	1,690,500	2,021,838
HC LABS	1,375,000	1,610,000	1,932,000	2,254,000	2,695,784
HC PREV CARE	3,093,750	3,622,500	4,347,000	5,071,500	6,065,514
HC OPER & MAINT	1,925,000	2,254,000	2,704,800	3,155,600	3,774,098
CENTRAL ADMIN	9,400,000	10,528,000	12,107,200	13,560,064	15,594,074
OTHER REC COSTS	4,053,030	4,539,394	5,220,303	5,846,739	6,723,750
TOTAL RECURRENT EXPENDITURE	41,770,770	49,393,052	59,429,260	70,020,005	83,926,694
HLTH SECTOR CAPITAL EXPENDITURES	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
HOSP CONSTRUCTION	197,500	210,000	241,500	270,480	311,052
HOSP EQUIPMENT	337,500	378,000	434,700	486,864	559,894
HOSP OTHER INVEST	52,500	58,800	67,620	75,734	87,095
HC CONSTRUCTION	75,000	84,000	96,600	108,192	124,421
HC EQUIPMENT	62,500	70,000	80,500	90,160	103,684
HC OTHER INVEST	18,750	21,000	24,150	27,048	31,105
PHYS TRAINING	301,596	397,787	1,083,570	1,264,520	1,513,049
NURSI TRAINING	298,125	333,900	398,475	462,521	550,562
NURSE2 TRAINING	311,719	349,125	407,531	463,197	540,453
AUX TRAINING	1,250	1,400	1,610	1,803	2,074
OTHER CAP COSTS	4,053,030	4,529,394	5,220,303	5,846,739	6,723,750
TOTAL CAPITAL EXPENDITURE	6,199,469	6,943,406	8,056,553	9,097,258	10,547,138

HEALTH FINANCING MODEL: TABLE IVb

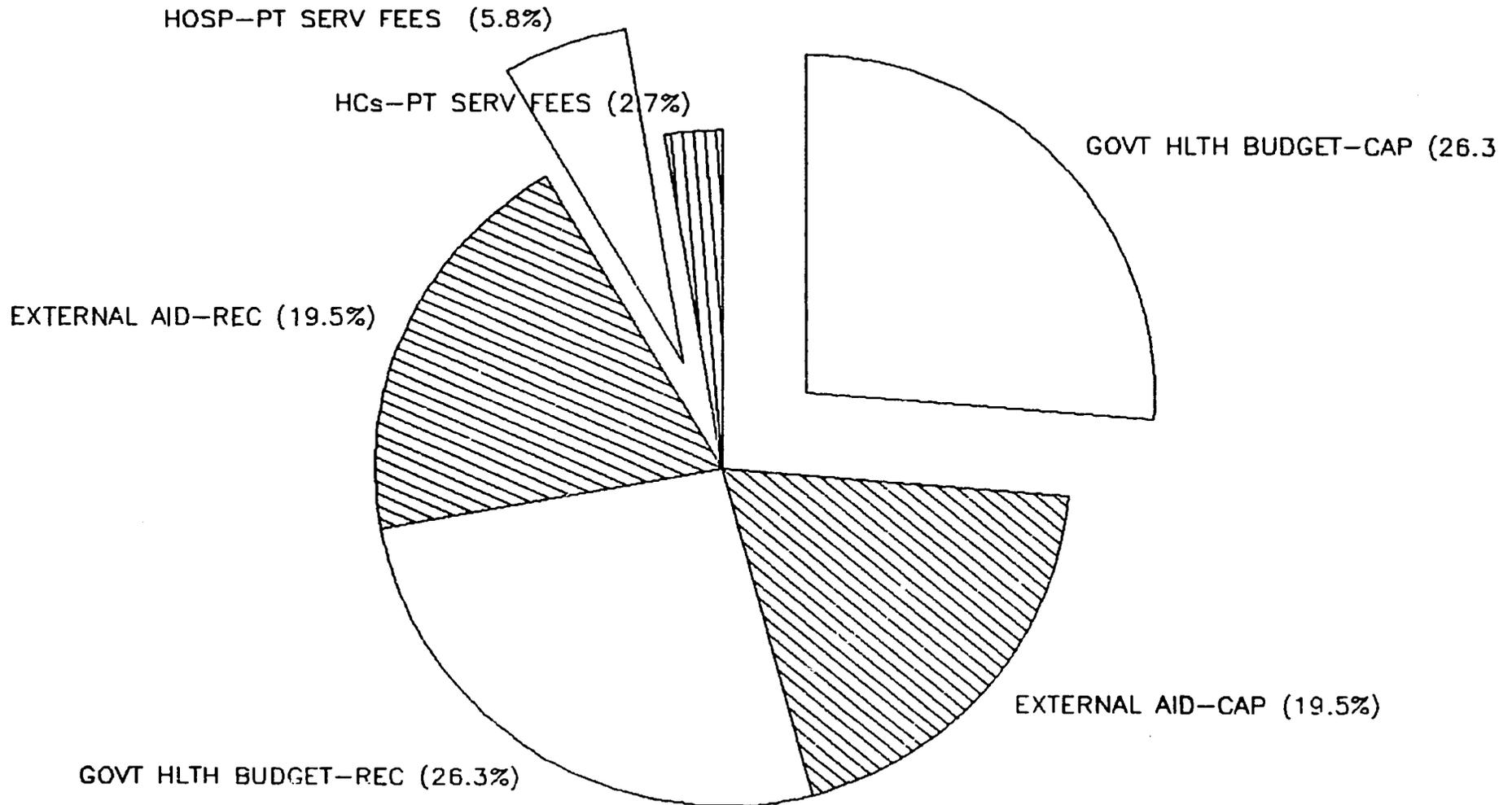
HOSPITAL EXPENDITURES	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
HOSP CONSTRUCTION	187,500	210,000	241,500	270,480	311,052
HOSP EQUIPMENT	337,500	378,000	434,700	486,864	559,894
HOSP OTHER INVEST	52,500	58,800	67,620	75,734	87,095
HOSP SALARIES	10,554,300	13,146,717	16,271,666	20,020,466	24,536,550
HOSP CONSUMMABLES	2,141,730	2,598,632	3,218,306	3,861,968	4,737,347
HOSP MEDS	1,502,820	1,823,422	2,256,236	2,709,885	3,324,126
HOSP LABS	2,555,640	3,100,843	3,840,275	4,608,330	5,652,895
HOSP OPER & MAINT	2,700,000	3,276,000	4,057,200	4,868,640	5,972,193
HC EXPENDITURES	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
HC CONSTRUCTION	75,000	84,000	96,600	108,192	124,421
HC EQUIPMENT	62,500	70,000	80,500	90,160	103,684
HC OTHER INVEST	18,750	21,000	24,150	27,048	31,105
HC SALARIES	63,250	76,044	91,253	109,313	130,738
HC CONSUMMABLES	1,375,000	1,610,000	1,932,000	2,254,000	2,695,784
HC MEDS	1,031,250	1,207,500	1,449,000	1,690,500	2,021,638
HC LABS	1,375,000	1,610,000	1,932,000	2,254,000	2,695,784
HC PREV CARE	3,093,750	3,622,500	4,347,000	5,071,500	6,065,514
HC OPER & MAINT	1,925,000	2,254,000	2,704,800	3,155,600	3,774,098
HEALTH SECTOR EXPENDITURES	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
HOSP REC COSTS	19,454,490	23,945,614	29,645,704	36,078,289	44,225,115
HOSP INVESTMENT	577,500	646,800	743,820	833,078	958,040
HC REC COSTS	8,863,250	10,380,044	12,456,053	14,534,913	17,383,756
HC INVESTMENT	156,250	175,000	201,250	225,400	259,210
TRAINING	1,412,689	1,582,212	1,891,186	2,192,041	2,606,138
CENTRAL ADMIN	9,400,000	10,528,000	12,107,200	13,560,064	15,594,074
OTHER CAPITAL COSTS	4,053,030	4,539,394	5,220,303	5,846,739	6,723,750
OTHER RECURRENT COSTS	4,053,030	4,539,394	5,220,303	5,846,739	6,723,750
TOTAL EXPENDITURES	47,970,239	56,336,457	67,485,618	79,117,263	94,473,632
REVENUE LESS EXPENDITURE	3,374,311	(3,946,494)	(13,988,448)	(24,399,671)	(38,410,702)
CAPITAL REVEN LESS EXPEND	17,300,531	16,691,594	15,713,442	14,809,079	13,496,665
RECURRENT REVEN LESS EXPEND	(13,926,220)	(20,638,088)	(29,701,890)	(39,208,950)	(51,907,594)
POS. SERVICES FROM GIVEN REV.	BASE YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4
NUMBER OF HOSPITALS	96	91	83	78	71
NUMBER OF HOSPITAL BEDS (100's)	144	137	127	120	110
NUMBER OF HEALTH CENTERS	294	267	238	216	193
NUMBER OF PHYSICIANS	11,218	9,747	8,309	7,249	6,220
NUMBER OF CLASS I NURSES	9,633	9,294	8,740	8,364	7,333
NUMBER OF CLASS II NURSES	14,450	13,714	12,693	11,962	11,036
NUMBER OF AUX PERSONNEL	294	267	238	216	193
NUMBER OF HOSPITALIZATIONS	443,025	416,991	382,601	357,824	327,499
NUMBER OF HOSP AMB CASES	481,654	453,350	416,178	389,024	356,055
NUMBER OF HC AMB CASES	735,860	668,400	594,540	540,311	482,158
NUMBER OF PREVENT. VISITS (10's)	441,516	401,040	356,724	324,187	286,295

**APPENDIX D**

**Sample Graphs and Figures**

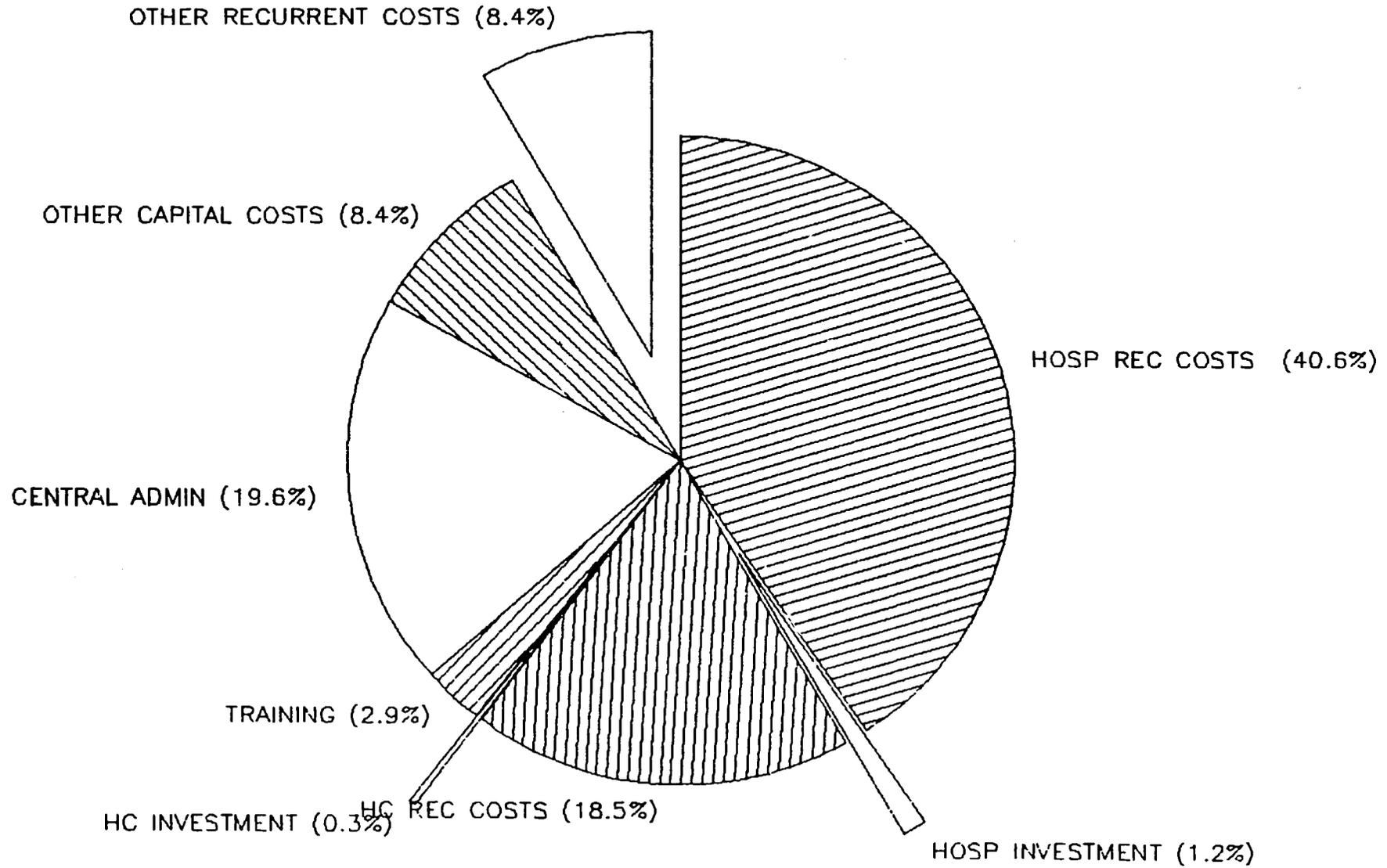
# BREAKDOWN OF ALL REVENUES

BASE YEAR



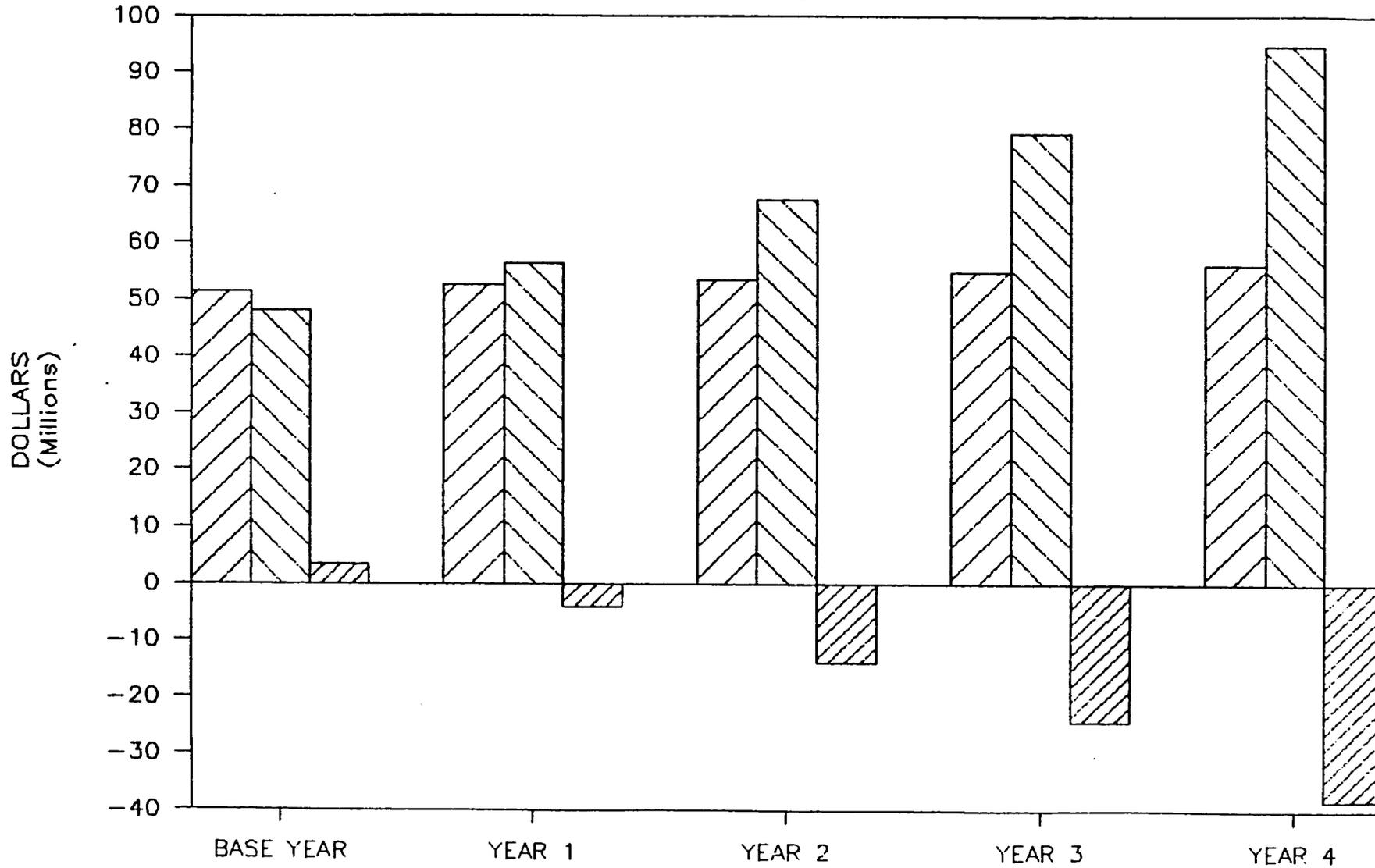
# BREAKDOWN OF TOTAL EXPENDITURE

BASE YEAR



# FORECAST OF TOT REVENUE AND EXPENDITURE

FIVE YEARS



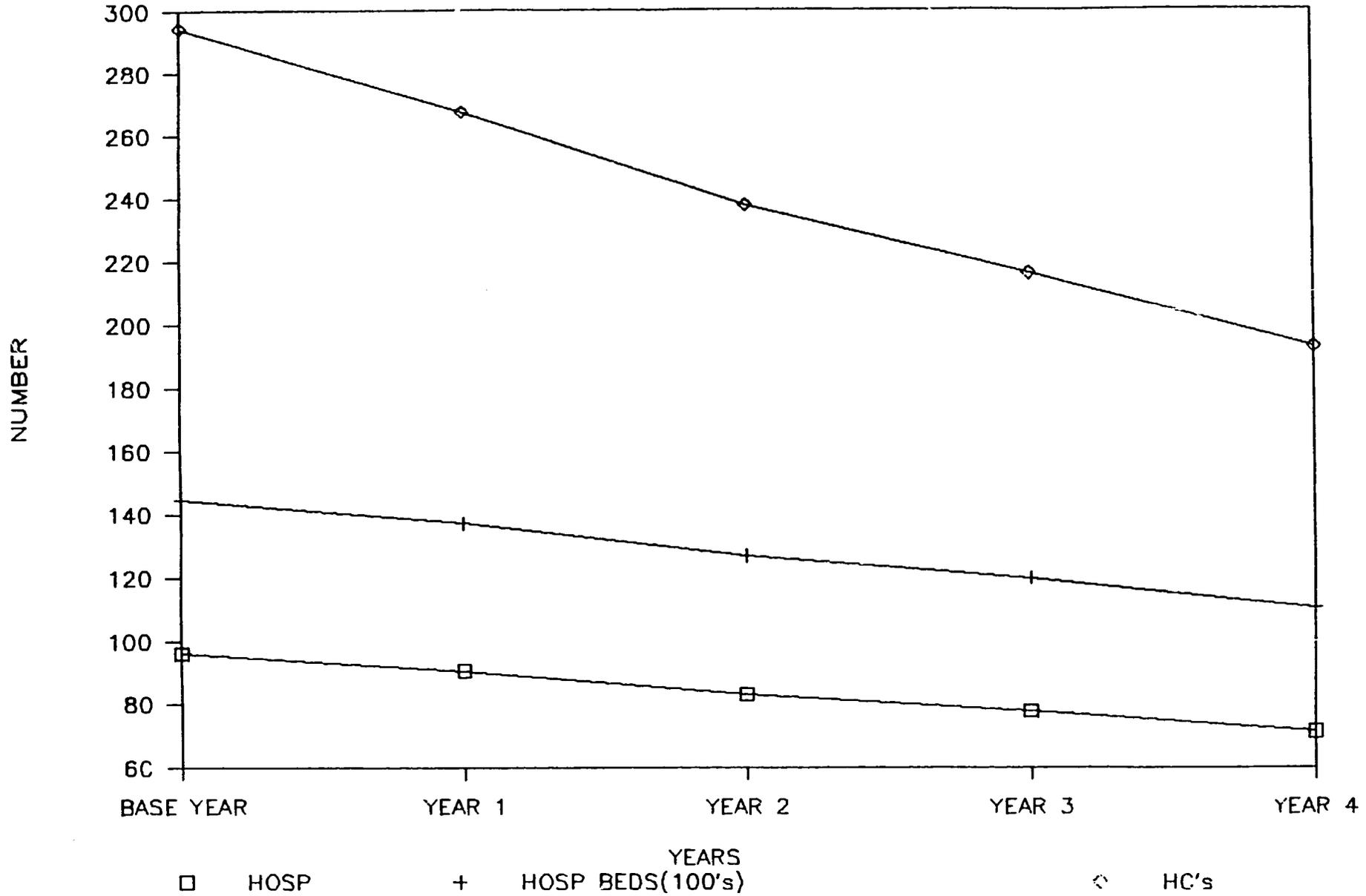
TOTAL REV

TOTAL EXPEND

REV-EXPEND

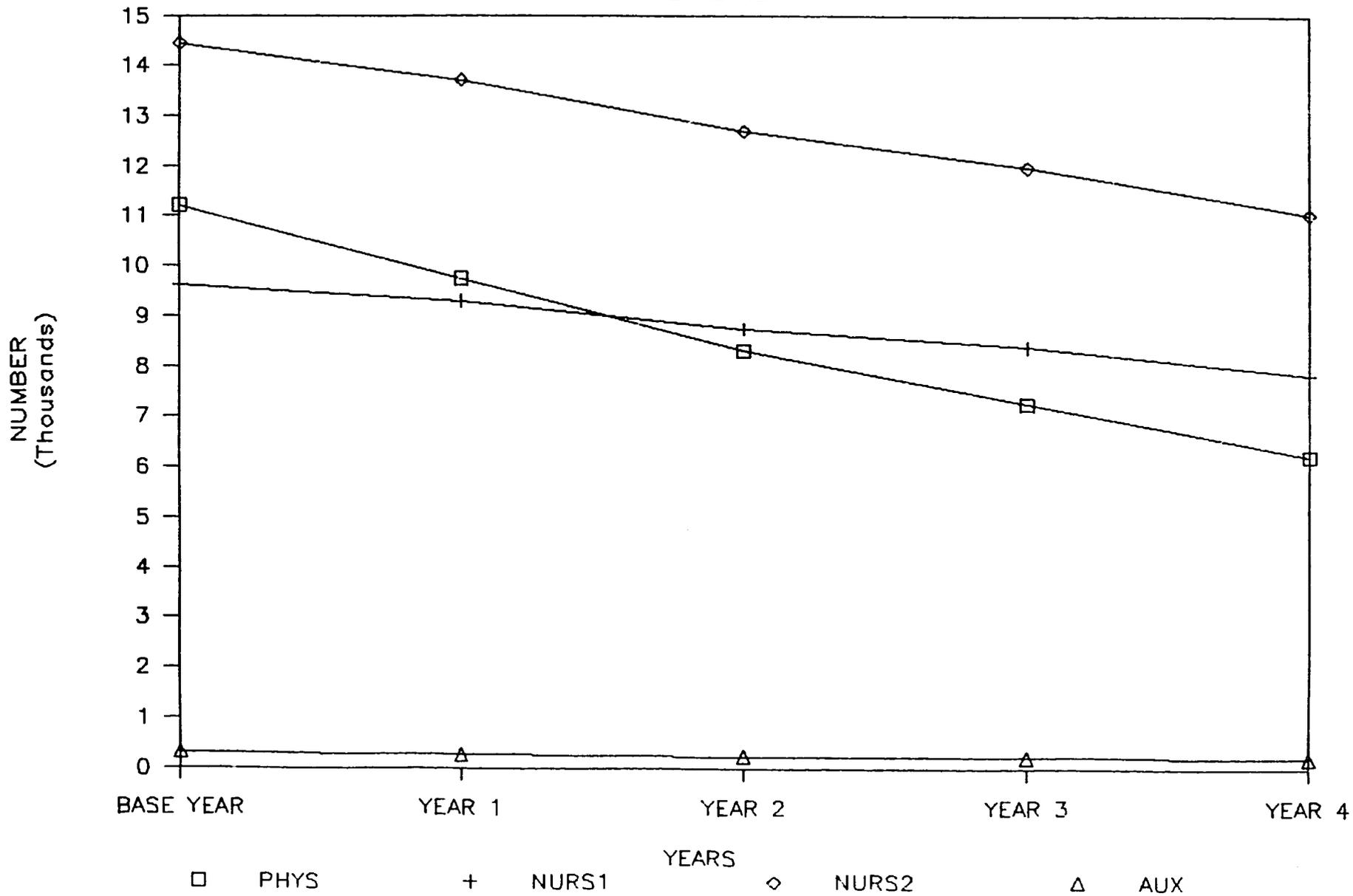
# POSSIBLE FACILITIES FROM EXPECTED REV

FIVE YEARS



# PERSONNEL AVAIL FROM EXPECTED REV

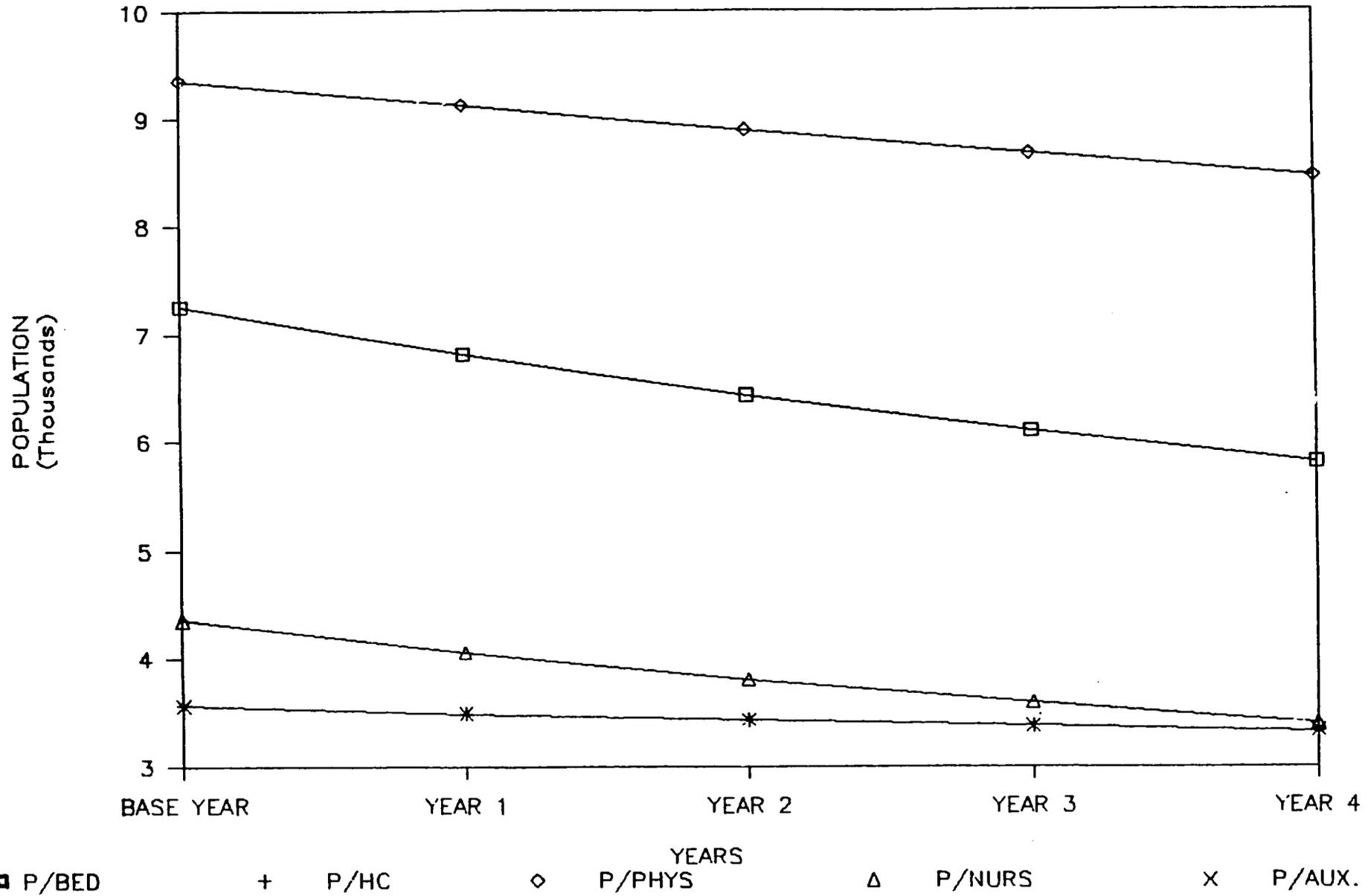
FIVE YEARS



6/16

# HEALTH SERVICES INDICATORS

FIVE YEARS



100

**APPENDIX E**

**Formulas Used in the Model**

## FORMULAS USED IN THE MODEL

### REVENUE FORMULAS

There are six sources of revenue in the model: the government capital and recurrent budgets, external aid for capital and recurrent expenditures, fees from hospital patients, and fees from health center patients. The following are the formulas for each of the revenue sources:

- 1) government health budget (capital) = total government capital budget x percent of capital budget to health
- 2) government health budget (recurrent) = total government recurrent budget x percent of recurrent budget to health
- 3) external aid for health (capital) = external capital aid for health
- 4) external aid for health (recurrent) = external recurrent aid for health
- 5) fees from hospital = (fee per hospitalization x hospital annual inpatient days) + (fee per ambulatory visit X hospital annual ambulatory visits)
- 6) fees from health centers = fee per ambulatory visit X health center ambulatory visits

### RECURRENT EXPENDITURE FORMULAS

The model provides for a choice of detailed or aggregated breakdowns of recurrent expenditures.

#### A. Detailed Expenditures

In the detailed version of expenditures there are fourteen categories, five related to hospitals and six to health centers and three for the overall sector. The following are the formulas used:

1. hospital salaries = numbers of hospitals x ((numbers of physicians per hospital x physician's salary) + (numbers of first-class nurses per hospital x first-class nurse's salary) + (numbers of second-class nurses per hospital x second-class nurse's salary))
2. hospital consumables cost = (hospital annual inpatient days x cost of hospital consumables per inpatient day) + (hospital annual ambulatory visits x cost of consumables per ambulatory visit)

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3 . hospital medicine cost = (hospital annual inpatient days x cost of medicines per inpatient day) + (hospital annual ambulatory visits x cost of medicines per ambulatory visit)

4. hospital laboratory costs = (hospital annual inpatient days x cost of laboratory and diagnostics per inpatient day) + (hospital annual ambulatory visits x cost of laboratory and diagnostics per ambulatory visit)

5. hospital fixed cost = number of hospitals x fixed cost per hospital

6. health center salaries = number of health centers x ((number of auxiliaries per health center x auxiliary's salary) + (number of first-class nurses per health center x first-class nurse's salary) + (number of second-class nurses per health center x second-class nurse's salary))

7. health center consumables cost = health center annual ambulatory visits x cost of consumables per ambulatory visit

8. health medicine cost = health center annual ambulatory visits x cost of medicine per ambulatory visit

9. health center preventive cost = health center annual preventive visits x cost of preventive services per visit

11. health center fixed costs = number of health centers x fixed cost per health center

12. central administrative cost = fixed amount

13. investment costs = fixed amount

14. other health costs = fixed amount

#### B. Aggregated Recurrent Expenditures

The aggregated group has four categories: hospitals, health centers, and two categories for the overall sector. The following formulas are used in the aggregated version:

1. hospital costs = number of hospitals x (hospital operating costs + hospital administration costs + hospital fixed costs)

2. health centers = number of health centers x (health center operating costs + health center administration costs + health center fixed costs)

3. central administration = fixed amount

4. other health costs = fixed amount

CAPITAL EXPENDITURES

There are eleven capital expenditure equations. They include hospital and health center construction, personnel training, and other capital expenditures.

1. hospital construction = number of new hospitals x cost of constructing a hospital
  2. hospital equipment = number of new hospitals x cost of hospital equipment
  3. hospital other investment = number of new hospitals x other investment costs of hospitals
  4. health center construction = number of new health centers x cost of health center construction
  5. health center equipment = number of new health centers x cost of health center equipment
  6. health center other investment cost = number of new health centers x other investment cost of health centers
  7. physician training = number of new physicians x physician training cost
  8. first-class nurse training = number of new first-class nurses x first class nurse training cost
  9. second-class nurse training = number of new second-class nurses x second-class nurse training cost
  10. auxiliary training = number of new auxiliaries x auxiliary training cost
  11. other capital cost = fixed amount
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